DT1.3 Data Collections

Version n. 1

"SMEs and Training Institutions assessment" 06/2019

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Executive Summary

The objective of Activity 1.3 is to carry out a cross-analysis, conducted in the three countries, between the SMEs need of highly specialized technicians with a specific basic preparation on new enabling technologies (KETs) and the training offer (3rd, 4th and 5th level EQF) on these technologies, in order to define the possible gaps and identify an innovative technical profile (and related set of skills) to be trained through a new transnational short cycle education pathway.

Why focus on Key Enabling Technologies (KETs)? KETs are today the basis of every innovative process, having literally penetrated into all aspects of our lives. The products and services obtained through their use now impact on a wide range of sectors (Transport, Agri-food / Agro-industry, Environment and territory, Cultural heritage, Biomedical diagnostics, Manufacturing, Social Innovation, Energy technologies, Pharmaceuticals, etc.)

Therefore, the spread of KETs in the EU is not only of strategic importance, but is indispensable to support the innovation and competitivity of companies, and in particular of SMEs.

What is the answer of educational systems? The Educational Institutions programs (3° and 4° EQF Levels) are not yet fully aligned to the skills needs for enabling technologies expressed by companies, which today require a wide range of advanced technical skills, as well as entrepreneurial skills, ICT skills, skills related to multidisciplinarity and creativity, capacity for project management and problem solving, ability to work with safety and quality standards, etc.

The potential growth of KETs depends largely on both the quality of the skills possessed by current and future employees, and the number of qualified people available to work in sectors that employ these new technologies.

The development of a short-cycle training offer, at a transnational level, aimed at preparing this specific target of qualified technicians, implemented according to the dual system to favor the rapid transition from the training world to that characteristic of small and medium-sized enterprises, seems to be the most effective and timely response to the concrete needs of technological development and innovation expressed by SMEs across borders.

In the following pages, each Project Partner will present the results of the analysis from different point of view: the three Chamber of Commerce assessed the SMEs needs while the other partner (ITS Cuccovillo, Montenegrin Ministry of Education and Duress Faculty of Economy) assessed the consequent training offers at local level.

This analysis will allow project partner to customize the new offer to be provided.

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PROJECT: ***"HIGH SPECIALIZED TECHNICIANS IN KETs"***

ACRONYM: ***HISTEK***

Report

Analysis of the training offer related to KETs
Country Report: Montenegro

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Abbreviations and acronyms	
KETs	Key Enabling Technologies
MQF	Montenegrin Qualification Framework
EQF	European Qualification Framework
AF	Application form

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1. INTRODUCTION

The HISTEK project aims at strengthening the competitive capacity of **Italian, Albanian and Montenegrin SMEs**, through the creation of a **new Cluster** (made up of SMEs, Educational Institutions and Public Institutions), which will act as a "**connector**" between the world of education and the world of companies for empowering human capital, as a strategic lever to support growth and development.

The small and medium-sized enterprises of the three countries are today **engaged in considerable efforts to internationalize and innovate** their organizations. Many Italian companies already have, or are planning to open, branches in Albania and Montenegro or vice versa.
To make these **processes more sustainable**, HISTEK proposes the cross-border definition of tools that can facilitate **training, transnational mobility and the inclusion in the SMEs of "high technicians / middle-skilled workers"** truly aligned with their current need for advanced technical skills, fundamental for supporting innovation processes.

First of all, the Cluster will define the architecture of a **new transnational short-cycle path (EQF Level 5)**, conceived according to the dual system, co-designed with the participating SMEs. Transnationality will imply the creation of **common and shared training standards between the 3 countries** and the prospect of the future joint delivery of the path, partly in Italy, partly in Montenegro and partly in Albania, with the cooperation of companies and training institutions of the 3 territories.

With the support of the **Chambers of Commerce, project partners,** in the design of the new training offer, will develop a robust cross-sector preparation in line with the **main development and innovation trajectories indicated by SMEs** in the needs analysis phase.
To this end, particular attention will be given to the technical and transversal skills required for the use of **new enabling technologies (KETs)**, recognized by the European Commission as the indispensable background to support, today, product and process innovation.

In addition, **other services will be developed for SMEs** in line with the implementation of dual systems, (which foresee the realization of at least 50% of training activities directly by company internal staff). In particular, **guidelines** will be produced to improve the ability of business referents to provide **on-the-job training** and to train young people during their **curricular internships**. A toolkit will also be created to support companies in **selecting future technicians.**
Lastly, the project foresees the signing of a **Consortium Agreement**, which will commit the partners to the implementation of the new training path immediately after the conclusion of the project, with a strong impact of the project results on SMEs at the CB level in the mid-term.

Main Benefits / Expected Impacts for SMEs after the implementation of the new path:

- ***Improved acquisition of talents and skills*** through the inclusion of **young Italians, Albanians and Montenegrins** trained in the specific skills required, with standards common to the three countries;
- ***Reduction of indirect costs for lacking and fast integration in the corporate culture at CB level***, and to the transition from the training world to that of SMEs, with its peculiarities and characteristics;
- ***Reduction of indirect*** costs related to the **loss of business opportunities** deriving from the lack of skills in terms of innovation, knowledge of the markets, use of technologies, etc;
- ***Higher internationalization capacity*** aimed at expanding outlet markets.

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Project partners:

Ministry of Education of Montenegro – LP (Montenegro)
Chamber of Economy of Montenegro – P2 (Montenegro)
Fondazione ITS "Antonio Cuccovillo" – P3 (Italy)
Chamber of Commerce of Bari – P4 (Italy)
Faculty of Business, "Aleksandër Moisiu" University, Durrës – P5 (Albania)
Chamber of Commerce of Tiranë – P6 (Albania)

HISTEK project aims to develop a CB curriculum which will join HEIs and SMEs from the three countries in a Cluster.

1.2 Educational system in Montenegro

The development of the 5th level of education in Montenegro (equivalent to the 5th level of MQF) is still at very low level. The department for qualifications development in the Ministry of Education of Montenegro is working on the preparation of methodology for developing higher secondary education (which is defined by 5th level). In Montenegro, there are exclusively high vocational schools, while technical schools, like the Italian ITS institute, are restructured into higher secondary schools. Currently, there is only one secondary vocational school in Montenegro which practises higher vocational education. Every vocational school has technically oriented qualifications: engineering technician, electro-technician of electronics, etc. The majority of technical-technological qualifications are gained in the educational institutions which practise dual model of education.

Dual education in Montenegro is still in the process of gradual development which is going on pretty much slow, due to the poor cooperation between the commercial side and educational institutions.

Secondary vocational education (regardless of the level) is organized and conducted by secondary vocational schools (the school can be mixed/combined if the formation of the institution includes mixed curriculum).
Secondary vocational education is conducted through modularized curricula, which integrally form the level of knowledge. The modulation of curricula is also a process which is in progress and which will not see its end in the close future. There are certain qualifications which system still does not recognize by sectors and subsectors.

In accordance with the Montenegrin legal provisions, the model of vocational education can be realized as follows:

- Lower vocational education
- Secondary vocational education
- Higher vocational education

Lower vocational education

Lower vocational education lasts two years and terminates by taking the practical exam. The exam includes preparation and defense of a work. Ultimately, one earns the qualification of a lower level of vocational education. This type of education does not record a significant growth of students' enrollment in Montenegro, so the cooperation of the Ministry of Education (specifically the Council for qualification development) and the Centre for Vocational Education is permanently focused on

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developing modules which would foster the development of this level of education. The dual education is realized at this level of education.

Secondary vocational education

Secondary vocational education is realized through educational programmes in the duration of three years and educational programmes in the duration of four years. By terminating this level, one earns the qualification of secondary level of vocational education. The-three-year education terminates by taking the final exam, while the-four-year education terminates by taking the professional exam. The professional exam can be external and internal. The Examination Centre in cooperation with the schools concerned carries out the external professional exam and it is a precondition for enrolling high education levels institutions. The schools carry out internal professional exam. Three mixed secondary schools in the municipalities of Tuzi, Plav and Ulcinj carry out secondary vocational education in Albanian language as well.

The system of vocational education enables earning a professional title, as a continuation of the professional specialization after the completion of three-year or four-year vocational school. Students earn the professional title by taking professional exam. The right for taking this exam have all the candidates who graduated from three-year vocational school and have three year of working experience in the field of their profession, as well as the candidates who graduated from four-year vocational school and have two years of working experience in the field of their profession.

After the completion of two-year education, it is possible to continue with the education in the three-year vocational schools, by taking complementary and differential exams. Candidates who graduated from two-year or three-year education can continue education by four-year curricula, by taking complementary and differential exams. Candidates who passed the external professional exam can enroll directly into appropriate higher vocational school. Here can also enroll candidates who have passed the professional exam, by taking complementary exams. Candidates who graduated from a four-year vocational school, and want to earn the gymnasium graduation, can enroll to a graduation course. Candidates who graduated from a gymnasium, and want to earn a degree of a four-year vocational school, can enroll to a graduation course. Adults who want to earn the educational level qualification attend adjusted, publicly valid curricula of formal education.

Higher vocational education

Higher vocational education, as a continuation of secondary vocational education, lasts two years and terminates by taking a graduation exam. After that, candidates earn the qualification level of a higher vocational education. In Montenegro, this level of education is underdeveloped. There is only one school (PI School for Secondary and Higher Vocational Education "Sergije Stanić" – Podgorica) which practices two 5th level curricula: programme for the cookery manager and programme for the restaurant industry manager.

In Montenegro, there are only two educational profiles of 5th level.

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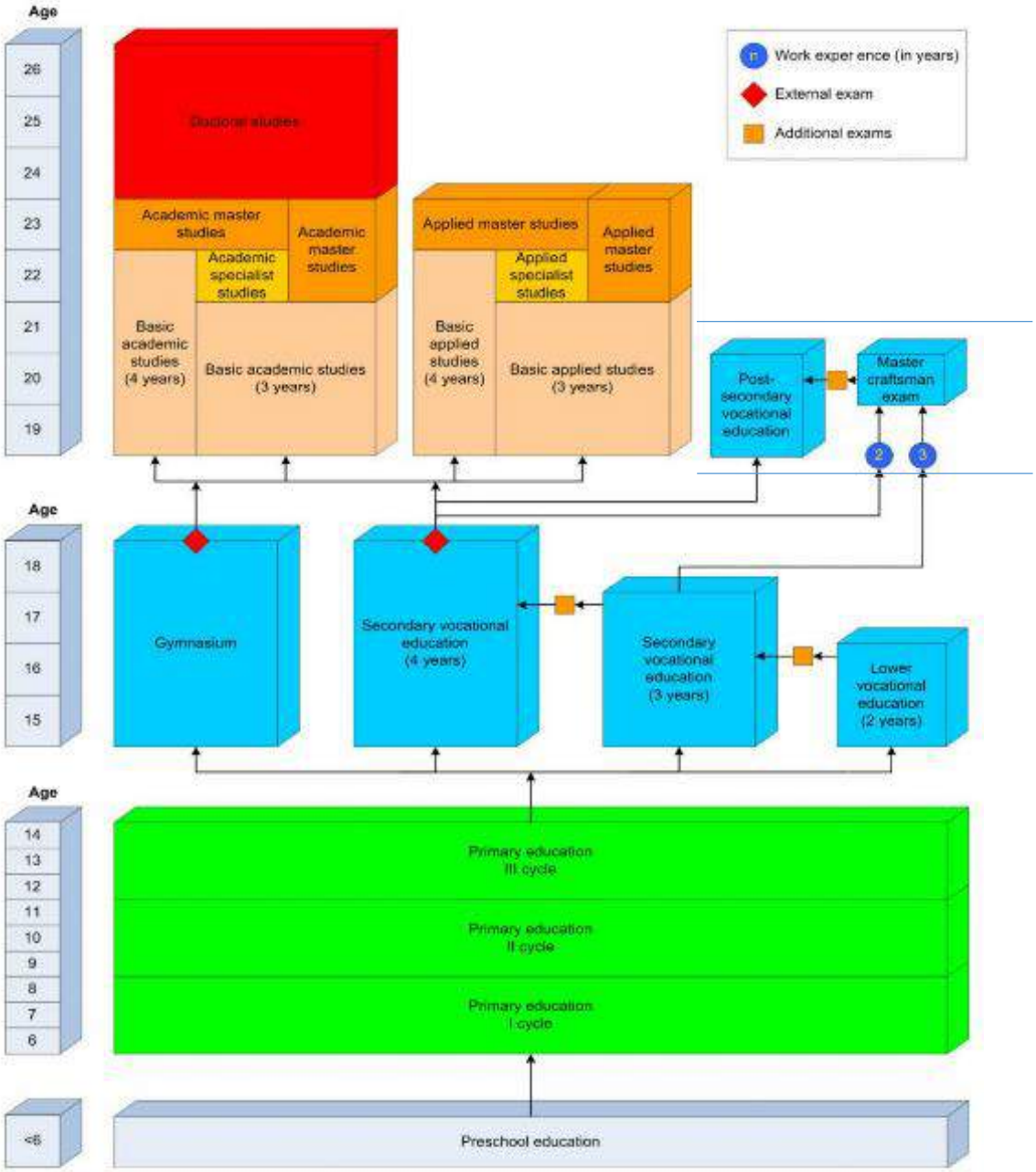

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2. ACTIVITY

2.1 OBJECTIVES

The objective of Activity 1.1 is to carry out a cross-analysis of the three countries, focusing on the SMEs' needs for highly specialized technicians (KETs) and the training offer (3rd, 4th and 5th level (EQF) on these technologies. The results shall show the possible gaps and help identify an innovative technical profile (and related set of skills) which will be covered through a new transnational short cycle education pathway.

Why focus on Key Enabling Technologies (KETs)? KETs are today the basis of every innovative process, having literally penetrated into all aspects of our lives. The products and services obtained through their use nowadays affect a wide range of sectors (Transport, Agro-food / Agro-industry, Environment and territory, Cultural heritage, Biomedical diagnostics, Manufacturing, Social Innovation, Energy technologies, Pharmaceuticals, etc.). It is important to mention that the Law on professional qualifications of Montenegro defines sectors in this country and that there are only 15 sectors so far. The underdevelopment of sectors and qualifications is a sign that certain sectors, recognized as the priority for KETs in Montenegro, do not even exist as such.
Therefore, the spread of KETs in the EU is not only of strategic importance, but is indispensable to support the innovation and competitiveness of companies, and in particular of SMEs. The Montenegrin public has poor knowledge of the key enabling technologies and very often one can find misunderstanding in the world of economy and educational institutions when talking about KETs. Ministry of Education of Montenegro, therefore, sees the need to familiarize the public of Montenegro about key enabling technologies, as the imperative that will lead to innovation and modernization of the labour market.

What is the answer of educational systems? The questionnaires and its results showed significant discrepancy between demand of the labour market and availability of educational profiles in Montenegro. The world of innovation and modernization trigger the need for plenty of new technical and entrepreneurial skills that would respond to the necessities of the companies, which are more and more oriented towards key enabling technologies. The school representatives expressed positive attitude for developing new educational 5^{th} level profile, which would fill the gap between the mismatch that is evident on the broad Montenegrin social-economic picture. The Montenegrin educational system reforms from day to day and often supervenes on various obstacles during the process of reformation. The labour market is insufficiently involved in the creation of professional qualifications, and the connection of schools and labour market is at low level. The educational institutions in Montenegro see the importance and usefulness in developing qualifications at this level, but the Sectoral Commissions, as the independent body, which decide on initiatives for this segment, do not share the same opinion. Answering the question "Do you consider it necessary to develop educational profiles for KETs in Montenegro?", 96% school representatives gave responded affirmatively.

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3. TRAINING OFFER IN THE FIELD OF KETs

3.1 QUESTIONNAIRE

In order to implement the analysis of the Training offer in the technological field in the three Countries (with a specific focus on Key Enabling Technologies - KETs) individual interviews with representatives of the Educational Institutions involved are proposed.
ITS Cuccovillo elaborated the structure of the Questionnaire and Albanian and Montenegrin partners integrated it in order to consider the differences present in the three National Educational Systems. Partners translated and adjusted Questionnaires to the National legal framework in each country.
The Questionnaire proposed is articulated as follows:

Table 1 Structure of the Questionnaire

EDUCATIONAL INSTITUTIONS DATA *This section is dedicated to the collection of the general data of the Educational Institution involved in the survey and the contact data of the person who will fill the questionnaire*
CONTEXT *This section is divided into 3 subsections and is dedicated to collect data on the material and professional resources available to the educational institution and on the level of cooperation it has with SMEs*
Section 1) Material resources: *This subsection explores the equipment of technical-technological classrooms and laboratories*
Section 2) Professional resources: *This sub-section explores the skills possessed by the teachers, with a specific focus on KETs, the teaching methodologies adopted, the attention given to soft skills and the updating level of teachers*
Section 3) Relation with the territory: *This sub-section explores the possible cooperation links between educational institution and SMEs*
TRAINING OFFER *This section is composed by 2 subsections and explores the training offer, with specific reference to soft and hard skills related to KETs*
Section 1) Transversal skills: *This sub-section explores the training offer in the framework of two specific categories of transversal skills:* *1. MANAGEMENT AND ENTREPRENEURSHIP* *2. QUALITY, RISK & SAFETY*
Section 2) Technical skills: *This sub-section explores the training offer in the framework of six specific categories of technical-technological skills at the base of KET 6 (Advanced Production Technologies):* *1. PRODUCTION TECHNOLOGIES AND AUTOMATION* *2. ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS* *3. INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES* *4. INNOVATIVE PRODUCTION PROCESSES* *5. OPTIMIZATION AND MANAGEMENT TECHNIQUES* *6. OF PRODUCTION SYSTEMS* *7. ECO-SUSTAINABLE TECHNICAL AND TECHNOLOGICAL SOLUTIONS*
GUIDANCE ACTIVITIES *This section is dedicated to the analysis of the guidance activities implemented by each Educational Institutions to promote the study of Key Enabling Technologies towards young students.* *In this section, the representatives of Montenegrin educational institutions were asked to provide their opinion on which profiles to focus on in the process of developing new educational profiles.*
THE NECESSITY FOR DEVELOPMENT OF EDUCATIONAL PROGRAMMES IN KETs This part is particularly created for the needs of the Ministry of Education, in order to map the opinions and attitudes of school representatives on developing educational profiles of V level MQF (EQF), but also to recognize

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deficient educational profiles in Montenegrin educational system.

3.2 THE SAMPLE

In Montenegro, there are 48 high schools, among which the **initial targeting** covered 28 schools, and **final targeting** included 10 schools. The initial targeting is based on the educational profiling that represents educational offer of the targeted schools, but also by creating a focus group made of school representatives willing to participate in the process of collecting information.
The survey sample is composed of 28 targeted vocational schools belonging to the **3°, 4° and 5° Educational Level** (compared with the European Qualification Framework), with technical-technological orientation (with study programs relating to subjects such as technology, IT, electronics, industry, energy, etc.). Among these 28, the final targeting included **10 vocational high schools** that cover educational profiles, which focus on specialized skills the most akin to key enabling technologies. Final targeting was possible just after the survey completion, because the results of the questionnaires provided real indicators of professional and material resources possessed by schools, which ultimately enabled the creation of a final 10-school sample.
The Educational institutions were selected through a public invitation to express interest in participating in the survey, taking into account not only the technical-technological orientation but also the location in different areas of each country, so that the criteria of territorial coverage, which is propagated by the project, shall be fulfilled.
The representatives involved were school directors, their deputies or assistants entrusted to bring out quantitative and qualitative data on research.
The **High school educational institutions** taking part in final targeting will have the chance to join the **new HISTEK transnational Cluster.**

Table 2 LIST OF SELECTED EDUCATIONAL INSTITUTIONS (Final targeting)

	EDUCATIONAL INSTITUTION, CITY	WEB SITE
1.	High Electrotechnical School "Vaso Aligrudić", Podgorica	www.elektropg.edu.me
2.	High School for Civil Engineering and Geodesy "Ing. Marko Radević", Podgorica	www.gradjevinska.me
3.	High Vocational School "Ivan Uskoković", Podgorica	www.masinskapg.me
4.	High Vocational School "Spasoje Raspopović", Podgorica	www.sraspopovic.com
5.	First High Vocational School, Nikšić	www.prvasrednjastrucnaskola.me
6.	High Vocational School, Nikšić	www.elektroskolank.me
7.	High Vocational School, Pljevlja	www.strucnapljevlja.me
8.	High Vocational School, Berane	www.sssba.edu.me
9.	High Vocational School "Vukadin Vukadinović", Berane	www.vvukadinovic.edu.me

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10.	High electro-economic school, Bijelo Polje	www.eeskolabp.me

Table 3 List of schools selected in final targeting by profile of education:

Final targeting			
Municipality	**Schools**		**Educational profiles**
Podgorica	1	ETŠ Vaso Aligrudić	ELECTRICAL INSTALLER AS OF 2017/18
			ELECTRICAL TECHNICIAN OF ELECTRONICS AS OF 2018/19
			ELECTRICAL TECHNICIAN FOR ELECTRONIC COMMUNICATIONS
			ELECTRICAL TECHNICIAN OF ENERGETICS AS OF 2017/18
			ELECTRICAL TECHNICIAN FOR COMPUTER SYSTEMS AND NETWORKS
			ELECTRICAL TECHNICIAN FOR WEB AND MOBILE APPLICATIONS DEVELOPMENT
			INSTALLER OF ELECTRONIC COMMUNICATION INFRASTRUCTURE
			TECHNICIAN OF MECHATRONICS
	2	SSŠ Spasoje Raspopović	MANUFACTURER OF FOOD PRODUCTS
			TECHNICIAN OF FASHION DESIGN
			TECHNICIAN FOR ENVIRONMENTAL PROTECTION
			GRAPHICAL TECHNICIAN AS OF 2016/17
			CHEMICAL LAB TECHNICIAN
			TECHNICIAN FOR PRECIOUS METALS PROCESSING
			AGRICULTURAL TECHNICIAN AS OF 2013
	3	SSŠ Ivan Uskoković	AUTO MECHANIC
			AUTO MECHATRONIC
			SANITARY HEATING AND AIR CONDITIONING INSTALLER
			SPEDITION-AGENCY AND CUSTOMS TECHNICIAN
			TECHNICIAN OF MECHATRONICS
	4	SGG Mirko Radević	INTERIOR DESIGNER
			GEODETIC TECHNICIAN – GEOMETER
			HIGH-RISE BUILDING CONSTRUCTION TECHNICIAN
			BUILDING CONSTRUCTION TECHNICIAN – GENERAL STREAM
Nikšić	5	Prva srednja stručna škola	AUTO MECHANIC
			AUTO MECHATRONIC
			HIGH-RISE BUILDING CONSTRUCTION TECHNICIAN
			FOOD TECHNICIAN AS OF 2018/19

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	6	Srednja stručna škola	AUTO ELECTRIC
			ELECTRICAL INSTALLER AS OF 2017/18
			ELECTRICAL TECHNICIAN OF ENERGETICS AS OF 2017/18
			ELECTRICAL TECHNICIAN FOR COMPUTER SYSTEMS AND NETWORKS
			ELECTRICAL TECHNICIAN FOR WEB AND MOBILE APPLICATIONS DEVELOPMENT
			INSTALLER OF ELECTRONIC COMMUNICATION INFRASTRUCTURE
Pljevlja	7	Srednja stručna škola	AUTO MECHATRONIC
			TECHNICIAN FOR COMPUTER CONSTRUCTION AND MANAGEMENT
			ELECTRICAL TECHNICIAN FOR COMPUTER SYSTEMS AND NETWORKS
			SANITARY HEATING AND AIR CONDITIONING INSTALLER
Bijelo Polje	8	Srednja elektro-ekonomska škola	ELECTRICAL INSTALLER AS OF 2017/18
			ELECTRICAL TECHNICIAN OF ENERGETICS AS OF 2017/18
			ELECTRICAL TECHNICIAN FOR COMPUTER SYSTEMS AND NETWORKS
			ELECTRICAL TECHNICIAN FOR WEB AND MOBILE APPLICATIONS DEVELOPMENT
			INSTALLER OF ELECTRONIC COMMUNICATION INFRASTRUCTURE
Berane	9	Srednja stručna škola	ELECTRICAL INSTALLER AS OF 2017/18
			ELECTRICAL TECHNICIAN FOR COMPUTER SYSTEMS AND NETWORKS
			ELECTRICAL TECHNICIAN FOR WEB AND MOBILE APPLICATIONS DEVELOPMENT
	10	SSŠ "Vukadin Vukadinović"	AUTO MECHANIC
			SANITARY HEATING AND AIR CONDITIONING INSTALLER

Fig.2 Geographical distribution of educational institutions

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It is important to note that the majority of vocational schools, and therefore the number of students attending vocational education, are located in Podgorica, the capital city. The result of that is the largest number of schools from Podgorica included by the final targeting.

The final targeting includes 4 schools from Podgorica, 2 schools from Nikšić, 2 schools from Berane, 1 school from Pljevlja and 1 school from Bijelo Polje.

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Table 4 Stratification by addresses and sectors

Educational profile		No. of schools practising the profile	Percentage	Sector	Subsector
1	Electrical installer	6	9,7%	Engineering and Production Technologies	Electrical engineering
2	Electrical technician of electronics	5	8,1%		
3	Electrical technician of electronic communications	4	6,5%		
4	Electrical technician of energetics	4	6,5%		
5	Electrical technician for computer systems and networks	4	6,5%		
6	Installer of electronic communication infrastructure	3	4,8%		
7	Technician of mechatronics	3	4,8%		Mechatronics
8	Auto mechatronics	2	3,2%		
9	Interior designer	3	4,8%	Construction and spatial planning	Spatial planning
10	High-rise building construction technician	3	4,8%		Construction
11	Building construction technician	3	4,8%		
12	Agricultural technician	1	1,6%	Agriculture, nutrition and veterinary medicine	Agriculture
13	Food technician	1	1,6%		Nutrition
14	Shipyard technician	1	1,6%	Traffic and communications	Traffic
15	Nautical technician	1	1,6%		
16	Graphic technician	1	1,6%	Mining, metallurgy and chemical industry	Chemical industry
17	Chemical lab technician	1	1,6%		
18	Technician for precious metals processing	1	1,6%		Metallurgy
19	Technician for environmental protection	1	1,6%		
20	Electrical technician for web and mobile applications development	3	4,8%	Information Technology	
21	Auto mechanic	2	3,2%	N/A	These

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22	Sanitary heating and air conditioning installer	2	3,2%	N/A	qualifications are in the development process and are not divided on sectors, because the Centre for Vocational Education still haven't created educational profiles
23	Spedition-agency and customs technician	2	3,2%	N/A	
24	Technician for computer construction and management	1	1,6%	N/A	
25	Technician of fashion design	1	1,6%	N/A	
26	Welder	1	1,6%	N/A	
27	Auto electric	1	1,6%	N/A	
28	Tinsmith-panel beater	1	1,6%	N/A	

In detailed analysis of educational profiles, standards of knowledge and learning outcomes, the Work group of Ministry of Education highlighted three priority educational profiles to be transformed and upgraded into 5th level. Those are: mechatronic (higher technician for mechatronics), electrical technician for web and mobile applications development (higher technician for innovative production technologies) and technician for environmental protection (higher technician for clean production).

In case that one educational programme is developed, it can be realized in multiple schools.

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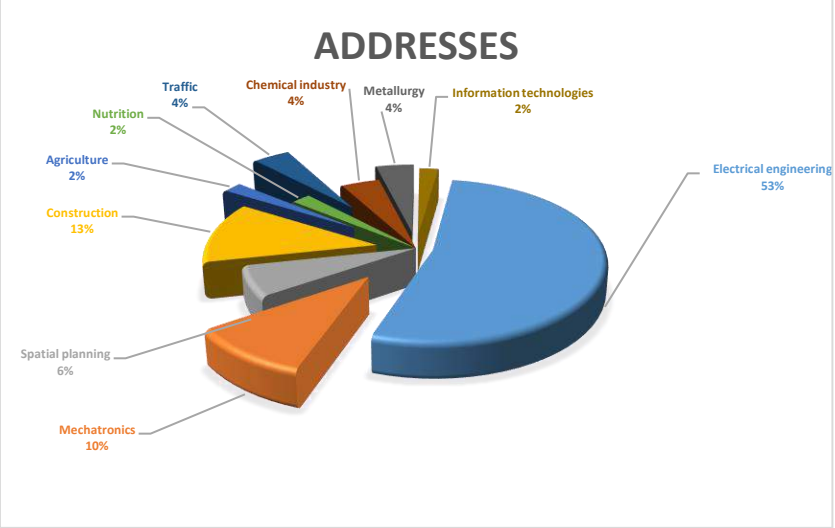
Fig.3 Stratification by addresses



The survey could be completed by sessions of verification of the output through in-depth interviews with privileged witnesses such as the representatives of the institutes who completed the questionnaire, school directors, their deputies and/or assistants.

All the educational institutions that participated in the interview actively engaged in the investigation process, punctually and with accurate indication filled out the data for each analysis section.

3.3 SURVEY RESEARCH METHODOLOGY

The survey aims to gather information from a sample of schools through the compilation of a questionnaire and the subsequent analysis of the collected data.

As a research instrument, the survey uses a structured, multiple choice questionnaire, that consists of a series of questions and other prompts for the purpose of gathering needed information from respondents.

The questionnaire is structured in four sections: 1.Educational Institutions data, 2.Context (material resources, professional resources and relations with companies), 3.Training offer (Transversal skills and technical skills), 4.Guidance activities aimed at young people, 5. Opinions and attitudes of school representatives on launching the initiative for developing 5th level qualification (MQF). This structure aims to organize the data collection following a logical flow.

The selected institutions are chosen on the basis of presence of specific educational profiles and tendencies expressed in the questionnaires in terms of developing new educational profiles. Regarding the geographical aspect, the municipalities included are: **Podgorica, Nikšić, Pljevlja, Berane and Bijelo Polje.** The geographical distribution of the sample allows to have a more representative indication of the various realities in different parts of the country.

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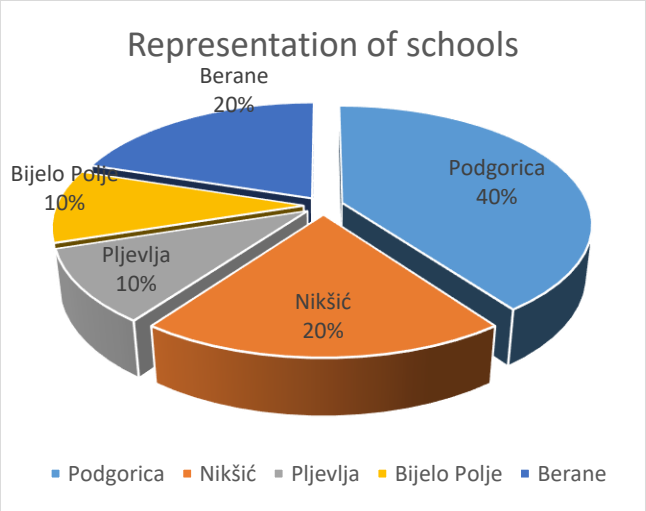
The questionnaire was sent by e-mail and is therefore completed autonomously by the designated representatives; this method was chosen to allow compilers to gather the various data to answer the questions of the various sections.

A guide has been prepared to support compilers with the illustration of the project and the explanation of the purpose of the questionnaire and its articulation.

Before sending the questionnaire, partners arranged meetings with the schools, in order to explain the project's objective and to describe how to fill the questionnaire.

Fig. 4 Representation of schools



3.4 REFERENCE FOR SKILLS ON KEY ENABLING TECHNOLOGIES

For the identification of the skills connected with the Key Enabling Technologies, reference documents are the following:

- Year 2009 document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - Preparing our future: developing a common strategy for key enabling technologies in the EU

- Year 2012 document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - A European Strategy for Enabling Technologies - A Bridge to Growth and Jobs

- Year 2014 document on methodology, work plan and roadmap for crosscutting KETs activities in Horizon 2020 (RO-cKETs)

- Year 2014 document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

- Year 2016 Skills for Key Enabling Technologies in Europe document

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- Legislation and General Acts applicable in the Regulation of Secondary Higher Education in the Technical Field

• Law on Vocational Education ("Official Gazette of the Republic of Montenegro", No. 064/02 of 28.11.2002, 049/07 of 10.08.2007, Official Gazette of Montenegro ", No. 045/10 of 04.08.2010, 39 / 13 of 07.08.2013, 047/17 of 19.07.2017)

• Strategy of Development of Vocational Education in Montenegro (2015-2020), Ministry of Education of Montenegro

- Legislation Regulating the Development of Qualifications

• Law on National Professional Qualifications ("Official Gazette of Montenegro", No. 80/2008 and 14/2009, 80/2010 - second law, 18/2011 - second law (on the date of accession of Montenegro to the European Union, the provisions relating to recognition of foreign certificates for performing regulated professions in Montenegro ceases to be applied) 40/2011 - second law and 40/2016

A list of quotes from these documents are listed in Annex B

4. DATA ANALYSIS AND RESULTS

The categories of KETs competences defined in the document "Skills for Key Enabling Technologies in Europe - State-of-play, Supply and Demand, Strategy" were used to define the list of knowledge and skills to be analyzed for this survey.

Further, the analysis included the base of MQF data, educational profiles of Centre of Vocational Education and the Educational Bureau, the Rulebook for qualifications developing, as well as the standards of knowledge and expected learning outcomes.

4.1 MATERIAL RESOURCES

The schools declare a total availability of 524 classrooms, with an average of 19 classrooms for each schools. 262 classrooms (50% of total) are equipped with personal computers and internet connection.

56 computer laboratories are available; the distribution of computer laboratories cannot be showed by average, because some schools have two of them and some have none.

The schools declare availability of 1 283 personal computers in total (desktop and laptop) with an average of about 45 pc for each schools.

Of 28 schools, 13 declare that there have been made investments in the last 3 years in the IT laboratories, which is 46,43% of the total IT laboratories investments; investments involved all the laboratories in 1 case, a good part of the laboratories in 8 cases and a small part of the laboratories in 4 cases.

There are 66 language laboratories, with a distribution from 1 to 2 laboratories for each school and about 67 technological laboratories without specializations. Technical laboratories are not specialized,

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because, due to the missing development funds of schools, certain laboratories are used for multiple performance of practical work.

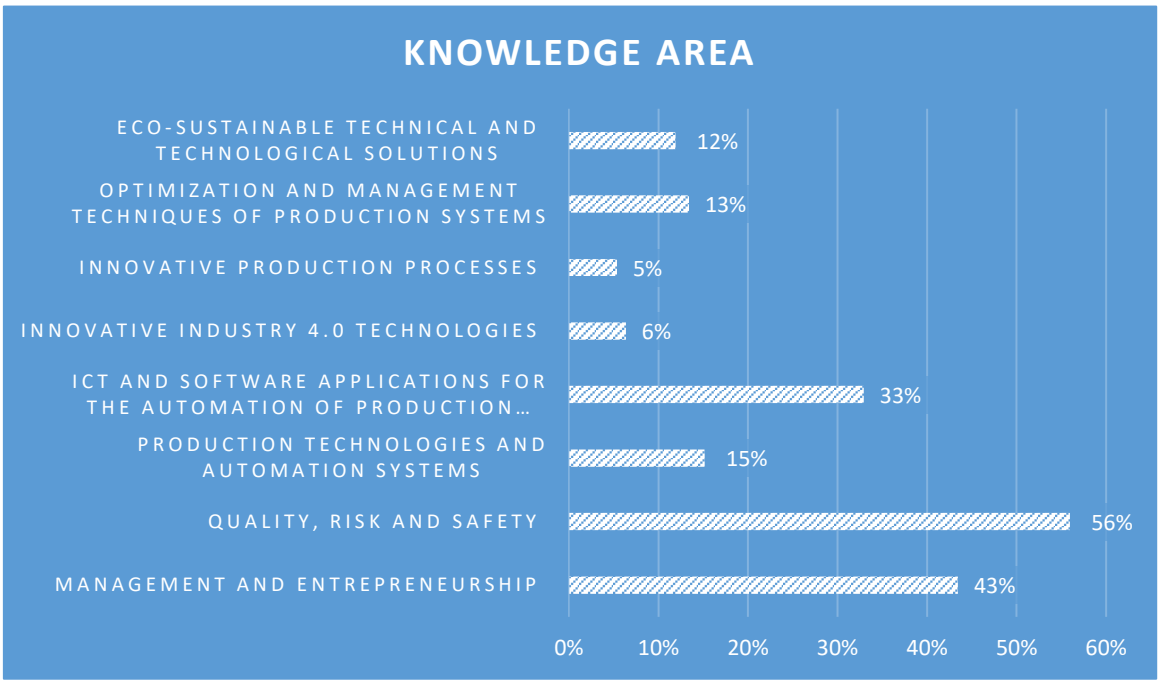
10 schools out of 28 state that investments have been made in technological laboratories in the last 3 years, which is 35,71% of the total technical laboratories investments; investments involved all the laboratories in 3 cases, a good part of the laboratories in 1 case and a small part of the laboratories in 6 cases.

4.2 PROFESSIONAL RESOURCES

This section aims to evaluate the presence of teachers with specialization in the disciplines where the skills for the Key Enabling Technologies required by the companies are most concentrated.

The graph below shows in blue the coverage with respect to the total sample of institutions surveyed.

4.1 Knowledge Area



The high percentage of coverage in the "Quality, risk management and security" category is highlighted, linked in particular to the coverage of 50% of institutions on the subject relating to security. The significant percentage of teachers' professional specialization is conducted with the focus on management and entrepreneurship; this is so mostly because entrepreneurial learning has been the focus in the last few years. The field of ICT and software applications for automatization of production systems is in the development, which we can see in the percentage representation of 33%. Fields such as Eco-sustainable technical and technological solutions and Optimization and techniques for production system managing are also in the development and show the growth of professional resources about 10%. Montenegrin schools have the lowest level of professional resources in innovative production processes and technologies of innovative industry 4.0, which is below 10%.

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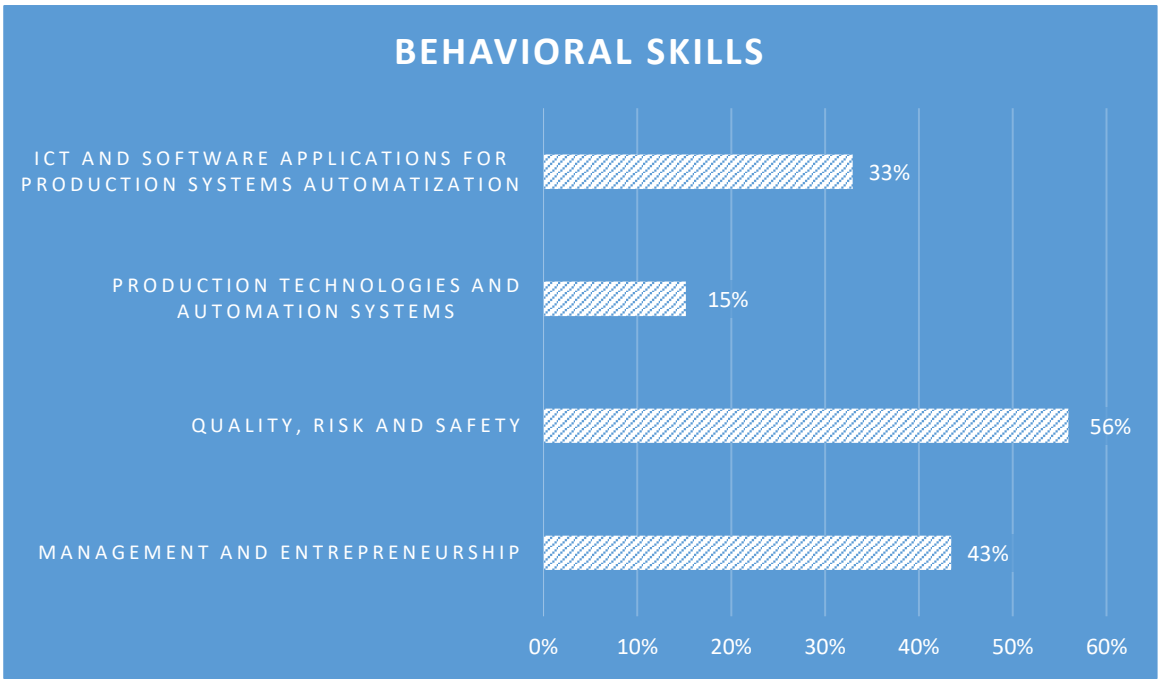
4.2 Behavioral skills Area

In the process of assessment of behavioral skills, we also consulted educational programs recognizing that the indicators in the results of questionnaire and in the programs coincide. Namely, the skills listed are found in the programmes as topics or as parts of a larger programme. There is no clearly defined skill, because there is rarely an interdisciplinary approach.

The results are the following:



Regarding the area of Behavioral skills, we highlight the high percentage of coverage in the "Communication skills" and “Emotional intelligence skills” category, while on the other hand there are lower percentages in the areas "Skills for management and entrepreneurship" and "Skills for innovation".

With regard to the teaching methodologies of technical-technological disciplines, all the schools declare to use interactive and laboratory methodologies for a percentage below 25% in 12 cases, between 25% and 50% in 10 cases and above 50% in 6 cases.

The average annual number of hours dedicated by the teachers to their update is equal to 20 hours with a range between 10 and 50 hours.

4.3 RELATIONS WITH COMPANIES

This section of the questionnaire aims at collecting indications to evaluate the degree of connection and collaboration relationships between the schools and the SMEs of the various productive sectors.

All schools declare to have agreements with SMEs (small and medium-sized enterprises) to realize school-work alternation activities and internships in the company.

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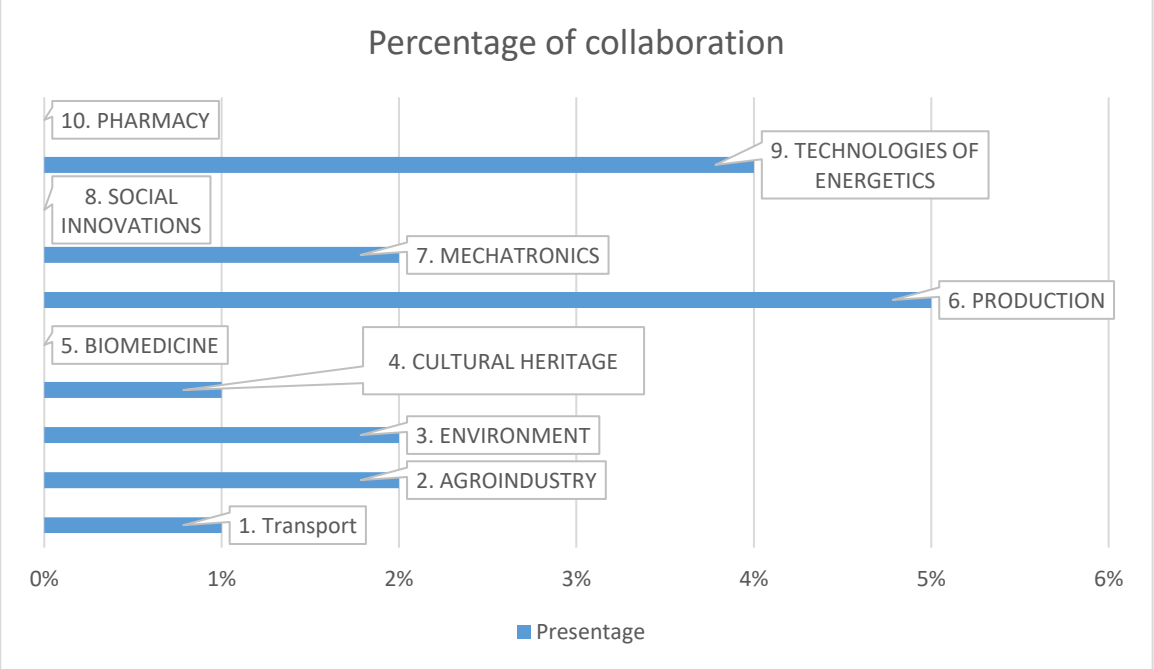
All schools have collaborations with companies that operate in various sectors of economic activity. The number of collaborations for each sector is shown below. The cooperation between schools and SMEs in Montenegro started just recently and implements merely through the programme of dual education. As this is still a pilot project in Montenegro, there are no records about the cooperation, but this part of questionnaire is analyzed according to the number of contracts for implementing dual education with the employers.

Dual type of vocational education is being implemented in Montenegro in the last two years. According to the Law of the Vocational Education of Montenegro, during the first two school years, the expenses for the fees that follow the pupils are paid by the Ministry of Education. The expenses in the last two years of education are then at the burden of employers (companies) with whom students signed contracts. In this turning year, the result noted by the Ministry of Education is the 40%-decline of the contract number.



In the fields such as Pharmacy and Biomedicine, in Montenegro it is not possible to achieve stronger cooperation at this level of education due to the strict legislative regulations, which regulate these fields. The Pharmaceutical industry in Montenegro is at low level and in most of the cases, there is no cooperation between educational institutions and the production in this field, because it is restricted by legal frameworks. Regarding Social innovations, such a concept in Montenegro is not known and is insufficiently developed and it is indisputably necessary to strengthen the capacities in this field.

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4.4 TRAINING OFFER

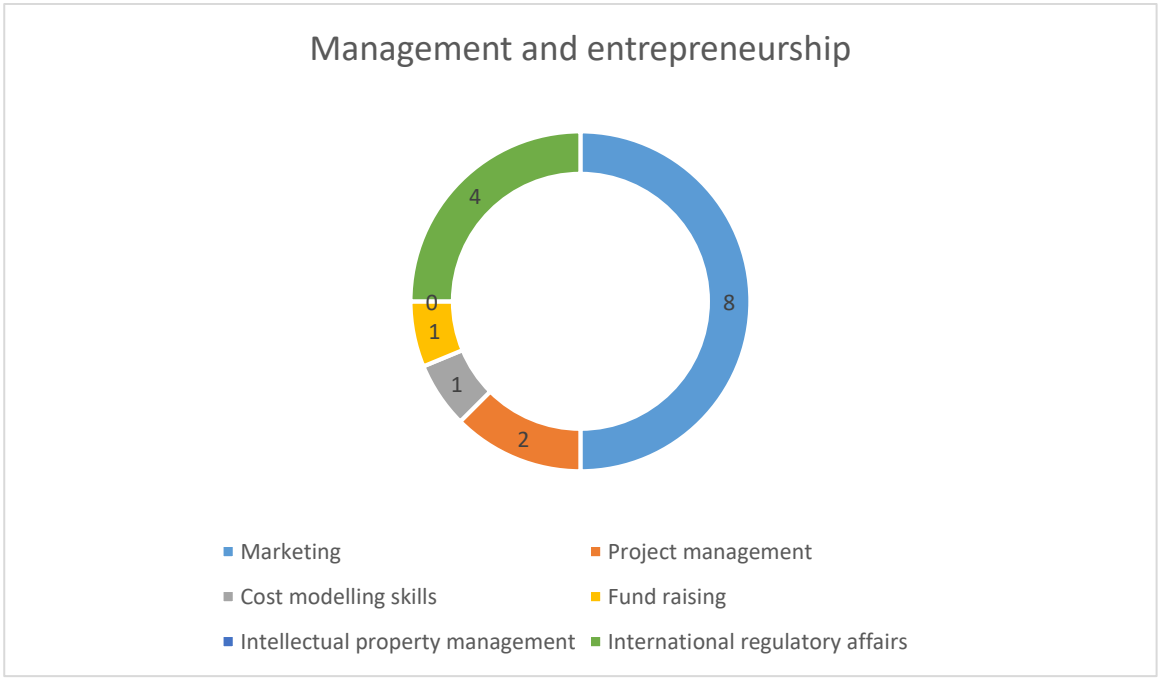
The schools were asked to indicate the duration in terms of teaching hours throughout the entire school curriculum for each discipline in order to evaluate in general terms the degree of study.

The evaluation included two parameters: whether the concerned skill is taught through some of the educational profiles, whether the standard of knowledge covers the skills in the expected results of the learning.

The first parameter is whether the concerned skill is being taught in the targeted educational profiles, and then follows the assessment of the number of classes (in Montenegro, the number of hours is defined according to the programme in the number of school classes in the duration of 45 minutes).

4.5 TRANSVERSAL SKILLS SECTION

Considering educational profiles and the results of learning in the standards of knowledge for transversal skills, the questionnaire shows that the schools teach marketing through targeted educational programmes in the high percentage.



Managing the intellectual property is one of the skills which is not taught by any of the targeted educational profiles and it does not exist in any of the standards of knowledge.

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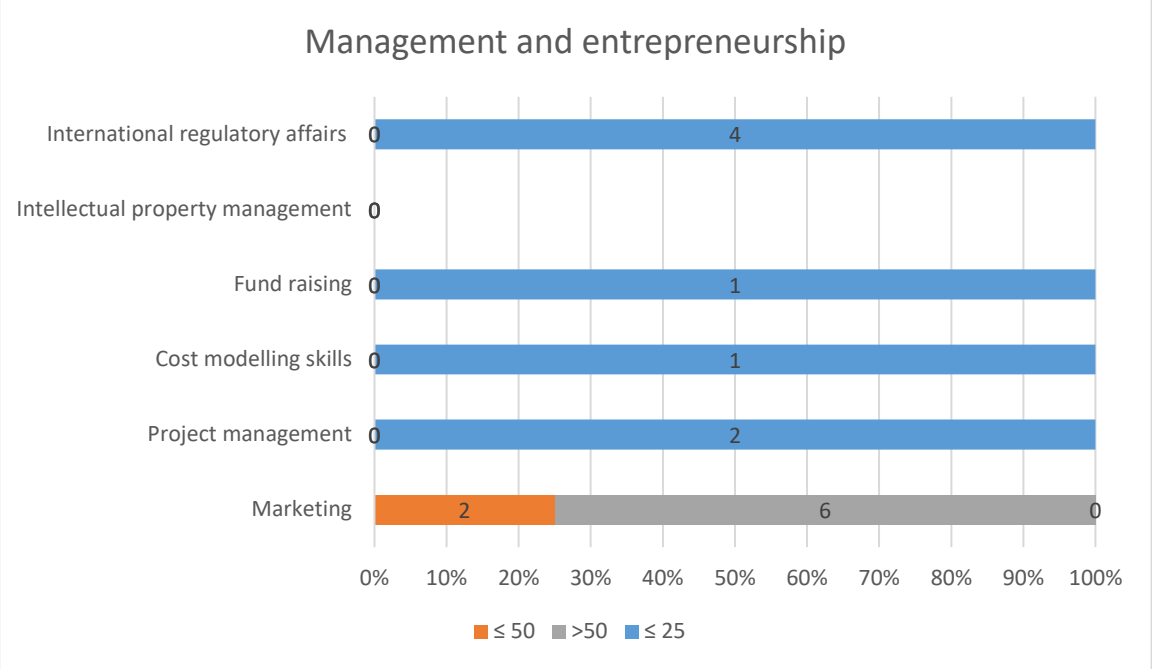
What is the average of the hours devoted to training these skills throughout the entire curriculum period? ≤ 25 - ≤ 50 - more



The analysis of the collected data shows that Marketing is one of the skills present in the highest percentage and it has the highest number of hours dedicated. All of the other skills have less time dedicated, which points that they are not priority skills in the standard of knowledge in the targeted educational profiles.

Regarding the Quality, risk and security, the data collected give us the following picture:

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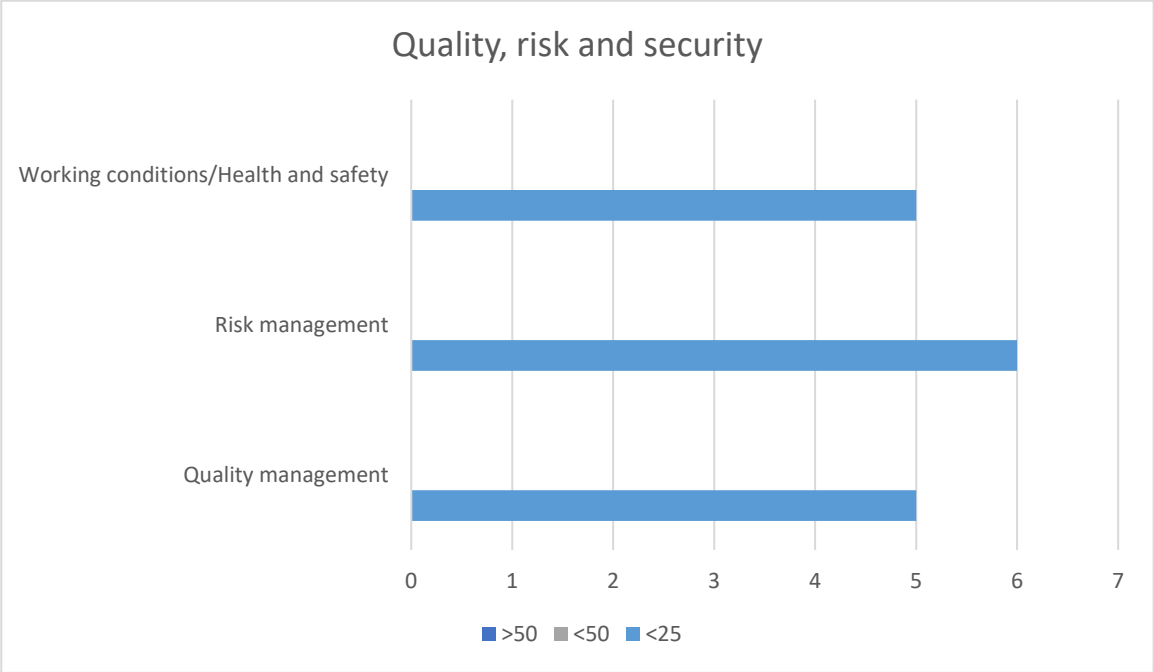
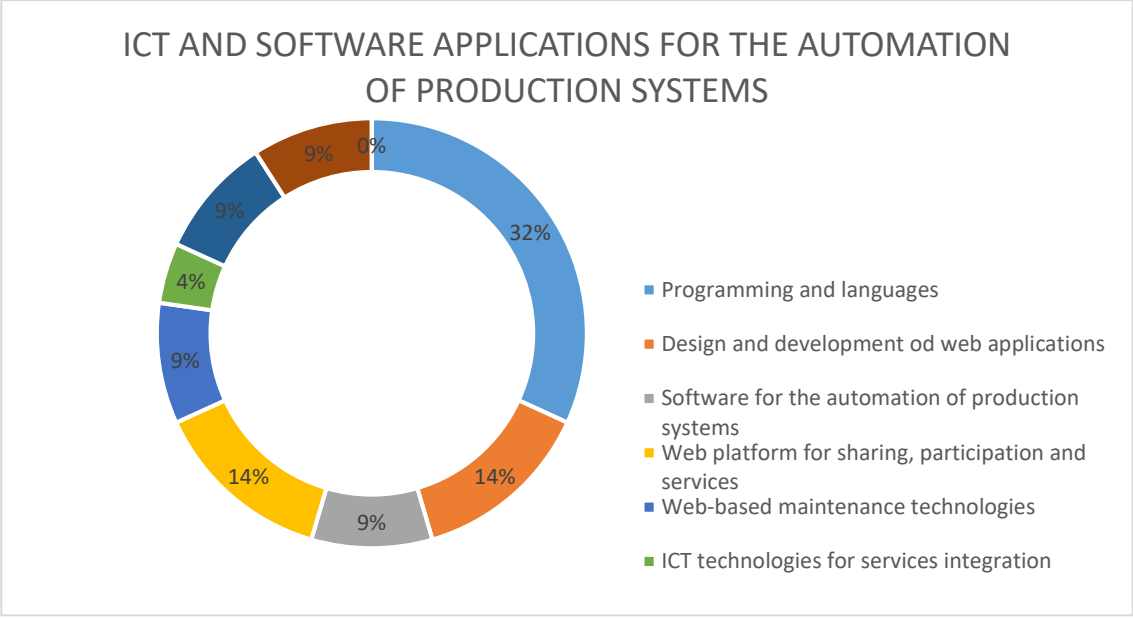
What is the average of the hours devoted to training these skills throughout the entire curriculum period? ≤ 25 - ≤ 50 - more



All of the answers show that the number of classes dedicated to teaching these skills is less than 25, which points that the skills concerned are not the priorities in the results of teaching or in the standards of knowledge.

4.6 TECHNICAL SKILLS SECTION

What is the average of the hours devoted to training these skills throughout the entire curriculum period? ≤ 25; ≤ 50; >50 - more



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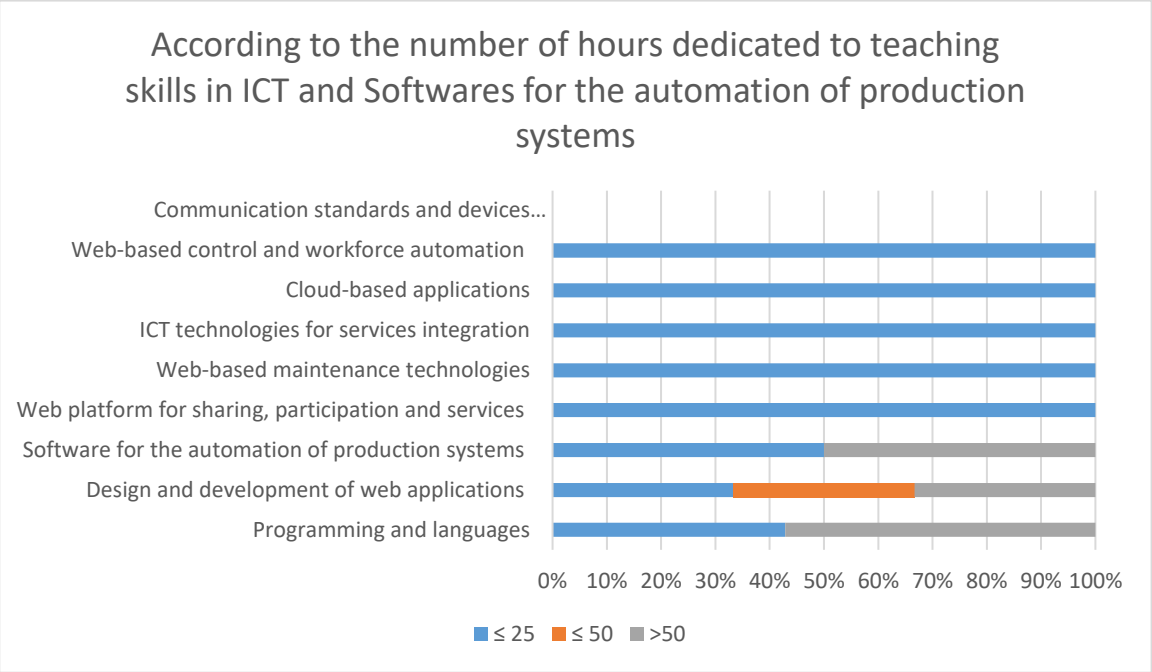
In the analysis of the collected data, we can see that the Communication standards and Devices interoperability cannot be found in any of the processes of teaching skills.

According to the classes dedicated to these skills in the process of teaching, the following data are collected:



Programming and languages, Design and development of web applications are the only skills, which, according to the scope, are present with more than 50 classes, because they can be found in the standards of knowledge and expected results of learning.

Regarding the Technologies of innovative industry 4.0, the development of certain skills from this field is sporadic and they do not have strong significance, because they almost do not even exist in the curricula.

In the field of Production processes, the only skill detected is Hot forming that can be found in the outdated curricula and has less and less attendants.

Optimization and management techniques also show sporadic results of learning which coincide with some of the mentioned skills, but these overlappings are impossible to express in classes, because we are talking about partial overlappings.

Eco-sustainable and technological skills are noted only through one educational profile – Environmental protection, which is not part of the final targeting profiles, because it does not fit into the planned project activities.

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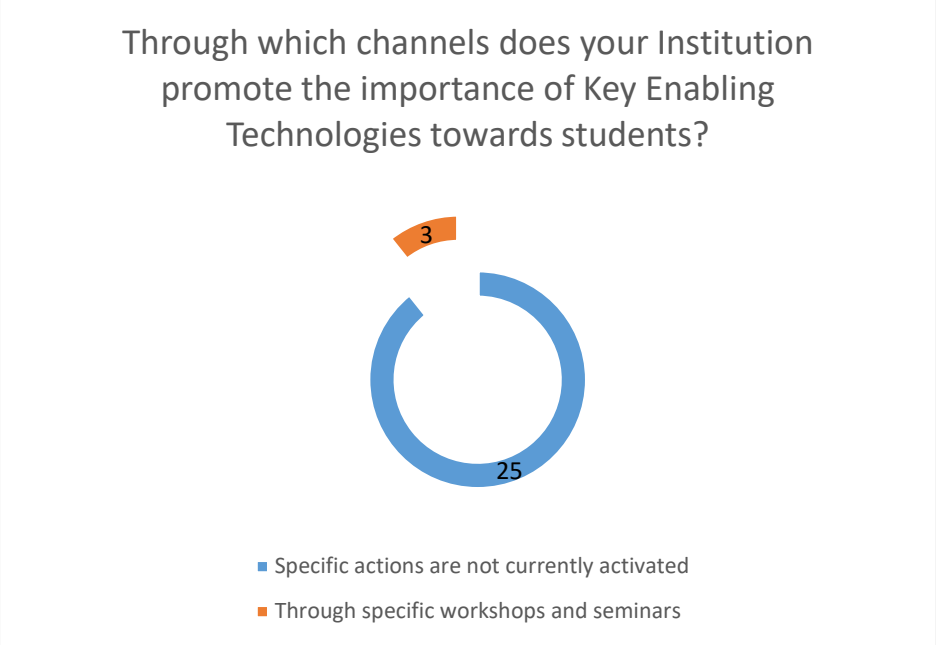
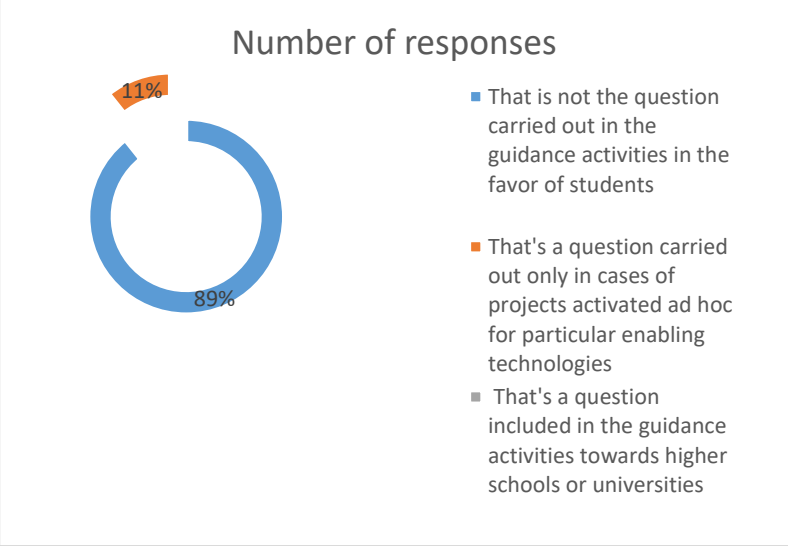


4.7 ORIENTATION

The questionnaire contains 4 questions aimed at evaluating the degree of participation of schools in the activities of guidance of young people towards technical and technological subjects and Key Enabling Technologies.

The first question aims to verify if specific study activities are carried out in the study programmes on behalf of the students on the importance of Key Enabling Technologies.

The majority of schools (25 of them) answered that this theme is not covered in the orientation activities for the students; 3 schools indicated that this topic is only addressed in the case of projects activated ad hoc on specific enabling technologies, while none of the schools responded that this question might be included into the guidance activities towards higher schools or universities.



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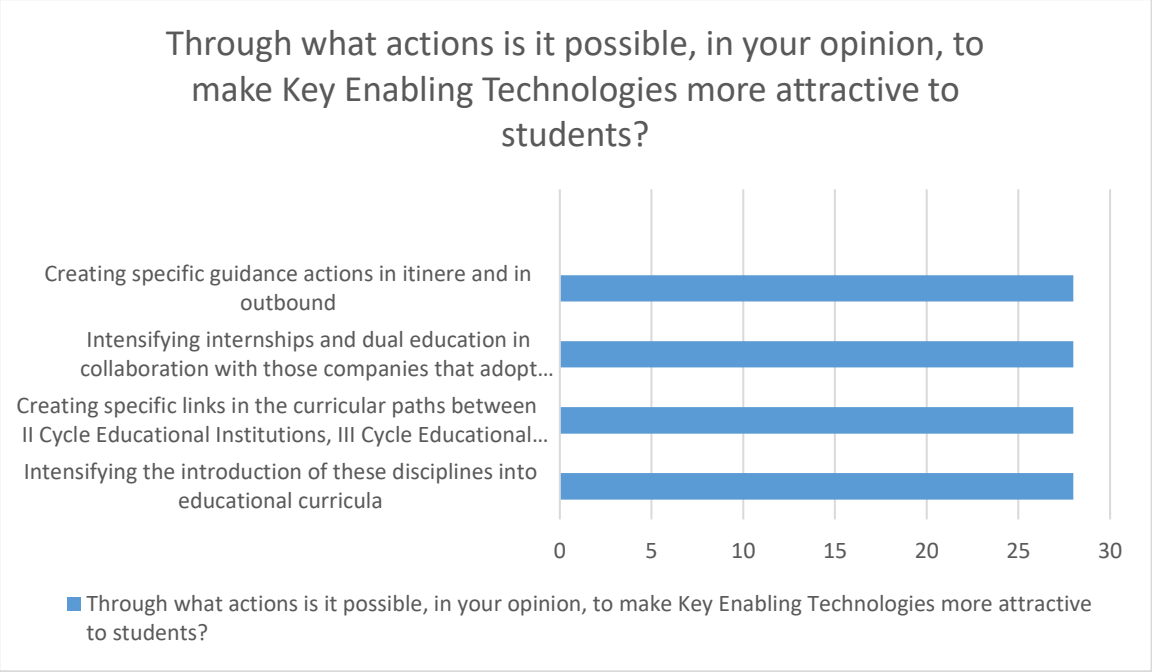
The second question asks which channels the schools use for promoting the importance of Key Enabling Technologies to students. It is possible for each institution to provide more answers.

Answering the question on which ways the institution achieves and promotes the importance of KETs, 25 institutions declared that they do not have any such promotions, while 3 of them listed workshops and seminars as means of KETs promotion.

The third question asks through which modalities are possible career opportunities presented to the students in the sectors that employ Key Enabling Technologies.

Answering the question how are possible career opportunities in sectors that use Key Enabling Technologies shown to the students, all of the 28 institutions responded that they do not implement any particular activities.

The fourth question asks through which actions is it possible, in their opinion, to make the study of Key Enabling Technologies more attractive for students, and the institutions responded that they recognized all of the mentioned activities as the possibilities for attracting students.



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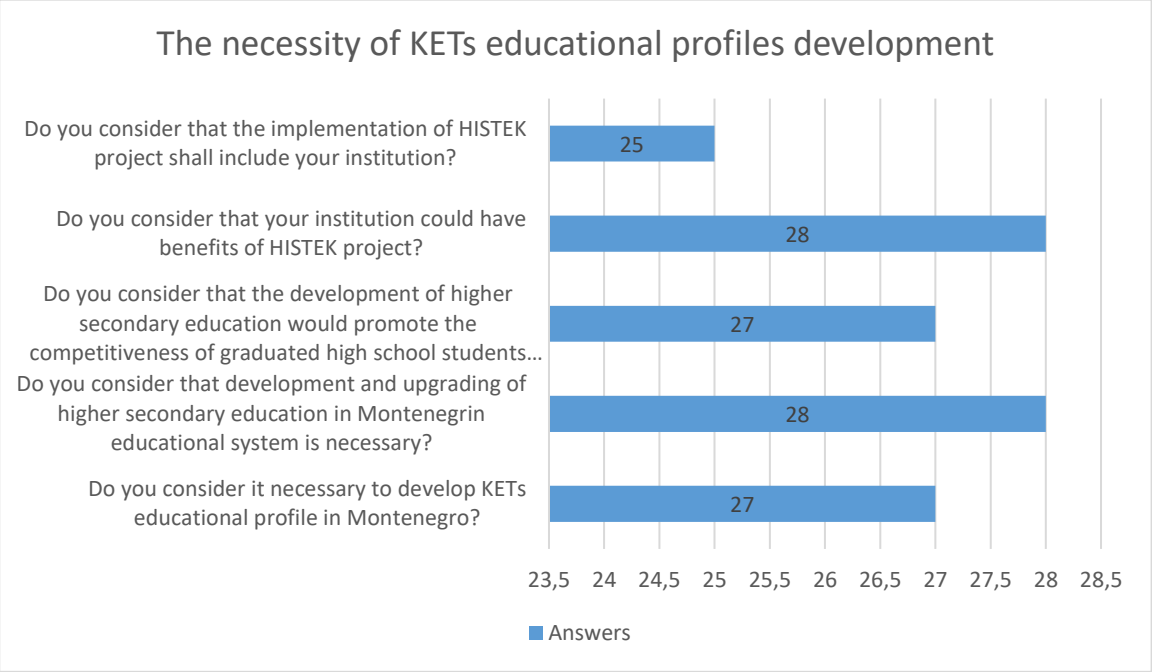
5. The necessity of KETs educational profiles development

In this section, there are 5 questions aimed to map the current opinions and attitudes of schools on KETs and the necessity of qualification development for this field.



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ANNEX A

2.1 1. Material Resources		
	Number	**Average**
A. Number of locations of which your Institution is composed (including separate buildings)	47	2
B. Number of classrooms devoted to normal teaching activities	524	19
C. Number of classrooms with internet and PC connection	262	9
D. Number of computers (fixed and portable) available to students	1283	46
E. Number of IT labs	56	2

	YES		**NO**	
E.1 Have investments been made on IT laboratories in the last 3 years?	13	46,4%	15	53,6%

E.2 If yes, these investments have renewed:	**All the laboratories**		**A good part of the laboratories**		**A small part of the laboratories**	
	1	7,7%	8	61,5%	4	30,8%

	Number	**Average**
F. Number of classrooms used for linguistic laboratories	66	2
G. Number of technological laboratories (both fixed and mobile) available	67	2

	YES		**NO**	
G2.1 Have investments been made on technological laboratories in the last 3 years?	10	35,71%	18	64,29%

G2.2 If yes, these investments have renewed:	**All the laboratories**		**A good part of the laboratories**		**A small part of the laboratories**	
	3	30%	1	10%	6	60%

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3.1.1 MANAGEMENT AND ENTREPRENEURSHIP

Transversal skills	In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?				If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?		
	YES		NO		≤ 25	≤ 50	>50
Marketing	8	28,57%	20	71,43%		2	6
Project Management	2	7,14%	26	92,86%	2		
Cost modelling skills	1	3,57%	27	96,43%	1		
Fund raising	1	3,57%	27	96,43%	1		
Intellectual Property (IP) management		0,00%	28	100%			
International regulatory affairs	4	14,29%	24	85,71%	4		

3.1.2 QUALITY, RISK & SAFETY

Transversal skills	In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?				If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?		
	YES		NO		≤ 25	≤ 50	>50
Quality Management	5	17,86%	23	82,14%	5		
Risk Management	6	21,43%	22	78,57%	6		
Working conditions/ Health and safety	5	17,86%	23	82,14%	5		

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ADVANCED PRODUCTION TECHNOLOGIES

3.2.1 PRODUCTION TECHNOLOGIES AND AUTOMATION SYSTEMS

Transversal skills	In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?				If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?		
	YES		NO		≤ 25	≤ 50	>50
Robotics	6	21,43%	22	78,57%	6		
Systems for automation and industrial communication	2	7,14%	26	92,86%	2		
Innovative production technologies	1	3,57%	27	96,43%	1		
Flexible production systems	0	0,00%	28	100%			

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3.2.2 ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS

Transversal skills	In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?				If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?		
	YES		NO		≤ 25	≤ 50	>50
Programming & Languages	7	25,00%	21	75,00%	3		4
Design and development of Web applications	3	10,71%	25	89,29%	1	1	1
Software for the automation of production systems	2	7,14%	26	92,86%	1		1
Web platforms for sharing, participation and services	3	10,71%	25	89,29%	3		
Web based maintenance technologies	2	7,14%	26	92,86%	2		
ICT technologies for services integration	1	3,57%	27	96,43%	1		
Cloud-based applications	2	7,14%	26	92,86%	2		
Web–Based Control and Workforce Automation	2	7,14%	26	92,86%	2		
Communication standards and devices interoperability	0	0,00%	28	100%			

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3.2.3 INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES

Transversal skills	In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?				If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?		
	YES		NO		≤ 25	≤ 50	>50
Big Data & Analytics	1	3,57%	27	96,43%	1		
Sensors and intelligent systems	5	17,86%	23	82,14%	5		
IoT & Machine Interaction	4	14,29%	24	85,71%	2		2
Virtual and augmented reality	1	3,57%	27	96,43%	1		
Advanced process technologies based on engineering	3	10,71%	25	89,29%	2	1	
RFID Technologies (Radio Frequency IDentification)	3	10,71%	25	89,29%	1		2
Machine Interface Technologies	2	7,14%	26	92,86%	1	1	
Technologies for simulation and testing	5	17,86%	23	82,14%	4	1	
Communication technology for Industry 4.0	0	0,00%	28	100%			

3.2.4 INNOVATIVE PRODUCTION PROCESSES

Transversal skills	In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?				If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?		
	YES		NO		≤ 25	≤ 50	>50
Additive manufacturing	1	3,57%	27	96,43%	1		
Plasma processes	0	0,00%	28	100%			
Hot forming	1	3,57%	27	96,43%		1	
Forming and polymerization of laminates in composite material	0	0,00%	28	100%			
Other (Specify ….)	0	0,00%	28	100%			

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3.2.5 OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS

Transversal skills	In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?				If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?		
	YES		NO		≤ 25	≤ 50	>50
Optimization of production processes	3	10,71%	25	89,29%	2	1	
Logistics management of advanced supply chains	2	7,14%	26	92,86%	2		
Organization and management of production systems	3	10,71%	25	89,29%	3		
Production management and control systems	4	14,29%	24	85,71%	3		1

3.2.6 ECO-SUSTAINABLE TECHNICAL AND TECHNOLOGICAL SOLUTIONS

Transversal skills	In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?				If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?		
	YES		NO		≤ 25	≤ 50	>50
Cutting-edge eco-sustainable technical and technological solutions	1	3,57%	27	96,43%	1		
Eco-sustainable Packaging	2	7,14%	26	92,86%	2		
Technologies for the efficiency of production processes	1	3,57%	27	96,43%	1		

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ANNEX B

- **Year 2009: COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Preparing our future: developing a common strategy for key enabling technologies in the EU:**

"..on the current research and market trends worldwide, the following technologies can be considered the most relevant KETs from a strategic point of view, ..: Nanotechnology, micro and nanoelectronics, including semiconductors, photonics, advanced materials , Biotechnology; In the supply chain of KET, advanced manufacturing systems, which produce knowledge-based goods with a high commercial value and related services (eg modern robotics), are of particular importance.

- Year 2012: COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A European Strategy for Enabling Technologies - A Bridge to Growth and Jobs:

"..The Commission defines enabling technologies as "knowledge-intensive" technologies associated with high R & D intensity, rapid innovation cycles, substantial investment costs and highly skilled jobs ... Based on current research, analysis of market trends and their contribution to the solution of social issues, micro /nanoelectronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced production technologies (considered "horizontal" technologies) have been identified as EU enabling technologies."

- Year 2014 document on methodology, work plan and roadmap for crosscutting KETs activities in Horizon 2020 (RO-cKETs):

".. On 26 June 2012, the European Commission tabled its strategy to boost the industrial production of innovative products, based on current research, economics analysts of market trends and their contribution to solving societal challenges, micro and nano electronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced manufacturing systems (the latter recognized as a KET) have been identified as the EU's Key Enabling Technologies."

- Year 2014 COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS "For a European industrial rebirth"

"..The need to accelerate investments in cutting-edge technologies in Rapidly growing sectors are the main reason behind the Commission's decision to identify the six sectors in which the investments are to be encouraged in the 2012 Industrial Policy Communication. These strategic cross-cutting sectors are: advanced manufacturing processes, key enabling technologies, clean vehicles and transport, bioproducts, sustainable construction and raw materials as well as smart grids."

- Year 2016 document on Skills for Key Enabling Technologies in Europe:

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"..KETs have been defined by the European Commission as knowledge intensive technologies associated with high R & D intensity, rapid innovation cycles, high capital expenditure and highly skilled employment. KETs enable process, goods and service innovation in the economy and are of systemic relevance. KETs currently includes the following six areas of technology: micro- / nanoelectronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced manufacturing technologies ...

..Analysis of skill requirements for KETs

- KETs rely on a balance of both technical and non-technical competences.
- Technical competences can be considered the 'heaviest' category in terms of required knowledge and skills due to the knowledge-intensive nature of KETs.
- Other relevant but non-technical competences include quality, risk & safety; management & entrepreneurship; communication; innovation and emotional intelligence.
- Sez. Key sources of KETs-related skills: "..The type of people needed for KETs also differs depending on the pillars of the KETs innovation trajectory. Our analysis suggests that degrees highly demanded by employers generally include Master's and Bachelor's (or similar), with an important role also for PhDs within the Technological Research pillar, and a clear need for people with vocational education for Competitive Manufacturing pillar", "..Pillar 3 (Competitive Manufacturing) often heavily relies on middle-skilled people (vocational training/short-cycle tertiary education)."

- Six categories of KETs competences After developing an initial compilation of KETs competences and clustering them based on their relationship patterns, the following six categories of competences were identified: Technical (1.1 Technical background, 1.2 Design, 1.3 ICT skills, 1.4 Modelling and simulation, 1.5 Equipment handling skills, 1.6 Manufacturing, 1.7 Diverse other technical competences) Quality, risk & safety (2.1 Quality, 2.2 Risk & safety), Management & entrepreneurship (3.1 Business development, 3.2 Operational management, 3.3 Entrepreneurship) Communication: Innovation, Emotional intelligence (6.1 Self-management, 6.2 Social skills).
- Annex A: Core KETs competences, knowledge and skills

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6. CONCLUSIONS

In Montenegro, there is no single strategical document used for the development of qualifications focused on KETs. The strategy for development od vocational education is mainly focused on development and improvement of the already existing qualifications, but also on the process of educational programmes modularization. Dual education is still a pilot project in Montenegro and its sustainability is still not analyzed. The number of developed 5th-level qualifications in Montenegro is very low and it is crucially important to work on their development.

The sector analysis shows that sectors and disciplines in MQF are significantly different rearding those prescribed and recognized by EU. In the Ministry of Education of Montenegro, there is a Department for National qualification framework, which, in collaboration with the Centre for Vocational Education, through sectoral commissions, works on improving and developing qualifications. The initiative to redefine sectors and to better define KETs qualifications is not feasible, because it means law alterations from the bottom.

The analysis of national legislation shows that the mobility of students between 4th and 5th levels is feasible, but that is not the same in case of bridging between secondary and high education. The mobility is not feasible from 5th level of education to 6th level of education and that is the main legal hindrance.

The analysis of material resources shows that there is very low number of schools possessing all the equipment necessary for quality teaching process as defined in the AF. The sample included in the final targeting shows the underdevelopment of implementation of certain educational profiles, as well as low response of the students. Material resources analysis targeted three school which have the highest level of such resources that will be included in further project activities.

The analysis of professional resources shows that Montenegrin educational system counts significant number of professionaly trained teachers, especially in certain sectors and disciplines, so through their adaptation and additional training, they could be easily included in further activities. Educational programmes from the sector of information technologies and electrical engineering are in the process of development and their innovation is a permanent process which records growth by years. The most innovative educational profiles (and therefore the ones closest to the KETs requirements) are those from the sector of electrical engineering and mechatronics. There is only one educational profile at the 4th level which fits the most to the KETs focused profile and that is mechatronics.

The analysis of connection between companies and schools shows that these relationships are pretty much developed, but, as already noted above, due to the nature of dual education, they are rashly regressing.

The analysis of students' guidance shows that these activities must be defined in a better and more effiecient way. In Montenegro, there is a Centre for Informing and Professional Consulting (CIPS), but its activities are insufficiently KETs oriented.

The analysis of all data collected from the institutions involved in the process of qualification development and of those which define the educational policies shows that Montenegrin educational system needs certain number of strategic documents supporting the development of Key Enabling Technologies.

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Interreg - IPA CBC
Italy - Albania - Montenegro
HISTEK

Data Collections

D. T1.3.1

"SMEs and Training Institutions assessment" 05/2019

Version	Date	Author	Description
1.0	23.04.2019	Dragana Šofranac, Ksenija Đukanović/Chamber of Economy of Montenegro	Analysis of the Mooteengrin SMEs' needs for Skills in enabling technologies - 1st draft
2.0	13.05.2019	Dragana Šofranac, Tanja Radusinović/Chamber of Economy of Montenegro	Analysis of the Mooteengrin SMEs' needs for Skills in enabling technologies – 2nd draft
final	30.05.2019	Dragana Šofranac, Stefan Jovanović/Chamber of Economy of Montenegro	Analysis of the Mooteengrin SMEs' needs for Skills in enabling technologies

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

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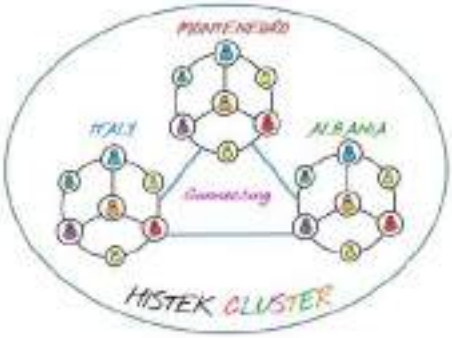
HISTEK: main project objectives



The HISTEK project aims at strengthening the competitive capacity of **Italian, Albanian and Montenegrin SMEs**, through the creation of a **new Cluster** (made up of SMEs, Educational Institutions and Public Institutions), which will act as a "**connector**" between the world of education and the world of companies for empowering human capital, as a strategic lever to support growth and development.

The small and medium-sized enterprises of the three countries are today **engaged in considerable efforts to internationalize and innovate** their organizations. Many Italian companies already have, or are planning to open branches in Albania and Montenegro or vice versa.

To make these **processes more sustainable**, HISTEK proposes the cross-border definition of tools that can facilitate **training, transnational mobility and the inclusion in the SMEs of "high technicians / middle-skilled workers"** truly aligned with their current need for advanced technical skills, fundamental for supporting innovation processes.

First of all, the Cluster will define the architecture of a **new transnational short-cycle path (EQF Level 5)**, conceived according to the dual system, co-designed with the participating SMEs. Transnationality will imply the creation of **common and shared training standards between the 3 countries** and the prospect of the future joint delivery of the path, partly in Italy, partly in Montenegro and partly in Albania, with the cooperation of companies and training institutions of the 3 territories.

With the support of the **Chambers of Commerce, project partners,** in the design of the new training offer, a robust cross-sector preparation will be developed in line with the **main development and innovation trajectories indicated by SMEs** in the needs analysis phase.

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To this end, particular attention will be given to the technical and transversal skills required for the use of **new enabling technologies (KETs)**, recognized by the European Commission as the indispensable background to support, today, product and process innovation.

In addition, **other services will be developed for SMEs** in line with the implementation of dual systems, (which foresee the realization of at least 50% of training activities directly by company internal staff). In particular, **guidelines** will be produced to improve the ability of business referents to provide **on-the-job training** and to train young people during their **curricular internships**. A toolkit will also be created to support companies in **selecting future technicians.**

Lastly, the project foresees the signing of a **Consortium Agreement**, which will commit the partners to the implementation of the new training path immediately after the conclusion of the project, with a strong impact of the project results on SMEs at the CB level in the mid term.

Main Benefits / Expected Impacts for SMEs after the implementation of the new path:

- ***Improved acquisition of talents and skills*** through the inclusion of **young Italians, Albanians and Montenegrins** trained in the specific skills required, with standards common to the three countries;
- ***Reduction of indirect costs for lacking and fast integration in the corporate culture at CB level***, and to the transition from the training world to that of SMEs, with its peculiarities and characteristics;
- ***Reduction of indirect*** costs related to the **loss of business opportunities** deriving from the lack of skills in terms of innovation, knowledge of the markets, use of technologies, etc;
- ***Higher internationalization capacity*** aimed at expanding outlet markets.

Project partners:

- Ministry of Education of Montenegro – LP (Montenegro)
- **Chamber of Economy of Montenegro – P2 (Montenegro)**
- Fondazione ITS "Antonio Cuccovillo" – P3 (Italy)
- Chamber of Commerce of Bari – P4 (Italy)
- Faculty of Business, "Aleksandër Moisiu" University, Durrës – P5 (Albania)
- Chamber of Commerce of Tiranë – P6 (Albania)

Survey description

Interviewing Method

The selected methods are CAWI (Computer Assisted Web Interviewing) questionnaire, through Google's free online form for the collection of responses and focus groups meetings. The questionnaire is about the Montenegrin situation, since the activity has been originally conceived as diversified among Italy, Albania and Montenegro, to respect the entrepreneurial and social differences. Participants of the Focus groups were selected on the basis of their trade exchange with Italy and Albania.

Detection Technique

The Questionnaire has been detected through a qualitative and quantitative method, composed by a data set of 22 variables. Main topics which were discussed at the Focus groups meetings were aligned with variables from Questionnaire.

Technical Assessments (Activity T1.3)

The analysis and elaboration of the results have been carried out by the HISTEK's partners (one for each Country) and the result is going to be showcased in this document via graphs and comment (discursive).

Detection Period

The period in which questionnaire has been available is end of December 2018.
The Focus groups meetings were held from January to end of March 2019.

Code of conduct

The survey has been designed and spread in compliance with the provisions of EU General Data Protection Regulation (GDPR) of May 25th 2016. The answers to the questionnaire are used in aggregate form and only for statistical purposes.

Communication

The following survey has been disseminated via e-mail and it is also accessible through the institutional website and social networks. The survey contained brief information about the project and. It followed the communication policy of the project (information and publicity) and, at the end, there was a link with a call to action button to access to the fillable questionnaire (as stated in the Picture below):

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Survey Summary Table

Personal data	✓ The person that is submitting the Form ✓ Full Name ✓ Work e-mail ✓ Web sajt ✓ Phone ✓ City ✓ Province
Company Details	✓ Company Name ✓ Company Role ✓ What is the number of employees (regardless of the contractual form) of the company? ✓ Sectors ✓ Does the company collaborate with other subjects (research centers, universities, ITS, high schools) in the design, research and development of new products / services? ✓ Does the company collaborate with other subjects (research centers, universities, ITS, high schools) in the design, research and development of new products / services? ✓ In your company, in a range from 0 to 10, what's the value of foreign market turnover over the total? ✓ What are the 3 most important foreign countries for your turnover? ✓ Does your company work with the following countries? (tick only if the answer is yes) ✓ Does the company buy equipment or technology abroad?
Focus on Mechatronic	✓ Which innovative equipment or advanced technology does the company buy abroad? ✓ How does the maintenance work?
Professional and training needs related to innovation	✓ What is the educational profile of employee related to innovation that the company needs most? ✓ Which products, processes or technologies should he be able to manage? ✓ What kind of training should the employee have? What education level is needed? ✓ Which subjects should be taught or which soft skills?

Table 1: Survey Summary Table

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Learned by previous experince from the meetings held with companies as the regular Chamber's activities, we apponted our focus to two specific laber market needs (web/mobile aplications and mehatronics)

Target groups

As mentioned above Target group was composed mostly of SMEs from different economic activities. **Over a project target of 10 companies there was a final collection of 29 replies.**

Turnover	Number of employees					
	0 - 9	10 - 49	50 - 249	250 - 499	500 +	Total
< 250k€	2					2
250k€ - 500k€	2	3				5
500k€ - 1M€		2				2
1 - 2.5M€	1	3	2			6
2.5- 5M€			1		1	2
5 – 10M€		3	3			6
10 – 25M€			4	1		5
25 – 50M€					1	1
	5	11	10	1	2	29

Table 2 - Numeric Pivot Table of the 29 companies participating in the survey

Turnover	Number of employees					
	0 - 9	10 - 49	50 - 249	250 - 499	500 +	Total
< 250k€	"BOŽJA VODA" "ME-NET"					2
259k€ - 500k€	"EKO - VLADOŠ" "HIDRO-RAD"	"REMID VIS" "SEKAS" "FLEKA"				5
500k€ - 1M€		"MONTEX - ELEKTRONIKA" "AMPLITUDO"				2
1 - 2.5M€	"BOMEX - M"	"BILD STUDIO" "FRIGOELEKTRO" "BEKOM CO"	"INSTITUT ZA CRNU MATALURGIJU" "ŠIŠKOVIĆ"			6
2.5- 5M€			"METALAC TERMOCHEM"		"UNIPROM KAP"	2
5 – 10M€		"FARMONT M.P." "ČIKOM" "OSMANAGIĆ CO"	"ETG GRUPA" "MONTE PUT" "RIBNICA COMMERCE"			6
10 – 25M€			"TERMOSISTEM" "LEDO" "EUROMIX BETON" "HEMOMONT"	"TOSCELIK ALLOYED ENGINEERING STEEL"		5
25 – 50M€					"13 JUL - PLANTAŽE"	1

Table 3 – Number of employees and Turnover of 29 companies participating in the survey

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

General overview

Territorial coverage of respondent companies

The survey included 29 companies from different sectors of the economy, that is: 58.6% from Podgorica, 17.4% from Nikšić, 6.9% from Danilovgrad, 6.9% from Cetinje, 3.4% from Kotor, 3.4% from Kolašin and 3.4% from Bar. Observed by regions, the survey covered 90% of companies from the central region, 7% from the coastal (south) and 3% from north region.

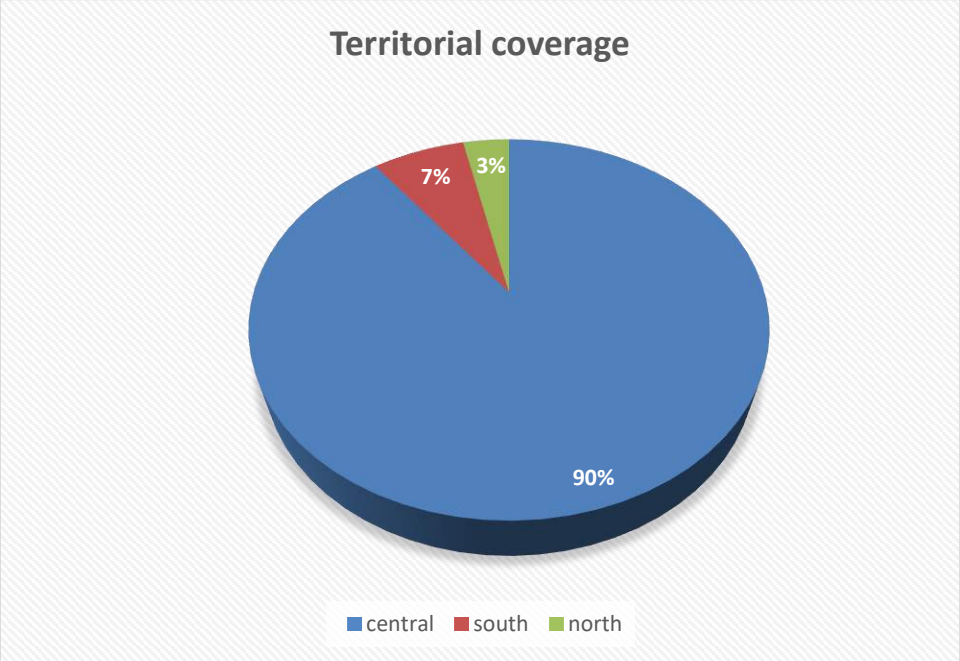

Figure 1 – Territorial coverage of respondent companies

Covered role of the interviewed within the company

The survey involved 14 managers (CEO) or 48.2% of respondents, as well as 15 owners or 51.8%.

Observed by the number of employees, survey involved 5 companies (17.3%), employing 0 to 9 employees, 11 companies (37.9%) employing 10 to 49 employees, then 10 companies (34.5%), employing 50 to 249 employees, 1 company (3.5%) employing 250 to 499 and 2 companied (6.8%) employing 500+ employees.

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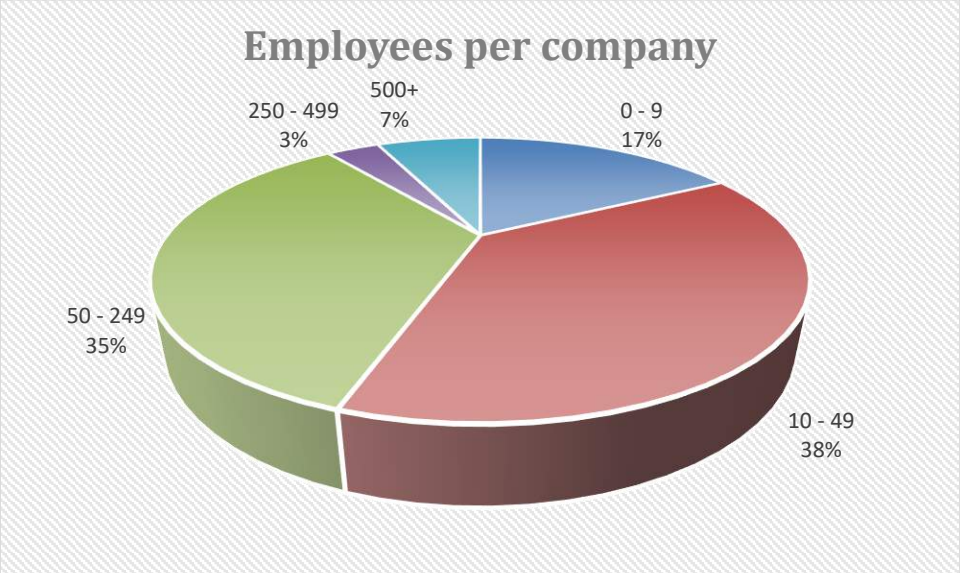

Figure 2 – Number of employees per company

Covered economic activities

The sample comprised most of the companies from ICT (6 companies) and metallurgy and machinery (5 companies), followed by construction (4 companies), trade (4 companies), and pharmaceutical industry, agro industry, engineering, services (2 companies per activity) and water and wood production (1 company per activity).

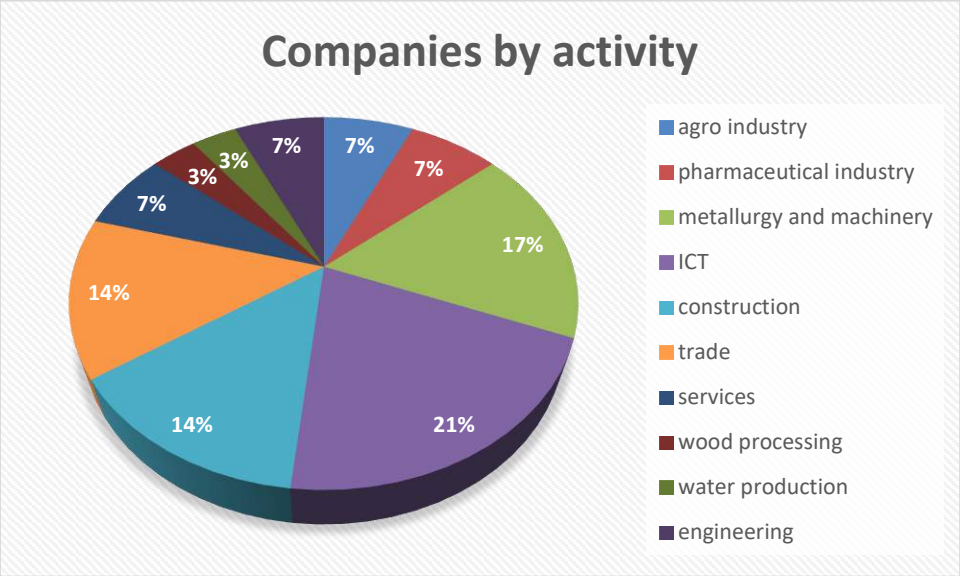

Figure 3 – Companies by activity

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Collaborations with Educational institution

When asked whether companies cooperate with other institutions (research centers, universities, IT centers, secondary schools) in the creation, research and development of new products/services, 15 companies or 51.7% of respondents answered that they are involved in educational activities through the intermediary role of the Chamber of Economy of Montenegro but they are interested to start direct cooperation, while 12 companies, or 41.4% of respondents, answered that they cooperate with other institutions, in accordance with cooperation agreements. Two of the companies responded that they are not interested to cooperate in this field.

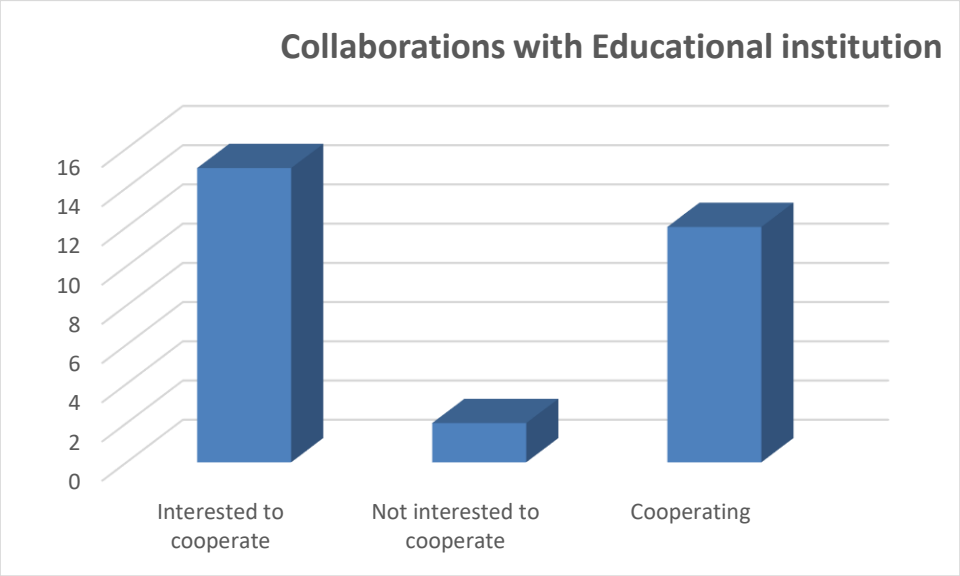

Figure 4 – Collaborations with Educational institutions

The most of companies which already cooperating with educational institutions belong to ICT sector. Based on the initiative from the Chamber of Economy of Montenegro the majority of them developed the educational programme for occupational profile web and mobile application developer on the secondary level. The work of ICT Focus group has resulted in identified necessity for transforming above mentioned educational programme into the fifth level as adequate one for required competences. They demonstrated willingness to organize practical part of education.

Value of foreign sales over total turnover

On the question what is the value of the realized turnover in the foreign market, in relation to the total value, on the scale from 0 to 10, 11 companies (37.9%) choose the answer 0, then 2 companies or 6.9% response 1, 8 companies or 27.6% answer 2, 2 companies or 6.9% answer 3, 2 companies or 6.9% answer 4, 1 company or 3.4% responses 6, 1 company or 3.4% answers 7 and 2 of them or 6.9% chose 10.

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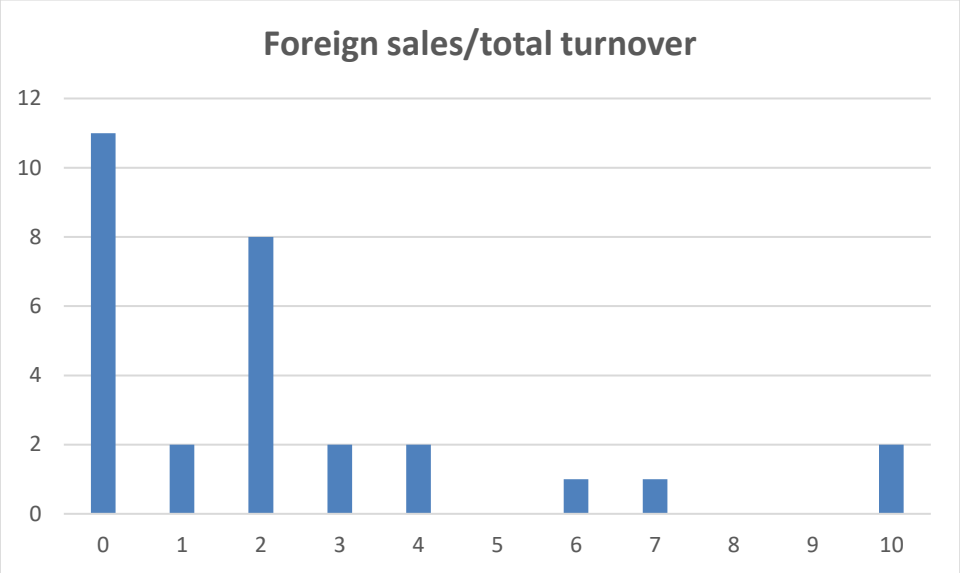

Figure 5 – Foreign sales/total turnover

The three most important foreign trade partners for the products/services of the surveyed companies are Croatia, Italy, Greece and other (mostly Serbia). Of the total number of surveyed companies, 72.4% cooperate with Croatia, 65.5% with Italy, 24.1% with Greece and 86.2% others.

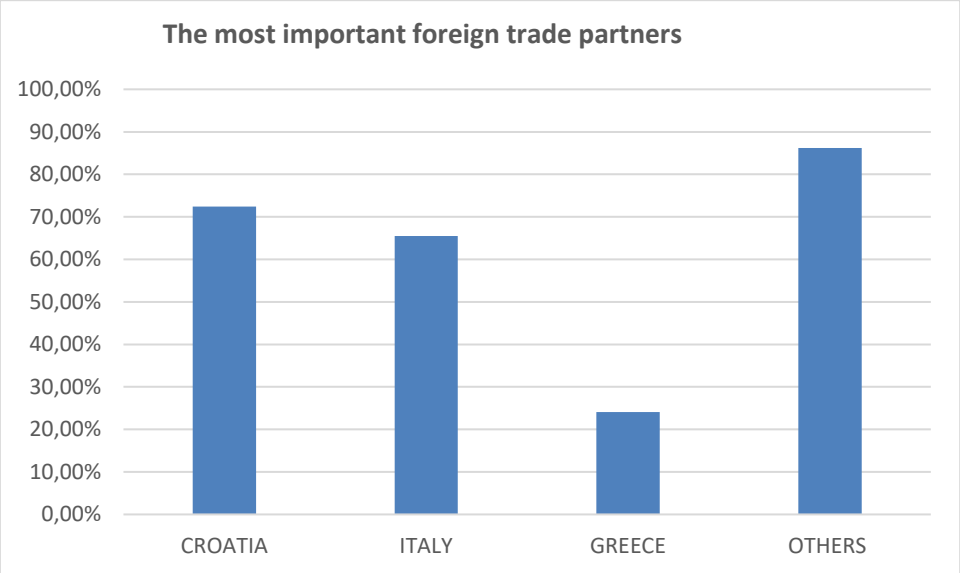

Figure 6 – The most important foreign trade partners

Cooperation with Italy and Albania

Italy and Albania are very important markets for Montenegrin companies. Of the total number of surveyed companies, 41.4% already cooperate with Albania and 65.5% with Italy.

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Machinery from abroad

Equipment and technologies acquire abroad 84.2% of surveyed companies.

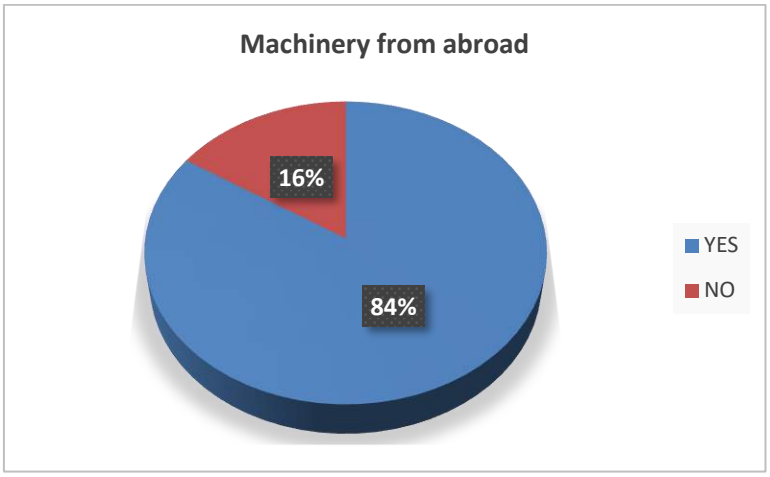

Figure 7 – Machinery from abroad

The equipment or technology most often purchased abroad by the companies surveyed is software (43.8%), innovative electronic devices, appliances and similar (18.8%).

Of the total number of companies surveyed, 50% of the equipment is maintained with the assistance of external foreign technicians, who come to the site and perform repairs, while 43.9% of the surveyed maintain equipment with the help of local technicians.

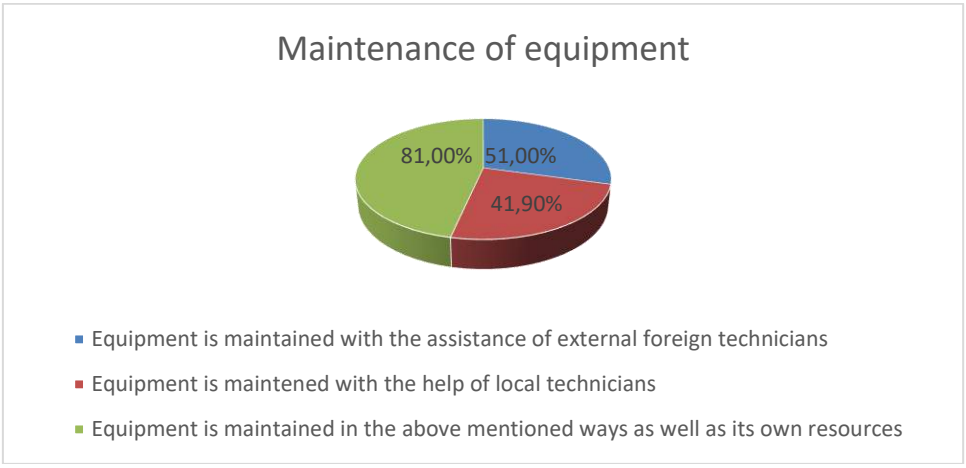

Figure 8 – Maintenance of equipment

Expected level of education

Educational profiles most needed for the surveyed companies for innovations are IT professionals in the field of development web and mobile applications and technicians and mechatronics. Whereby the respondents believe that the profile of the staff they need should have the level of education as follows:

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university degrees 4 (13.8%), secondary school diploma 7 (24.1%) and higher education 18 (62.1%) of respondents.

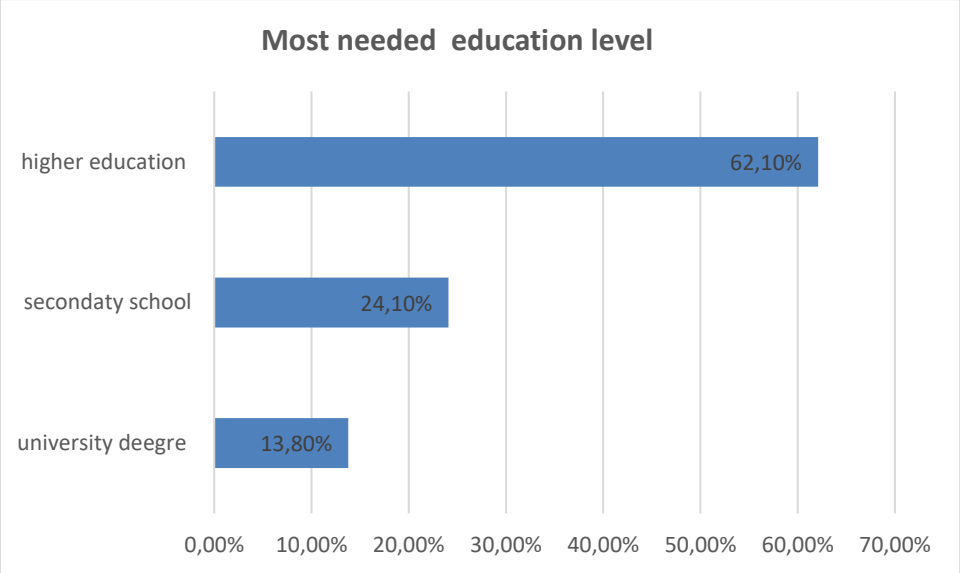

Figure 9 – Most needed education level

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Recommendation

The companies' selection and involvement of companies into the survey and work of focus group were indicated by intensity of their realized foreign trade exchange especially with Italian partners and usage of technologies, engines and appliances. From the obtained data emerged that utmost of selected companies are great importers of technologies from the one side, and that they do not have at their disposal technicians for the maintenance and repair of engines which constantly causes costs of hiring foreign specialist for performing such jobs. The lack of competences form the field of mechatronics emerged to be the crucial reason behind the timely and costly inefficient way in which Montenegrin companies resolve the issue of equipment maintenance. The companies gathered within the focus group agreed that the development of educational profile from mechatronics would be absolutely favorable from their more efficient business performance. They have also recognized the tertiary level as optimal for the occupational profile from mechatronics they have a need for.

The emergence of mechatronics imposed the establishment of model for education at tertiary level. Achieving this objective requires a shift: the transition from sequential engineering to simultaneous engineering which requires and integrative educational approach that seeks to develop systemic thinking learners. The future of technological development in Montenegro will increasingly call upon and depend on mechatronics expertise to provide equipment and specialized skills that will not add value to the finish products, but do it quickly, accurately, economically and in large volumes. Mechatronics interdisciplinary laboratories are the basis for the realization of the principles of ''learning by doing''. Educational program has to be formulated by ensuring a balance between innovation and maintenance teaching, insurance of an optimum relation between formal and informal education, extension of educational process to the lifetime of student. Today, a mechatronics technician must be familiar with the benefits and limitations of cross-discipline technologies in software and electronic hardware; must be trained on how to apply this knowledge to optimize a mechanical design; and must understand how to rapidly prototype and test various embedded solution to develop a final solution. Mechatronics education provides flexibility in action and thought, defining features of experts in the market economy. Flexibility is an essential feature of mechatronics system. This characteristic is determined by the fact that the link between functional modules is achieved through information, so the same hardware structure can achieve different functions according to software installed. The goal of mechatronics education is to obtain technicians who are educated in the theories, principles and applications of mechatronics while improving their competences in innovative thinking, communication skills and teamwork. According with these aspects in our activities we intend to assure a gradual training of our students in order to face effectively the requests of the labor market through: developing the students' cognitive capacities based on up-to date knowledge taught and assessed in a modern and effective way, developing the students' team working skills as a base on an efficient further social and professional integration, developing the students' effective self-assessment skills by using a transparent and formative assessment system. The labor that companies need should be equipped according with the new education strategy and mechatronics curricula.

The survey and focus groups have also involved the leading Montenegrin ICT companies which expressed interest to create the new curricula in web and mobile applications. The expansion of information technologies and every growing significance of its implementation in other economic

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sectors has caused the huge scarcity of human resources in this area that Montenegrin educational system and labor market currently do not have at their disposal in sufficient number. The National Strategy of Smart Specialization foreseen the implementation of digital solution in the sectors of agriculture, energy and tourism which pose the imperative for enlarging the basis of technicians enabled to develop web and mobile applications. The ICT companies within the focus group have agreed for the educational profile to be developed on tertiary level as appropriate level for the most required skills and competencies that would met the current needs of Montenegrin economy. Mobile application developers have to be versatile, especially for enterprise mobility, because businesses will undoubtedly have employees that utilize both iOS and Android. UI and how it affects UX is very important for mobile app development, because it is what determines how successful the app will be. Poor UI design can lead to poor accessibility for users, which doesn't exactly encourage them to spend more time with the mobile apps. Be aware of any cross-development software that offers agile design tools. Agile design tools provide the important options like drag-and-drop functionality and a multi-layout manager.

Another solution for cross-platform development for mobile app developers is to create apps with cloud computing infrastructure. The cloud allows developers to create applications that can be ported to cloud servers where users can access these apps and their data via browsers on various mobile devices. Be well-versed in mobile enterprise application platforms (mobile app development platforms) and HTML5. Having the skills to build the cloud computing infrastructure that supports an ecosystem of mobile apps stored within a cloud server will be a major asset.

Mobile apps, especially enterprise ones for content management and daily operations, need to be heavily protected. Sensitive business data and metadata that may be stored in these apps is too important to leave vulnerable to hackers. One of the biggest cyber security risks to date is extortion hacking, which costs a business not just its data and money, but its reputation as well. The time is required to learn how to build apps whose code is virtually bug free and amass a toolset for encryption and data-loss prevention.

With the Internet of things continuing to expand in 2019, the companies need to be knowledgeable about how to make the mobile apps interface with other devices connected to the internet. For enterprise mobile apps this means more options for customer loyalty rewards programs and e-payment, which is a rapidly growing mobile trend itself.

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Education for near future

8 Top Technology Trends for 2019 and the Jobs They'll Create

By Nikita Duggal Last updated on Feb 11, 2019

Technology is now evolving at such a rapid pace that annual predictions of trends can seem out-of-date before they even go live as a published blog post or article. As technology evolves, it enables even faster change and progress, causing the acceleration of the rate of change, until eventually it will become exponential.

Technology-based careers don't change at that same speed, but they do evolve, and the savvy IT professional recognizes that his or her role will not stay the same. The IT worker of the 21st century will constantly be learning, out of necessity if not desire.

What does this mean for you? It means staying current with technology trends. And it means keeping your eyes on the future, to know which skills you'll need to know and what types of jobs you want to be qualified to do.

Artificial Intelligence (AI)

Artificial Intelligence, or AI, has already received a lot of buzz in recent years, but it continues to be a trend to watch because its effects on how we live, work and play are only in the early stages. In addition, other branches of AI have developed, including Machine Learning, which we will go into below. AI refers to computers systems built to mimic human intelligence and perform tasks such as recognition of images, speech or patterns and decision making. AI can do these tasks faster and more accurately than humans.

AI has been around since 1956 is already widely used. In fact, five out of six Americans use AI services in one form or another every day, including navigation apps, streaming services, smartphone

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personal assistants, ride-sharing apps, home personal assistants, and smart home devices. In addition to consumer use, AI is used to schedule trains, assess business risk, predict maintenance, and improve energy efficiency, among many other money-saving tasks.

AI is one part of what we refer to broadly as automation, and automation is a hot topic because of potential job loss. Experts say automation will eliminate 73 million more jobs by 2030. However, automation is creating jobs as well as eliminating them, especially in the field of AI: Pundits predict that jobs in AI will number 23 million by 2020. Jobs will be created in development, programming, testing, support and maintenance, to name a few. Artificial Intelligence architect is one such job. Some say it will soon rival data scientist in need for skilled professionals.

Machine Learning

Machine Learning is a subset of AI. With Machine Learning, computers are programmed to learn to do something they are not programmed to do: They literally learn by discovering patterns and insights from data. In general, we have two types of learning, supervised and unsupervised.

While Machine Learning is a subset of AI, we also have subsets within the domain of Machine Learning, including neural networks, natural language processing (NLP), and deep learning. Each of these subsets offers an opportunity for specializing in a career field that will only grow.

Machine Learning is rapidly being deployed in all kinds of industries, creating a huge demand for skilled professionals. The Machine Learning market is expected to grow to $8.81 billion by 2022. Machine Learning applications are used for data analytics, data mining and pattern recognition. On the consumer end, Machine Learning powers web search results, real-time ads and network intrusion detection, to name only a few of the many tasks it can do.

In addition to completing countless tasks on our behalf, it is generating jobs. Machine Learning jobs rank among the top emerging jobs on LinkedIn, with almost 2,000 job listings posted. And these jobs pay well: In 2017, the median salary for a machine learning engineer was $106,225.

Robotic Process Automation or RPA

Like AI and Machine Learning, Robotic Process Automation, or RPA, is another technology that is automating jobs. RPA is the use of software to automate business processes such as interpreting applications, processing transactions, dealing with data, and even replying to emails. RPA automates repetitive tasks that people used to do. These are not just the menial tasks of a low-paid worker: up to 45 percent of the activities we do can be automated, including the work of financial managers, doctors and CEOs.

Although Forrester Research estimates RPA automation will threaten the livelihood of 230 million or more knowledge workers or approximately 9 percent of the global workforce, RPA is also creating

new jobs while altering existing jobs. McKinsey finds that less than 5 percent of occupations can be totally automated, but about 60 percent can be partially automated.

For you as the IT professional looking to the future and trying to understand technology trends, RPA offers plenty of career opportunities, including developer, project manager, business analyst, solution architect, and consultant. And these jobs pay well. SimplyHired.com says the average RPA salary is $73,861, but that is the average compiled from salaries for junior-level developers up to senior solution architects, with the top 10 percent earning over $141,000 annually.

Blockchain

Although most people think of blockchain technology in relation to cryptocurrencies such as Bitcoin, blockchain offers security that is useful in many other ways. In the simplest of terms, blockchain can be described as data you can only add to, not take away from or change. Hence the term “chain” because you’re making a chain of data. Not being able to change the previous blocks is what makes it so secure. In addition, blockchains are consensus-driven, as explained in this Forbes article, so no one entity can take control of the data. With blockchain, you don’t need a trusted third-party to oversee or validate transactions.

This heightened security is why blockchain is used for cryptocurrency, and why it can play a significant role in protecting information such as personal medical data. Blockchain could be used to drastically improve the global supply chain, as described here, as well as protect assets such as art and real estate.

And as the use of blockchain technology increases, so too does the demand for skilled professionals. In that regard, we are already behind. According to Techcrunch, blockchain-related jobs are the second-fastest growing category of jobs, with 14 job openings for every one blockchain developer. A blockchain developer specializes in developing and implementing architecture and solutions using blockchain technology. The average yearly salary of a blockchain developer is $130,000.

The job of a developer is not the only one available in the blockchain space, however. Employers are also looking for software engineers, consultants and project managers. Jobs are available at financial institutions, but also in retail and healthcare, and soon probably manufacturing as well. Learn more about becoming a blockchain developer.

Edge Computing

Formerly a technology trend to watch, cloud computing has become mainstream, with major players AWS (Amazon Web Services), Microsoft Azure and Google Cloud dominating the market. The adoption of cloud computing is still growing, as more and more businesses migrate to a cloud solution. But it’s no longer the emerging technology. Edge is. Move over, cloud computing, and make way for the edge.

As the quantity of data we're dealing with continues to increase, we've realized the shortcomings of cloud computing in some situations. Edge computing is designed to help solve some of those problems as a way to bypass the latency caused by cloud computing and getting data to a data center for processing. It can exist "on the edge," if you will, closer to where computing needs to happen. For this reason, edge computing can be used to process time-sensitive data in remote locations with limited or no connectivity to a centralized location. In those situations, edge computing can act like mini datacenters. Edge computing will increase as use the Internet of Things (IoT) devices increases. By 2022, the global edge computing market is expected to reach $6.72 billion.

As with any growing market, this will create job demand, primarily for software engineers.

Virtual Reality and Augmented Reality

Virtual Reality (VR) immerses the user in an environment while Augment Reality (AR) enhances their environment. Although VR has primarily been used for gaming thus far, it has also been used for training, as with VirtualShip, a simulation software used to train U.S. Navy, Army and Coast Guard ship captains. The popular Pokemon Go is an example of AR.

Both have enormous potential in training, entertainment, education, marketing, and even rehabilitation after an injury. Either could be used to train doctors to do surgery, offer museum-goers a deeper experience, enhance theme parks, or even enhance marketing, as with this Pepsi Max bus shelter.

According to an article at Monster.com, the demand for job candidates with VR knowledge is up 37 percent, but the potential employees are in short supply. That demand will only increase. There are major players in the VR market, like Google, Samsung, and Oculus, but plenty of startups are forming and they will be hiring—or trying to, in light of the shortage. Getting started in VR doesn't require a lot of specialized knowledge. Basic programming skills and a forward-thinking mindset can land a job, although other employers will be looking for optics as a skill-set and hardware engineers as well.

Cyber Security

Cyber security might not seem like emerging technology, given that it has been around for a while, but it is evolving just as other technologies are. That's in part because threats are constantly new. The malevolent hackers who are trying to illegally access data are not going to give up any time soon, and they will continue to find ways to get through even the toughest security measures. It's also in part because new technology is being adapted to enhance security. Three of those advancements are hardware authentication, cloud technology, and deep learning, according to one expert. Another adds data loss prevention and behavioral analytics to the list. As long as we have hackers, we will have cyber security as an emerging technology because it will constantly evolve to defend against those hackers.

As proof of the strong need for cybersecurity professionals, the number of cybersecurity jobs is growing three times faster than other tech jobs. However, we're falling short when it comes to filling those jobs. As a result, it's predicted that we will have 3.5 million unfilled cybersecurity jobs by 2021.

Many cyber security jobs pay six-figure incomes, and roles can range from ethical hacker to security engineer to Chief Security Officer, offering a promising career path for someone who wants to get into and stick with this domain.

Internet of Things

Although it sounds like a game you'd play on your smartphone, the Internet of Things (IoT) is the future. Many "things" are now being built with WiFi connectivity, meaning they can be connected to the Internet—and to each other. Hence, the Internet of Things, or IoT. IoT enables devices, home appliances, cars and much more to be connected to and exchange data over the Internet. And we're only in the beginning stages of IoT: The number of IoT devices reached 8.4 billion in 2017 is and expected to reach 30 billion devices by 2020.

As consumers, we're already using and benefitting from IoT. We can lock our doors remotely if we forget to when we leave for work and preheat our ovens on our way home from work, all while tracking our fitness on our Fitbits and hailing a ride with Lyft. But businesses also have much to gain now and in the near future. The IoT can enable better safety, efficiency and decision making for businesses as data is collected and analyzed. It can enable predictive maintenance, speed up medical care, improve customer service, and offer benefits we haven't even imagined yet. However, despite this boon in the development and adoption of IoT, experts say not enough IT professionals are getting trained for IoT jobs. An article at ITProToday.com says we'll need 200,000 more IT workers that aren't yet in the pipeline, and that a survey of engineers found 25.7 percent believe inadequate skill levels to be the industry's biggest obstacle to growth.

For someone interested in a career in IoT, that means easy entry into the field if you're motivated, with a range of options for getting started. Skills needed include IoT security, cloud computing knowledge, data analytics, automation, understanding of embedded systems, device knowledge, to name only a few. After all, it's the Internet of Things, and those things are many and varied, meaning the skills needed are as well.

Although technologies are emerging and evolving all around us, these eight domains offer promising career potential now and for the foreseeable future. And all eight are suffering from a shortage of skilled workers, meaning the time is right for you to choose one, get trained, and get on board at the early stages of the technology, positioning you for success now and in the future.

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PROJECT: ***"HIGH SPECIALIZED TECHNICIANS IN KETs"***

ACRONYM: ***HISTEK***

Report

Analysis of the training offer related to KETs
Country Report: Italy (Puglia Region)

Work package No. T1:	**Analysis of the training offer related to KETs**
Activity No. 1.3:	**Analysis of the training offer related to KETs - Report**
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Authors:	**Annamaria Patella, Roberto Vingiani, Lucia Scattarelli**
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ANNEX A ..... **Errore. Il segnalibro non è definito.**

ANNEX B 23

ANNEX C 28

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Abbreviations and acronyms	
CB	Cross Border
EQF	European Qualification Framework
EU	European Union
I.I.S.S.	Istituto di Istruzione Secondaria Superiore
ITS	Istituto Tecnico Superiore
I.T.T.	Istituto Tecnico Industriale
KETs	Key Enabling Technologies
SME	Small and medium-sized enterprises

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1. INTRODUCTION

The HISTEK project aims at strengthening the competitive capacity of **Italian, Albanian and Montenegrin SMEs**, through the creation of a **new Cluster** (made up of SMEs, Educational Institutions and Public Institutions), which will act as a "**connector**" between the world of education and the world of companies for empowering human capital, as a strategic lever to support growth and development.

The small and medium-sized enterprises of the three countries are today **engaged in considerable efforts to internationalize and innovate** their organizations. Many Italian companies already have, or are planning to open branches in Albania and Montenegro or vice versa.
To make these **processes more sustainable**, HISTEK proposes the cross-border definition of tools that can facilitate **training, transnational mobility and the inclusion in the SMEs of "high technicians / middle-skilled workers"** truly aligned with their current need for advanced technical skills, fundamental for supporting innovation processes.

First of all, the Cluster will define the architecture of a **new transnational short-cycle path (EQF Level 5)**, conceived according to the dual system, co-designed with the participating SMEs. Transnationality will imply the creation of **common and shared training standards between the 3 countries** and the prospect of the future joint delivery of the path, partly in Italy, partly in Montenegro and partly in Albania, with the cooperation of companies and training institutions of the 3 territories.

With the support of the **Chambers of Commerce, project partners,** in the design of the new training offer, a robust cross-sector preparation will be developed in line with the **main development and innovation trajectories indicated by SMEs** in the needs analysis phase.
To this end, particular attention will be given to the technical and transversal skills required for the use of **new enabling technologies (KETs)**, recognized by the European Commission as the indispensable background to support, today, product and process innovation.

In addition, **other services will be developed for SMEs** in line with the implementation of dual systems, (which foresee the realization of at least 50% of training activities directly by company internal staff). In particular, **guidelines** will be produced to improve the ability of business referents to provide **on-the-job training** and to train young people during their **curricular internships**. A toolkit will also be created to support companies in **selecting future technicians.**
Lastly, the project foresees the signing of a **Consortium Agreement**, which will commit the partners to the implementation of the new training path immediately after the conclusion of the project, with a strong impact of the project results on SMEs at the CB level in the midterm.

Main Benefits / Expected Impacts for SMEs after the implementation of the new path:

- ***Improved acquisition of talents and skills*** through the inclusion of **young Italians, Albanians and Montenegrins** trained in the specific skills required, with standards common to the three countries;
- ***Reduction of indirect costs for lacking and fast integration in the corporate culture at CB level***, and to the transition from the training world to that of SMEs, with its peculiarities and characteristics;
- ***Reduction of indirect*** costs related to the **loss of business opportunities** deriving from the lack of skills in terms of innovation, knowledge of the markets, use of technologies, etc;
- ***Higher internationalization capacity*** aimed at expanding outlet markets.

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Project partners:

Ministry of Education of Montenegro – LP (Montenegro)
Chamber of Economy of Montenegro – P2 (Montenegro)
Fondazione ITS "Antonio Cuccovillo" – P3 (Italy)
Chamber of Commerce of Bari – P4 (Italy)
Faculty of Business, "Aleksandër Moisiu" University, Durrës – P5 (Albania)
Chamber of Commerce of Tiranë – P6 (Albania)

2. ACTIVITY 1.1: OBJECTIVES

The objective of Activity 1.1 is to carry out a cross-analysis, conducted in the three countries, between the SMEs need of highly specialized technicians with a specific basic preparation on new enabling technologies (KETs) and the training offer (3rd, 4th and 5th level (EQF) on these technologies, in order to define the possible gaps and identify an innovative technical profile (and related set of skills) to be trained through a new transnational short cycle education pathway.

Why focus on Key Enabling Technologies (KETs)? KETs are today the basis of every innovative process, having literally penetrated into all aspects of our lives. The products and services obtained through their use now impact on a wide range of sectors (Transport, Agri-food / Agro-industry, Environment and territory, Cultural heritage, Biomedical diagnostics, Manufacturing, Social Innovation, Energy technologies, Pharmaceuticals, etc .)
Therefore, the spread of KETs in the EU is not only of strategic importance, but is indispensable to support the innovation and competitivity of companies, and in particular of SMEs.

What is the answer of educational systems? The Educational Institutions programs (3° and 4° EQF Levels) are not yet fully aligned to the skills needs for enabling technologies expressed by companies, which today require a wide range of advanced technical skills, as well as entrepreneurial skills, ICT skills, skills related to multidisciplinarity and creativity, capacity for project management and problem solving, ability to work with safety and quality standards, etc.
The potential growth of KETs depends largely on both the quality of the skills possessed by current and future employees, and the number of qualified people available to work in sectors that employ these new technologies.
The development of a short-cycle training offer, at a transnational level, **aimed at preparing this specific target of qualified technicians**, implemented according to the dual system to favor the rapid transition from the training world to that characteristic of small and medium-sized enterprises, seems to be the most effective and timely response to the concrete needs of technological development and innovation expressed by SMEs across borders.

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3. TRAINING OFFER IN THE FIELD OF KETs

3.1 THE QUESTIONNAIRE

In order to implement the analysis of the Training offer in the technological field in the three Countries (with a specific focus on Key Enabling Technologies - KETs) individual interviews with representatives of the Educational Institutions involved are proposed.

The structure of the Questionnaire is elaborated by ITS Cuccovillo and integrated by Albanian and Montenegrin partners, in order to consider the differences present in the three National Educational System.

The Questionnaire proposed is articulated as follow:

EDUCATIONAL INSTITUTIONS DATA *This section is dedicated to the collection of the general data of the Educational Institution involved in the survey and the contact data of the person who will fill the questionnaire*
CONTEXT *This section is divided into 3 subsections and is dedicated to collect data on the material and professional resources available to the educational institution and on the level of cooperation it has with SMEs*
Section 1) Material resources: *This subsection explores the equipment of technical-technological classrooms and laboratories*
Section 2) Professional resources: *This sub-section explores the skills possessed by the teachers, with a specific focus on KETs, the teaching methodologies adopted, the attention given to soft skills and the updating level of teachers*
Section 3) Relation with the territory: *This sub-section explores the possible cooperation links between educational institution and SMEs*
TRAINING OFFER *This section is composed by 2 subsections and explores the training offer, with specific reference to soft and hard skills related to KETs*
Section 1) Transversal skills: *This sub-section explores the training offer in the framework of two specific categories of transversal skills:* 1. *MANAGEMENT AND ENTREPRENEURSHIP* 2. *QUALITY, RISK & SAFETY*
Section 2) Technical skills: *This sub-section explores the training offer in the framework of six specific categories of technical-technological skills at the base of KET 6 (Advanced Production Technologies):* 1. *PRODUCTION TECHNOLOGIES AND AUTOMATION* 2. *ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS* 3. *INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES* 4. *INNOVATIVE PRODUCTION PROCESSES* 5. *OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS* 6. *ECO-SUSTAINABLE TECHNICAL AND TECHNOLOGICAL SOLUTIONS*
GUIDANCE ACTIVITIES *This section is dedicated to the analysis of the guidance activities implemented by each Educational Institutions to promote the study of Key Enabling Technologies towards young students.*

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3.2 *THE SAMPLE*

The survey sample is composed, in each of the three countries, of **at least 10 Educational institutions belonging to the 3°, 4° and 5° Educational Level (compared with the European Qualification Framework),** with technical-technological orientation (with study programs relating to subjects such as technology, IT, electronics, industry, biotechnology, energy, etc.).
The Educational institutions were selected through a public invitation to express interest in participating in the survey, taking into account not only the technical-technological orientation but also the location in different areas of each country.
The representatives involved were the Institute Managers, who are entrusted to bring out quantitative and qualitative data on research.
The **Training Institutes** taking part in the survey will then be invited to join the **new HISTEK transnational Cluster.**

3.3 *LIST OF SELECTED EDUCATIONAL INSTITUTIONS*

EDUCATIONAL INSTITUTION	WEB SITE
1. **I.I.S.S. Ferraris Molfetta (BA)**	www.ferrarismolfetta.gov.it
2. **I.I.S.S. Fiore Modugno (BA)**	www.iissfiore.gov.it
3. **I.I.S.S. Marconi/Hack - Bari**	www.marconibari.it
4. **I.I.S.S. Righi - Taranto**	www.righi.gov.it
5. **I.I.S.S. Sette - Santeramo in Colle (BA)**	www.iisspietrosette.it
6. **I.T.I.S. Jannuzzi - Andria (BT)**	www.itisandria.gov.it
7. **I.T.T. Altamura/Da Vinci – Foggia**	www.ittaltamuradavinci.gov.it
8. **I.I.S.S. Ferraris – Brindisi**	www.iissferrarisdemarcovalzani.edu.it
9. **I.T.T. Panetti – Bari**	www.panettipitagora.gov.it
10. **ITS A. Cuccovillo**	www.itsmeccatronicapuglia.it

List of schools selected

1. **I.I.S.S. "Galileo Ferraris"**, Molfetta (BA): 4 technical-technological addresses: Chemistry, Materials and Biotechnologies; Electronics and Electrotechnics; IT and Telecommunications; Mechanics, Mechatronics and Energy.
2. **I.I.S.S. "Tommaso Fiore"**, Modugno (BA): 2 technical-technological addresses: Administration, Finance and Marketing - Business information systems; Scientific High School Applied Sciences.
3. **I.I.S.S. "Marconi/Hack"**, Bari (BA): 3 technical-technological addresses Mechanics, Mechatronics and Energy; IT and Telecommunications; Graphics and Communication.

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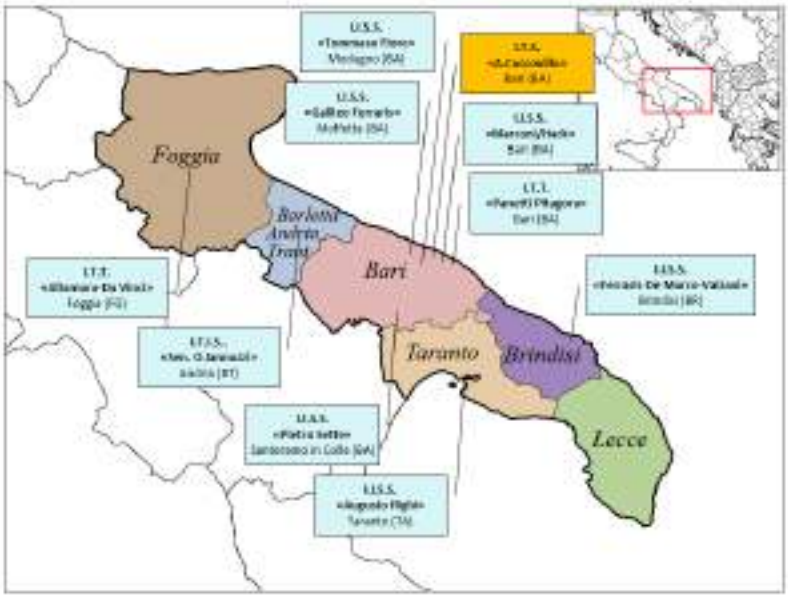
4. **I.I.S.S. "Augusto Righi",** Taranto (TA): 5 technical-technological addresses: Mechanics, Mechatronics and Energy; Electronics and Electrotechnics; Transportation and Logistics; IT and Telecommunications; Scientific high school Applied sciences.
5. **I.I.S.S. "Pietro Sette"**, Santeramo in Colle (BA): 4 technical addresses: Chemistry, Materials and Biotechnologies; Administration, Finance and Marketing - Business information systems ; Professional Institute of Industry and Crafts for Made in Italy; Professional Institute maintenance and technical assistance.
6. **I.T.I.S. "Sen. Onofrio Jannuzzi"**, Andria (BA): 3 technical-technological addresses: Mechanics, Mechatronics and Energy; Electronics and Electrotechnics, IT and Telecommunications.
7. **I.T.T. "Altamura – da Vinci"**, Foggia (FG): 5 Technical-technological addresses: Chemistry, Materials and Biotechnologies; Electronics and Electrotechnics; IT and Telecommunications; Mechanics, Mechatronics and Energy; Transportation and Logistics.
8. **I.I.S.S. "Ferraris-De Marco-Valzani"**, Brindisi (BR): 3 technical-technological addresses: Graphics and Communication; Professional Institute of Industry and Crafts for Made in Italy; Professional Institute maintenance and technical assistance.
9. **I.T.T. "Panetti Pitagora"**, Bari (BA): 4 Technical-technological addresses: Chemistry, Materials and Biotechnologies; Electronics and Electrotechnics; IT and Telecommunications; Buildings, environment and territory.
10. **ITS "A. Cuccovillo"**, Bari (BA): 4 Technical-technological addresses: Production, Automation, Energy, House System.

Fig.1 Geographical distribution of educational institutions



In relation to the category of expertise chosen, the sample identified includes technical and technological institutes, as evidenced by the stratification of the addresses of the selected schools.

Stratification by addresses

In relation to the category of expertise chosen, the sample identified includes technical and technological institutes, as evidenced by the stratification of the addresses of the selected schools.

The ten selected schools have a total of 33 addresses distributed as indicated in the following:

Number	*Address*	*Perc.%*
Nr. 6	IT and Telecommunications	18%
Nr. 5	Mechanics, Mechatronics and Energy	18%
Nr. 5	Electrotechnics and Electronics	15%
Nr. 4	Chemistry, Materials and Biotechnologies	12%
Nr. 2	Scientific High School - applied sciences	6%
Nr. 2	Business information systems	6%
Nr. 2	Graphics and Communication	6%
Nr. 2	Transportation and Logistics	6%
Nr. 2	Professional Industry and craftsmanship for Made in Italy	6%
Nr. 2	Professional Maintenance and technical assistance	6%
Nr. 1	Buildings, environment and territory	3%

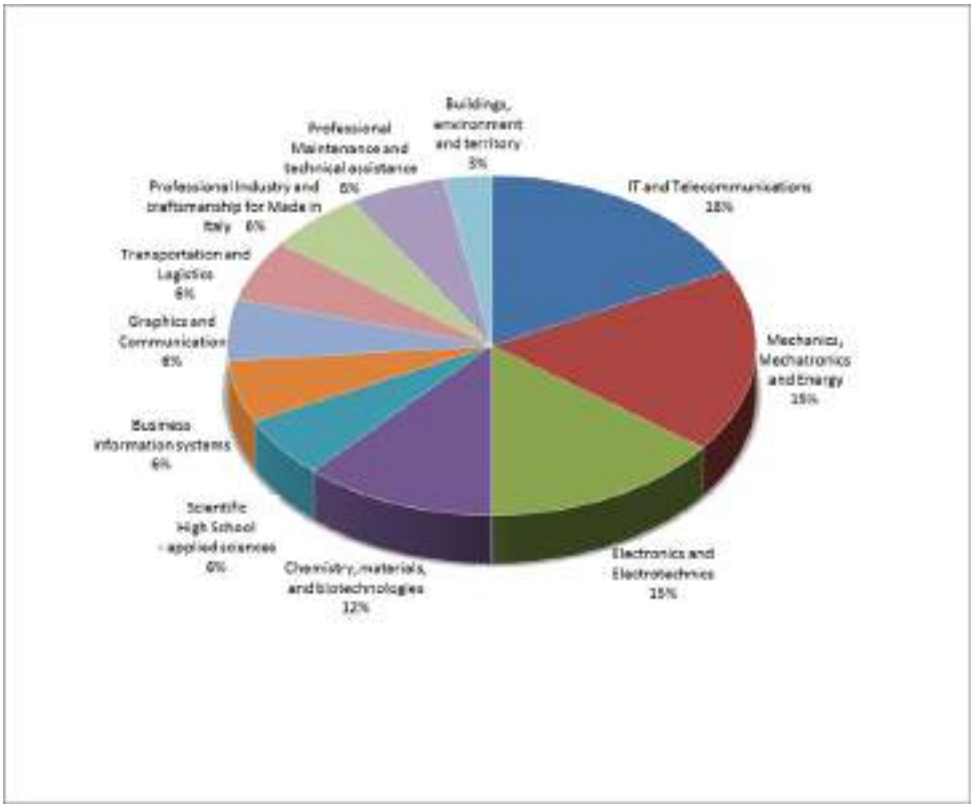


Figure 2 - Stratification by addresses

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The **10th Institute** that participated in the survey is the ITS Cuccovillo itself, as a qualified referent for the educational offer related to the 5th EQF level, with specific reference to the Mechanics-Mechatronics Area.

A first meeting with all the school managers was organized at ITS Cuccovillo to adequately present the initiative and share the objectives of the survey. The questionnaire was presented and commented on for each individual section. The task was then given to school managers to complete it within a certain deadline. All the educational institutes involved in the investigation process have really actively participated, producing the questionnaires filled out very punctually and with accurate indication of the data for each analysis section.

3.4 SURVEY RESEARCH METHODOLOGY

The survey aims to gather information from a sample of schools through the compilation of a questionnaire and the subsequent analysis of the collected data.

The survey use as research instrument, a structured, multiple choice questionnaire, that consists of a series of questions and other prompts for the purpose of gathering needed information from respondents.

The questionnaire is structured in four sections: 1.Educational Institutions data, 2.Context (material resources, professional resources and relations with companies), 3.Training offer (Transversal skills and technical skills), 4.Guidance activities aimed at young people. This structure is aimed to organize the data collection following a logical flow.

The target respondents are the representatives of institutes of the upper secondary school with technical-technological address from Puglia Region of Italy.

The sample consists of 9 Higher Secondary Education Institutes of the Puglia Region and 1 ITS. The selected institutes are representative of many of the provinces of the Puglia region, 5 Institutes are located in the province of Bari, 1 Institute in the province of Foggia, 1 in the province of Barletta-Andria-Trani, 1 in the province of Taranto and 1 in the province of Brindisi. The geographical distribution of the sample allows to have a more representative indication of all the various realities of the Region.

The questionnaire was sent by e-mail and was therefore completed autonomously by the designated representatives; this method was chosen to allow compilers to gather the various data to answer the questions of the various sections.

A guide was prepared to support compilers with the illustration of the project and the explanation of the purpose of the questionnaire and its articulation.

Before sending the questionnaire, it was organized a meeting with the schools to explain the project and describe how to fill the questionnaire.

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3.5 REFERENCE FOR SKILLS ON KEY EANBLING TECHNOLOGIES

For the identification of the skills connected with the Key Enabling Technologies, reference documents are the following:

- Year 2009 document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - Preparing our future: developing a common strategy for key enabling technologies in the EU

- Year 2012 document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - A European Strategy for Enabling Technologies - A Bridge to Growth and Jobs

- Year 2014 document on methodology, work plan and roadmap for crosscutting KETs activities in Horizon 2020 (RO-cKETs)

- Year 2014 document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS "Per una rinascita industriale europea"

- Year 2016 "SKILLS FOR KEY ENABLING TECHNOLOGIES IN EUROPE - Vision for the Development of Skills for Key Enabling Technologies (KETs)" European Commission document

- Year 2014 document, "THE PUGLIA DELLE KEY ENABLING TECHNOLOGIES" by ARTI Regional Agency for Technology and Innovation:

A list of quotes from these documents are listed in Annex C

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4. DATA ANALYSIS AND RESULTS

The categories of KETs competences defined in the document "Skills for Key Enabling Technologies in Europe - State-of-play, Supply and Demand, Strategy" were used to define the list of knowledge and skills to be analyzed for this survey. Recomendations and Sectoral Pilot ".

Individual KETs competence, Table 2.1, Pillar 3 Competitive Manufacturing:

Sez. 1.3 ICT skills; 1.4 Modelling and simulation; 1.5 Equipment handling skills; 1.6 Manufacturing (with an integration on specific contents related to innovative production technologies - Industry 4.0 and to innovative production processes) 2.1 Quality; 2.2 Risk & safety;

Attached the table that shows the correspondence between the skills of the document and the items of the questionnaire.

4.1 MATERIAL RESOURCES

The 10 institutes declared a total availability of 480 classrooms, the nine secondary schools have from 39 to 95 classrooms and the ITS have 8 classrooms. 406 classrooms (85% of total) are equipped with personal computer and internet connection.

A total of 64 computer laboratories are available, with an average ratio of 1 computer lab every 7 classrooms and a total of about 1,750 personal computers (desktop and laptop) The nine secondary schools have from 70 to 350 computers and the ITS have 40 computers.

All schools declare that have been made investments in the last 3 years about the IT laboratories; investments involved all the laboratories in 2 cases, a good part of the laboratories in 6 cases and a small part of the laboratories in 2 cases.

There are 15 language laboratories, with a distribution from 1 to 3 laboratories for each institute and about 125 technological laboratories about 33 different specializations, about 50% of which are dedicated to learning topics about electro technical automation, pneumatic, electronics , mechanics, mechatronics, machines, telecommunications, robotics, CAD / CAM, automated systems, systems and networks.

9 Institutes out of 10 stated that investments have been made on technological laboratories in the last 3 years, involving the total of the laboratories in 1 case (ITS Cuccovillo), a large part of the laboratories in 7 cases or a small part of the laboratories in 1 case.

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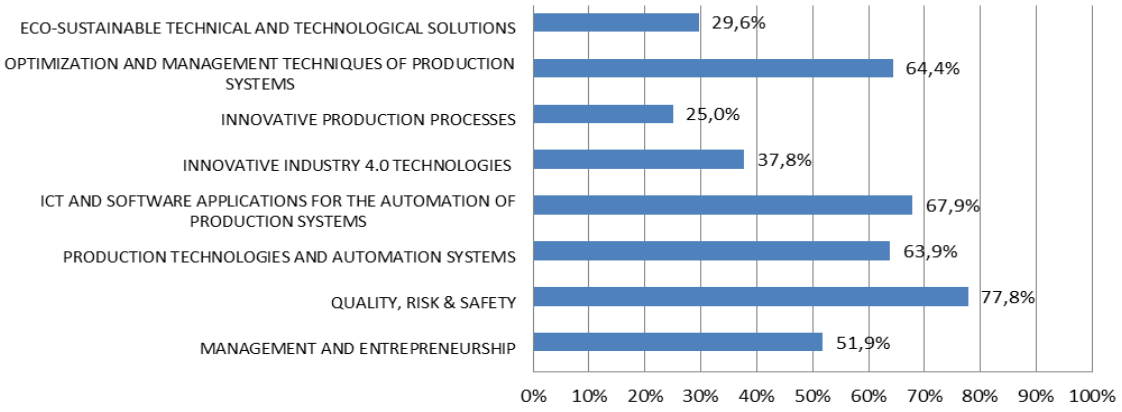
4.2 PROFESSIONAL RESOURCES

This section is aimed at evaluating the presence of teachers with specialization in the disciplines where the skills for the Key Enabling Technologies required by the companies are most concentrated.

The summary tables, shown in Annex B, show in numerical and percentage terms the means of the available professional resources for the various categories of competences.

The graph below shows in blue the coverage with respect to the total sample of schools surveyed

1. Knowledge Area (9 schools)



Percentage number of schools that indicate the availability of expert teachers in the categories of technical skills considered, the graph shows the situation for the 9 secondary schools without the ITS contribution.

The high percentage of coverage in the "Quality, risk management and security" category is highlighted, linked in particular to the coverage of 100% of institutions on the subject relating to safety, and to the category "ICT and software applications for system automation production".

The percentages in the intermediate segment of the areas "Management and entrepreneurship", "Technologies and automation systems for production", "Innovative technologies Industry 4.0" and "Techniques of optimization and management of production systems" are highlighted.

Lastly, the percentage of limited coverage in the "Innovative production processes" and "Eco-sustainable technical and technological solutions" areas is highlighted.

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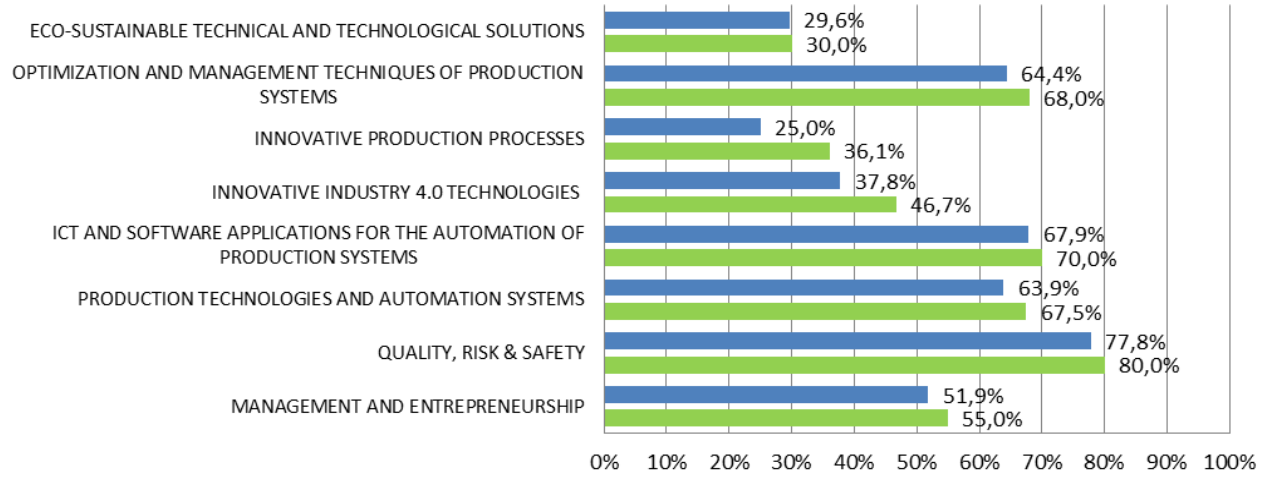
Considering the contribution of ITS, we can see in the chart below, in green, how the situation change

1. Knowledge Area (9 schools and ITS)

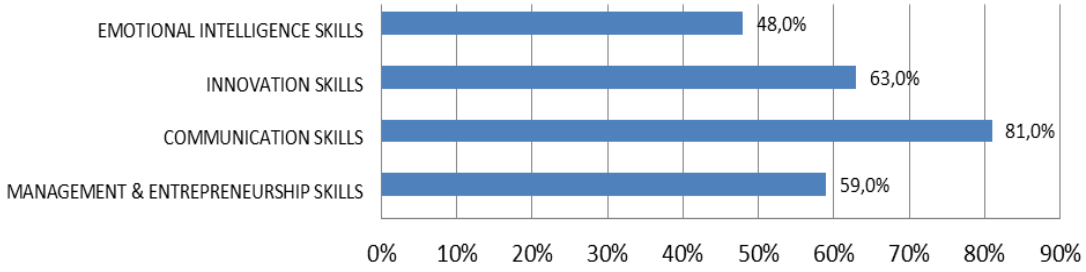


Percentage number of schools that indicate the availability of expert teachers in the categories of technical skills considered, the graph shows the situation for the 9 secondary schools (in blue) compared with the situation which also includes the contribution of ITS (in green).

We can observe that ITS contributes to enlarge the area of professional resources above all in the field of Innovative production process and Innovative Industry 4.0 technologies. Furthermore contrbutes to enlarge all the considered areas.

It is assessed whether in the course of curricular and extra-curricular activities, courses are planned or didactic methods / methodologies that support the development of specific skills are adopted

2. Behavioral skills Area (9 schools)



Percentage number of schools reporting the availability of expert teachers in the categories of transversal competences considered, the graph shows the situation for the 9 secondary schools without the contribution of ITS.

Regarding the area of behavioral skills, we highlight the high percentage of coverage in the "Communication skills" category, while on the other hand there are lower percentages in the areas "skills for management and entrepreneurship" and "skills for 'innovation', with a particularly reduced percentage in the area of emotional intelligence skills.

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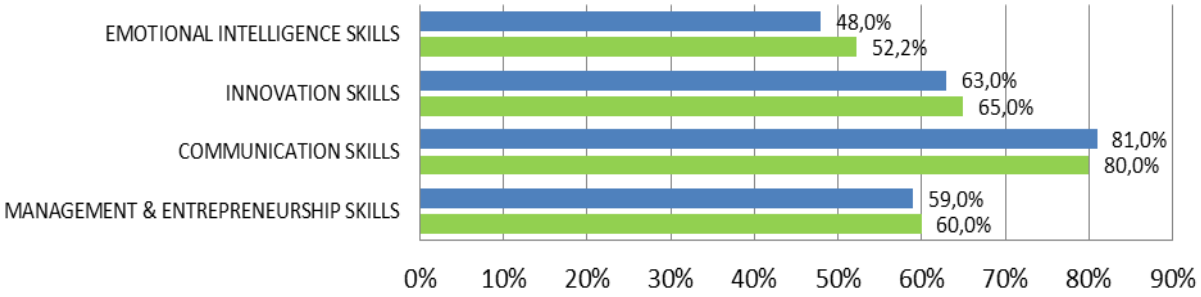
Considering the contribution of ITS Cuccovillo, we can see in the chart below how the situation change

2. Behavioral skills Area (9 schools and ITS)



Percentage number of schools that indicate the availability of expert teachers in the categories of transversal skills considered, the graph shows the situation for the 9 secondary schools (in blue) compared with the situation which also includes the ITS contribution (in green).

With regard to the teaching methodologies of technical-technological disciplines, all the institutes declare to use interactive and laboratory methodologies for a percentage of 25 to 50% of the total time in three cases and of more than 50% in 6 cases.

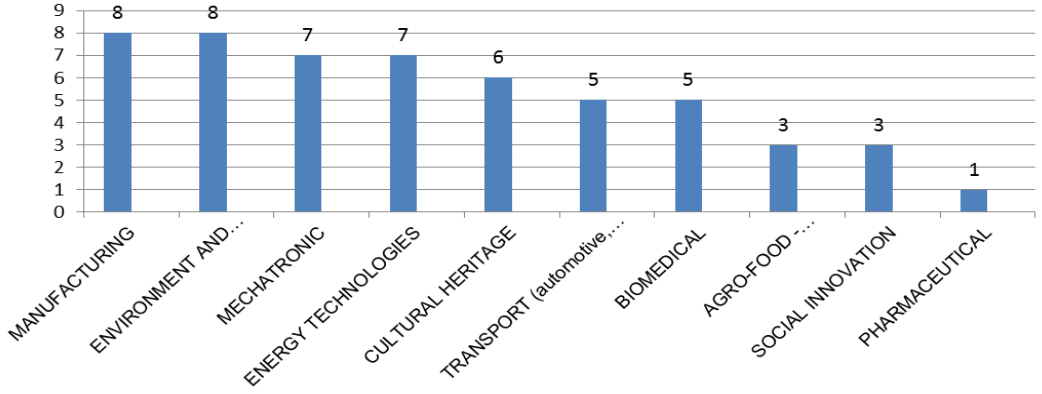
The average annual number of hours dedicated by the teachers to their update is equal to 35 hours with a range between 10 and 80 hours.

4.3 RELATIONS WITH COMPANIES

This section of the questionnaire aims at collecting indications to evaluate the degree of connection and the collaboration relationships between the schools and the SMEs of the various productive sectors. All schools declare to have agreements with SMEs (small and medium-sized enterprises) to realize school-work alternation activities and internships in the company

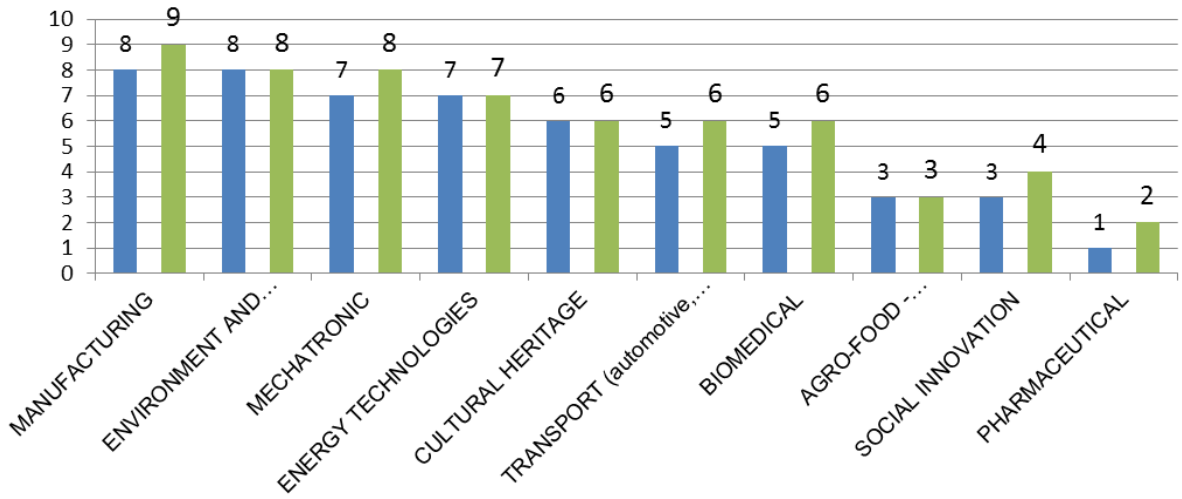
All schools have collaborations with companies that operate in various sectors of economic activity. The number of schools that have collaborations for each sector is shown below.

Fig.3 Nr. and sectors of collaboration with companies (9 schools)



Considering the contribution of ITS Cuccovillo, we can see in the chart below how the situation change, in 6 sectors increase the number of collaboration due to ITS contribution

Fig.4 Nr. and sectors of collaboration with companies (9 schools and ITS)



4.4 TRAINING OFFER: GAP EVALUTION

The schools were asked to indicate the duration in terms of teaching hours throughout the entire school curriculum for each discipline in order to evaluate in general terms the degree of study.Per le competenze trasversali sono state definite le fasce: 0 ore; 1-25 ore; 26-50 ore; oltre 50 ore.

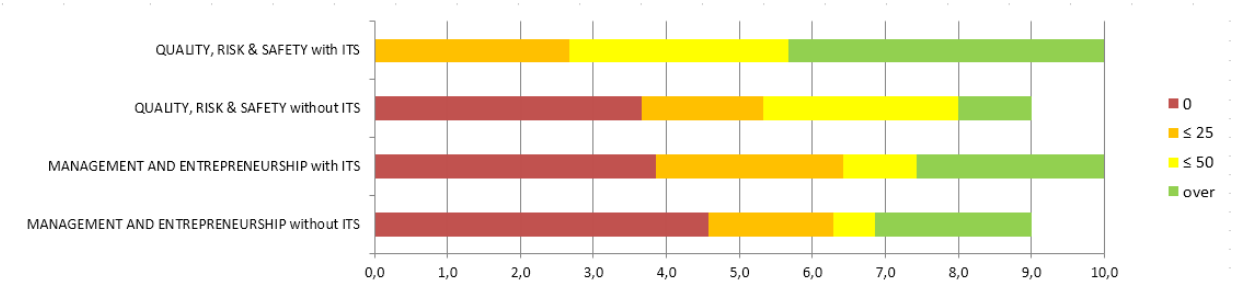
For the technical skills the bands have been defined: 0 hours; 1-50 hours; 51-100 hours; over 100 hours.

The parameter relative to the number of teaching hours was chosen as the first indicator of the importance given to the contents of the survey as part of the study program and the degree of in-depth study of the relevant lessons.

The contribution of the ITS in this case result in addition to the contribution of each school, because the student follow the ITS course path after have finished the secondary school path. In the table below, for each category of skills, the position is shown by the institutions in the various bands both without the ITS contribution and with the ITS contribution.

4.5 TRANSVERSAL SKILLS SECTION

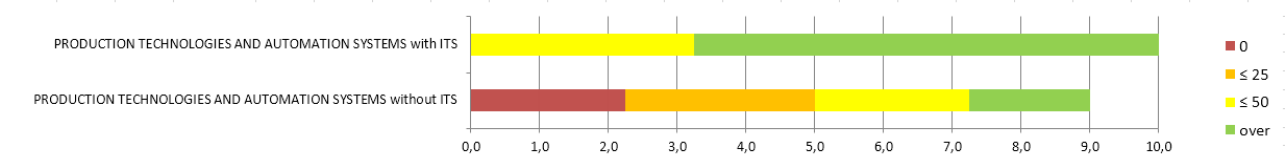
What is the average of the hours devoted to training these skills throughout the entire curriculum period? ≤ 25 - ≤ 50 - more



Subdivision of schools based on the number of hours dedicated to the categories of transversal competences considered, the chart compares the situation that results considering only 9 secondary schools, with the situation that results adding the hours foreseen by the ITS paths.

4.6 TECHNICAL SKILLS SECTION

What is the average of the hours devoted to training these skills throughout the entire curriculum period? ≤ 50 - ≤ 100 - more



Subdivision of schools based on the number of hours dedicated to the categories of technical skills considered, the chart compares the situation that results considering only 9 secondary schools, with the situation that results adding the hours foreseen by the ITS paths.

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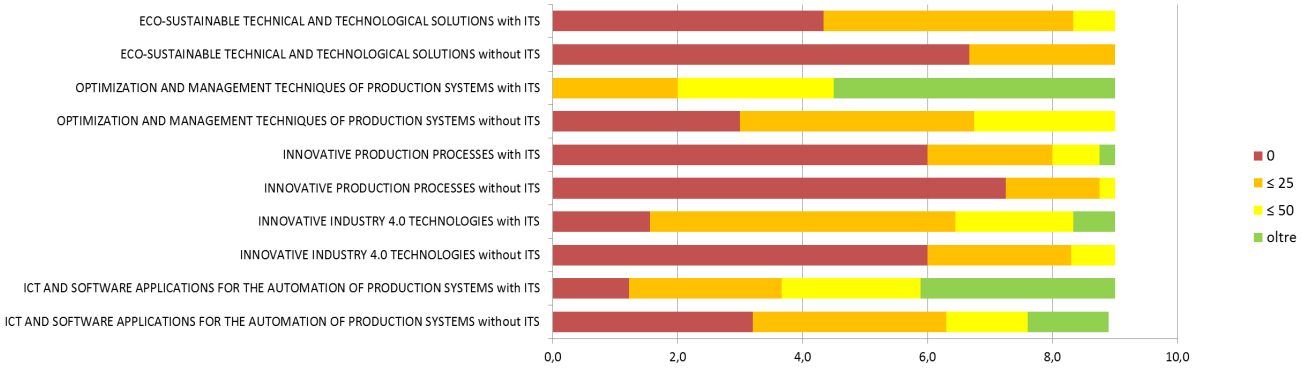
What is the average of the hours devoted to training these skills throughout the entire curriculum period? ≤ 50 - ≤ 100 - more



Considering the total score equal to 10 placements to be distributed in the 4 bands, the table allows to evaluate how on average the institutions are placed for each category of competences.
For the purposes of the survey, it is interesting both the data relative to where the majority of the institutions considered are placed and the degree of variability of the data.

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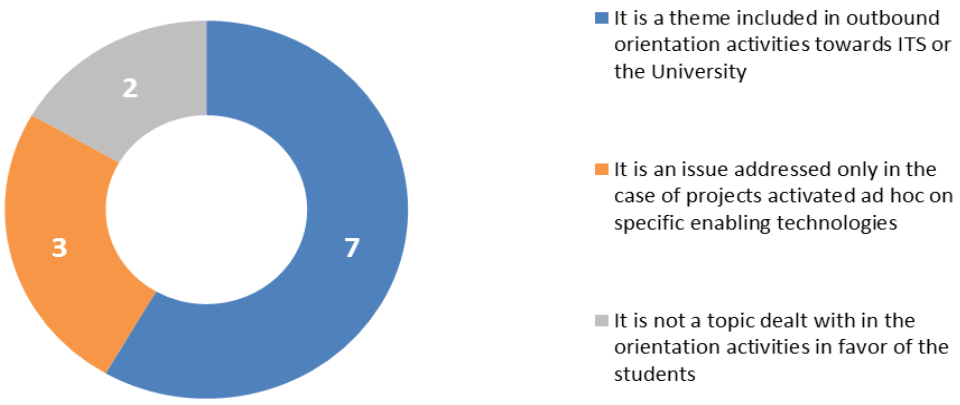
4.7 ORIENTATION

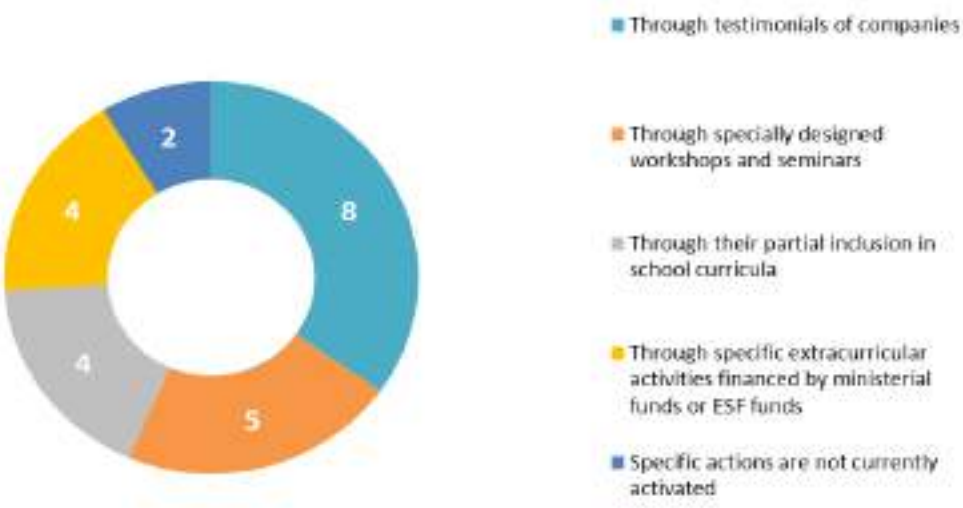
The questionnaire contains 4 questions aimed at evaluating the degree of participation of schools in the activities of guidance of young people towards technical and technological subjects and Key Enabling Technologies.

The first question aims to verify if specific study activities are carried out in the study programs on behalf of the students on the importance of Key Enabling Technologies.

The majority of the institutes (6 institutes) answer that this theme is included in the outbound orientation activities towards the ITS or the University; 3 Institutes indicate that this topic is only addressed in the case of projects activated ad hoc on specific enabling technologies; 2 Institutions report instead that this topic is not covered in the orientation activities for the students.



The second question asks which channels the Institute uses to promote for the students, the importance of Key Enabling Technologies. It is possible for each institution to provide more answers.



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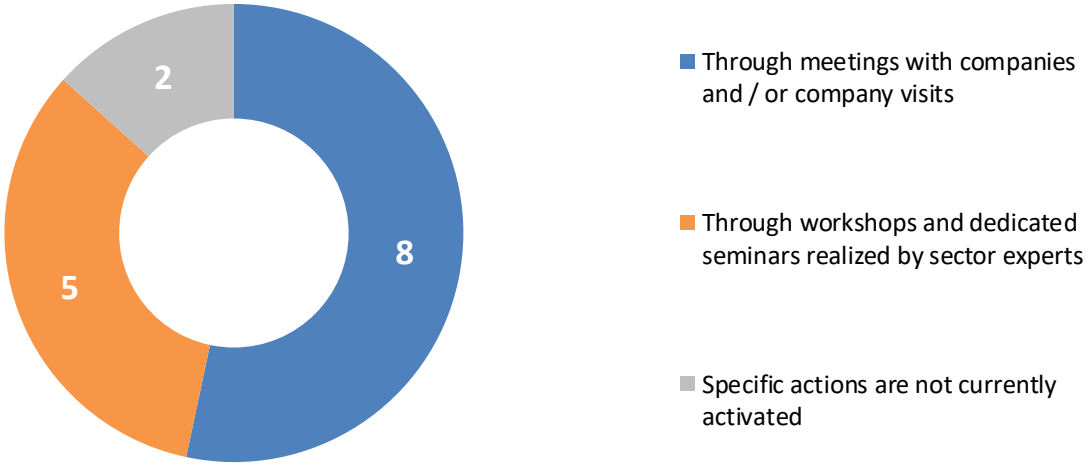
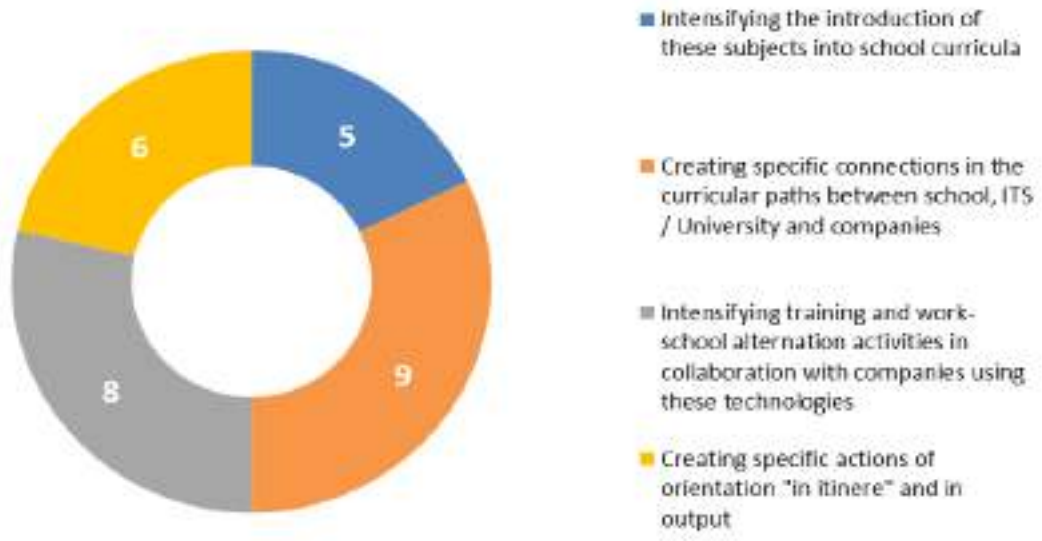
The third question asks through which modalities are presented to the students the possible career opportunities in the sectors that employ Key Enabling Technologies.



The fourth question asks through which actions is it possible, in your opinion, to make the study of Key Enabling Technologies more attractive for students?



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5. CONCLUSIONS

The sample is representative by geographical distribution, study path addresses, number of students compared to regional data.

The section on material resources has allowed us to have a picture of the equipment of the various institutes from which a good situation emerges in terms of locations, classrooms, laboratories, PCs.

The section on the availability of competent professional resources for the provision of contents concerning the various competences, grouped by categories, highlights: 1) a good coverage situation with regard to the more "traditional" skills such as "Quality, Risk and Safety" "Management of production systems", ICT and automatic systems "; 2) a situation of limited coverage with regard to the most innovative skills such as e.g. "Innovative process", "Innovative products", "Eco-sustainable".

The aggregated results with the ITS data highlight the expansion of the set of competences available, in particular precisely in the categories of the most innovative skills, thus integrating the set of skills already in the availability of secondary schools.

With regard to the section on teaching methods for the development of behavioral skills, we highlight the good coverage declared by secondary schools on communication skills, while managerial skills and emotional intelligence skills need to be better integrated.

As regards collaborations with companies, a good situation emerges which sees all schools making use of collaborations, with distribution in the various sectors, depending on the addresses of studies and the characteristics of the productive environment of the reference territory.

With regard to the section concerning the hours of training dedicated to specific competences on Key Enabling Technologies, the competency profile of a hypothetical representative group of the students leaving the schools involved in the survey was analyzed. From the example tables and charts, it emerges, due to the differences in the teachings of the competences considered in relation to the various addresses, a more or less marked inhomogeneity situation, in some cases with competences not considered by the study course and not covered with teaching hours.
Situations to be highlighted in this regard are related to the teaching on "Innovative Production processes" and "Innovative Industry 4.0 technologies and" Eco-sustainable technical and technological solutions".

These situations seems to improve considering the case in which the group leaving secondary schools then follows the two-year course of the ITS, thus adding up the hours spent in the secondary school paths, with those of the ITS course. In this case the data shows the general improvement of the coverage situation in the provision of the contents related to the various skills and in particular in the categories "Innovative Industry 4.0 technologies", "Optimization and management techniques of production systems" and also "ICT and software applications for the automation of production systems "

The section on orientation activities shows the remarkable activities carried out in this area that seems to represent an important initial element to activate a deepening of the comparison between scholastic institutions and the business world.

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ANNEX A

Skills for Key Enabling Technologies in Europe:

Extract from Table 2-1 KETs competences at the individual level and its connection to questionnaire Technical Skill sections

Skills for Key Enabling Technologies in Europe
State-of-play, Supply and Demand, Strategy ,
Recomendations and Sectoral Pilot

TABLE 2-1: KETs competences at the individual level	Pillar 3 Competitive Manufacturing	Questionnaire Technical Skills section (Advanced Production Technologies)	Technical Skill
1 TECHNICAL			
1.1 Technical background	**P**		
1. Chemistry	P		
2. Physics	P		
3. Engineering (incl. Systems Engineering)	P		
4. Electronics	P		
5. Biology	P		
6. Optics	P		
7. Photonics	P		
8. Computer science	P		
9. Nanoscience	P		
10. Materials	P		
11. Mathematics	P		
12. Statistics	P		
13. Metrology	P		
1.2 Design			
14. Design Methodology	P		
15. Operations Analysis			
16. Systems Analysis			
17. Computer-Aided Design (CAD)			
18. Multidisciplinary design optimisation			
19. Process Layout & Optimisation	P		
20. Life-cycle analysis			
21. Scalability analysis			
1.3 ICT skills	**P**		
22. Computer skills	P	ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS	Web platform for sharing, participation and services
			ICT technologies for services integration
			Communication standards and device interoperability
23. Programming	P	ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS	Programming&Languages
			Design and development of Web Applications
		INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES	Big Data e Analytics
24. Computational thinking	P	ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS	Cloud-based applications
1.4 Modelling and simulation			
25. Mathematical modelling and simulation			
26. Computer-Aided Engineering (CAE)			
27. Non-destructive testing			
28. Real-time modelling and simulations			
1.5 Equipment handling skills	**P**		
29. Equipment Selection	P	OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS	Production management and control systems
30. Installation	P		Production management and control systems
31. Equipment running skills	P		Production management and control systems
32. Operation Monitoring	P		Production management and control systems
33. Troubleshooting skills	P	ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS	Web-based Control e Workeforce Automation
34. Maintenance, Repair and Overhaul (MRO)	P		Web based maintenance technologies

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1.6 Manufacturing	**P**		
35. Process improvement tools	P	OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS	Optimization of production processes
36. Computer-Aided Manufacturing (CAM)	P	ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS	Software for the automation of production systems
		INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES	Virtual and augmented reality
			Technologies for simulation and testing
37. Systems Evaluation	P	OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS	Optimization of production processes
38. Standard Operating Procedures (SOP)	P	OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS	Optimization of production processes
39. Product labelling and packaging	P	ECO-SUSTAINABLE TECHNICAL AND TECNOLOGICAL SOLUTIONS	Eco-sustainable Packaging
40. Top-down fabrication techniques	P		
41. Bottom-up fabrication techniques/Synthesis	P		
42. Micro-assembly	P		
43. Macro-assembly	P	PRODUCTION TECHNOLOGIES AND AUTOMATION SYSTEMS	Robotics
			Sistems for automation and Industrial communication
			Innovative Production technologies
			Flexible Production systems
43B Innovative production technologies (Industry 4.0)*		INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES	Sensors and Intelligent systems
			IoT & Machine Interaction
			RFID technologies (Radio Frequency IDentification)
			Machine Interface Technologies
			Communication technology for Industry 4.0
			Advanced process technologies based on Engineering
		ECO-SUSTAINABLE TECHNICAL AND TECNOLOGICAL SOLUTIONS	Technologies for the efficiancy of production processes
43C Innovative Production process*		INNOVATIVE PRODUCTION PROCESSES	Additive manufacturing
			Plasma processes
			Hot forming
			Forming and polimerization of laminates in composite
		ECO-SUSTAINABLE TECHNICAL AND TECNOLOGICAL SOLUTIONS	Cutting edge eco-sustainable technical and tecnological solutions
1.7 Diverse other technical competences	**P**		
44. Systems integration	P		
45. Characterisation and analysis	P		
46. General Lab Skills	P		
47. Specific Lab Skills	P		

2 QUALITY, RISK & SAFETY			
2.1 Quality	**P**		
48. Quality management	P	QUALITY, RISK & SAFETY	Quality Management
49. Computer-Aided Quality Assurance (CAQ)	P		Quality Management
50. Quality Control Analysis	P		Quality Management
2.2 Risk & safety	**P**		
51. Risk Assessment	P	QUALITY, RISK & SAFETY	Risk Management
52. Working conditions/ Health and safety	P		Health and Safety
53. Emergency Management and Response	P		Health and Safety
54. Industrial Hygiene	P		Health and Safety
55. Equipment Safety	P		Health and Safety
56. Ethics	P		
3 MANAGEMENT & ENTREPRENEURSHIP			
3.1 Business development	**P**		
57. Strategic analysis	P		
58. Technology strategy	P		
59. New Product and Process Development	P		
60. Marketing	P	TRASVERSAL SKILLS	Marketing
61. Customer Focus	P	MANAGEMENT AND ENTREPENEURSHIP SKILLS	Customer focus
3.2 Operational management	**P**		
62. Project Management	P	TRASVERSAL SKILLS	Project Management
63. Time Management	P	TRASVERSAL SKILLS	Time Management
64. Teamwork skills	P	MANAGEMENT AND ENTREPENEURSHIP SKILLS	Team working
65. Coaching & Developing	P		
66. Delegation skills	P		
67. Monitoring	P		
68. Risk Management	P	QUALITY, RISK & SAFETY	Risk Management
69. Management of Personnel Resources	P		
70. Management of Financial Resources	P		
71. Supply chain management	P	OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS	Logistic management of advanced supply chains
72. Cost modelling skills	P	TRASVERSAL SKILLS	Cost modelling skills
73. Generation of shop floor work instructions	P	OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS	Organization and management of production systems
74. Procurement skills	P		
3.3 Entrepreneurship	**P**		
75. Deal negotiation skills	P	MANAGEMENT AND ENTREPENEURSHIP SKILLS	Negotiation
76. Acquisition of funding	P	TRASVERSAL SKILLS	Fund raising
78. Intellectual Property (IP) management	P		Intellectual Property (IP) management
79. International regulatory affairs	P		Internazional regulatory affairs

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4 COMMUNICATION			
80. Interpersonal skills	P	COMMUNICATION SKILLS	Interpersonal skills
81. Verbal communication	P		Verbal communication
82. Written communication	P		Written communication
83. Presentation skills	P		Presentation skills
84. Public communication	P		Public communication
85. Virtual collaboration	P		Virtual collaboration
5 INNOVATION			
86. Integration skills	P	INNOVATION SKILLS	Integration skills
87. Design mind-set	P		Design mind-set
88. Continuous experimentation	P		Continuous experimentation
89. Complex Problem Solving	P		Complex Problem Solving
90. Creativity	P		Creativity
91. Systems thinking	P		Systems thinking
6 EMOTIONAL INTELLIGENCE			
6.1 Self-management			
92. Persistence	P		
93. Passion, enthusiasm and curiosity	P		
94. Sense of responsibility	P		
95. Stress tolerance	P	EMOTIONAL INTELLIGENCE SKILLS	Stress tolerance
96. Attention to detail	P		
97. Adaptability	P		Adaptability
98. Ability to thrive on failures	P		Ability to learn from failures
99. Balancing life and work demands	P		
100. Self-discipline	P		
101. Self-control	P		
102. Proactivity	P		Proactivity
103. Continuous improvement orientation	P		Continuous improvement orientation
104. Active Learning	P		
105. Alertness	P		
106. Judgment and decision making	P		Decision making
6.2 Social skills			
107. Friendliness/Being respectful of others	P		
108. Leadership	P	EMOTIONAL INTELLIGENCE SKILLS	Leadership
109. Integrity	P		
110. Cooperation	P		Cooperation
111. Multi-cultural/global orientation	P		Multi-cultural/global orientation

***** Not present in the original table, added by project team

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ANNEX B

KNOWLEDGE AREA A. Presence of teachers with specialization in the following categories of subjects: YES / NO	Number of professional resources with ITS*	Number of professional resources without ITS*	% of coverage in the teaching of the discipline with ITS	% of coverage in the teaching of the discipline without ITS
MANAGEMENT AND ENTREPRENEURSHIP	5,50	4,67	55,0%	51,9%
QUALITY, RISK & SAFETY	8,00	7,00	80,0%	77,8%
PRODUCTION TECHNOLOGIES AND AUTOMATION SYSTEMS	6,75	5,75	67,5%	63,9%
ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS	7,00	6,11	70,0%	67,9%
INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES	4,67	3,40	46,7%	37,8%
INNOVATIVE PRODUCTION PROCESSES	3,25	2,25	36,1%	25,0%
OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS	6,50	5,80	68,0%	64,4%
ECO-SUSTAINABLE TECHNICAL AND TECHNOLOGICAL SOLUTIONS	3,00	2,67	30,0%	29,6%

AREA OF BEHAVIORAL SKILLS During the curricular and extra-curricular activities, are courses planned or teaching methods adopted for supporting the development of the following skills? YES / NO	Number of professional resources with ITS*	Number of professional resources without ITS*	% of coverage in the teaching of the discipline with ITS	% of coverage in the teaching of the discipline without ITS
MANAGEMENT & ENTREPRENEURSHIP SKILLS	6,00	5,33	60,0%	59,3%
COMMUNICATION SKILLS	8,00	7,33	80,0%	81,5%
INNOVATION SKILLS	6,50	5,67	65,0%	63,0%
EMOTIONAL INTELLIGENCE SKILLS	5,22	4,33	52,2%	48,1%

B. Presence of collaborations with SMEs operating in the following sectors: YES / NO	with ITS	without ITS
MANUFACTURING	9	8
ENVIRONMENT AND TERRITORY	8	8
MECHATRONIC	8	7
ENERGY TECHNOLOGIES	7	7
CULTURAL HERITAGE	6	6
TRANSPORT (automotive, railway, naval, aeronautical sectors)	6	5
BIOMEDICAL	6	5
AGRO-FOOD - AGROINDUSTRY	3	3
SOCIAL INNOVATION	4	3
PHARMACEUTICAL	2	1

TRAINING OFFER

1. TRANSVERSAL SKILLS SECTION In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills? YES / NO				
If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period? ≤ 25 - ≤ 50 - over	0	≤ 25	≤ 50	over
MANAGEMENT AND ENTREPRENEURSHIP without ITS	4,4	1,7	0,6	2,1
MANAGEMENT AND ENTREPRENEURSHIP with ITS	3,1	2,1	1,0	2,6
QUALITY, RISK & SAFETY without ITS	3,7	1,7	2,7	1,0
QUALITY, RISK & SAFETY with ITS	0,0	2,0	2,7	4,3

2. TECHNICAL SKILLS SECTION In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills? YES / NO				
If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period? ≤ 25 - ≤ 50 - over	0	≤ 25	≤ 50	oltre
PRODUCTION TECHNOLOGIES AND AUTOMATION SYSTEMS without ITS	2,3	2,8	2,3	1,8
PRODUCTION TECHNOLOGIES AND AUTOMATION SYSTEMS with ITS	0,0	0,0	2,5	6,5

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2. TECHNICAL SKILLS SECTION				
In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills? YES / NO				
If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period? ≤ 50 - ≤ 100 - over	0	≤ 50	≤ 100	oltre
ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS withou	3,1	3,1	1,3	1,3
ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS with IT	1,2	2,4	2,2	3,1
INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES without ITS	6,0	2,3	0,7	0,0
INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES with ITS	1,6	4,9	1,9	0,7
INNOVATIVE PRODUCTION PROCESSES without ITS	7,0	1,5	0,3	0,0
INNOVATIVE PRODUCTION PROCESSES with ITS	5,8	2,0	0,8	0,3
OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS without ITS	3,0	3,8	2,3	0,0
OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS with ITS	0,0	2,0	2,5	4,5
ECO-SUSTAINABLE TECHNICAL AND TECHNOLOGICAL SOLUTIONS without ITS	6,3	2,3	0,0	0,0
ECO-SUSTAINABLE TECHNICAL AND TECHNOLOGICAL SOLUTIONS with ITS	4,0	4,0	0,7	0,0

GUIDANCE ACTIVITIES

Q1.1 During the study course is a specific guidance activity carried out in favor of the students to show the importance of Key Enabling Technologies?

RESPONSES	N. indications
It is a theme included in outbound orientation activities towards ITS or the University	7
It is an issue addressed only in the case of projects activated ad hoc on specific enabling technologies	3
It is not a topic dealt with in the orientation activities in favor of the students	2

Q1.2 Through which channels does your Institution promote the importance of Key Enabling Technologies towards students?

RESPONSES	N. indications
Through testimonials of companies	8
Through specially designed workshops and seminars	5
Through their partial inclusion in school curricula	4
Through specific extracurricular activities financed by ministerial funds or ESF funds	4
Specific actions are not currently activated	2

Q1.3 How are possible career opportunities in sectors that use Key Enabling Technologies shown to the students?

RESPONSES	N. indications
Through meetings with companies and / or company visits	8
Through workshops and dedicated seminars realized by sector experts	5
Specific actions are not currently activated	2

Q1.4 Through what actions is it possible, in your opinion, to make Key Enabling Technologies more attractive to students?

RESPONSES	N. indications
Intensifying the introduction of these subjects into school curricula	5
Creating specific connections in the curricular paths between school, ITS / University and companies	9
Intensifying training and work-school alternation activities in collaboration with companies using these technologies	8
Creating specific actions of orientation "in itinere" and in output	6

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ANNEX C

- **Year 2009:** Communication from the Commission to the European Parliament, the Council, the European Economic and Social committee and the Committee of the Regions **Preparing our future: developing a common strategy for key enabling technologies in the EU** SEC(2009) 1257

2. IDENTIFYING KEY ENABLING TECHNOLOGIES *"Based on current global research and market trends the following could be regarded as the most strategically relevant KETs, ..: Nanotechnology, micro and nanoelectronics, including semiconductors, photonics, advanced materials, Biotechnology; ... In the supply chain of KETs, advanced manufacturing systems are important to produce high value marketable knowledge-based goods and the related services (e.g. modern robotics)."*

4. FOSTERING KEY ENABLING TECHNOLOGIES IN THE EU *".. For an effective industrial deployment of KETs the following policy areas need to be addressed: 4.10. Skills, higher education and training: Attention must be paid to the upgrading of skills and to developing adequate skills strategies to provide appropriate vocational training in response to labour market needs.*

- Year 2012: Communication from the Commission to the European Parliament, the Council, the European Economic and Social committee and the Committee of the Regions: **A European Strategy for Enabling Technologies - A Bridge to Growth and Jobs:**

"..The Commission defines enabling technologies as "knowledge-intensive" technologies associated with high R & D intensity, rapid innovation cycles, substantial investment costs and highly skilled jobs ... Based on current research, analysis of market trends and their contribution to the solution of social issues, micro /nanoelectronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced production technologies (considered "horizontal" technologies) have been identified as EU enabling technologies."

- Year 2014 document on methodology, work plan and roadmap for crosscutting KETs activities in Horizon 2020 (RO-cKETs):

".. On 26 June 2012, the European Commission tabled its strategy to boost the industrial production of innovative products , based on current research, economics analysts of market trends and their contribution to solving societal challenges, micro and nano electronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced manufacturing systems (the latter recognized as a KET) have been identified as the EU's Key Enabling Technologies."

- Year 2014 COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS "For a European industrial rebirth"

"..The need to accelerate investments in cutting-edge technologies in Rapidly growing sectors are the main reason behind the Commission's decision to identify the six sectors in which the investments are to be encouraged in the 2012 Industrial Policy Communication. These strategic cross-cutting sectors are: advanced manufacturing processes, key enabling technologies, clean vehicles and transport, bioproducts, sustainable construction and raw materials as well as smart grids."

- Year 2016 document on Skills for Key Enabling Technologies in Europe:

"..KETs have been defined by the European Commission as knowledge intensive technologies associated with high R & D intensity, rapid innovation cycles, high capital expenditure and highly skilled employment. KETs enable process, goods and service innovation in the economy and are of systemic relevance. KETs currently includes the following six areas of technology: micro- / nanoelectronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced manufacturing technologies ...

Analysis of skill requirements for KETs

KETs rely on a balance of both technical and non-technical competences.

Technical competences can be considered the 'heaviest' category in terms of required knowledge and skills due to the knowledge-intensive nature of KETs.

Other relevant but non-technical competences include quality, risk & safety; management & entrepreneurship; communication; innovation and emotional intelligence.

Sez. Key sources of KETs-related skills: "..The type of people needed for KETs also differs depending on the pillars of the KETs innovation trajectory. Our analysis suggests that degrees highly demanded by employers generally include Master's and Bachelor's (or similar), with an important role also for PhDs within the Technological Research pillar, and a clear need for people with vocational education for Competitive Manufacturing pillar", "..Pillar 3 (Competitive Manufacturing) often heavily relies on middle-skilled people (vocational training/short-cycle tertiary education)."

Six categories of KETs competences After developing an initial compilation of KETs competences and clustering them based on their relationship patterns, the following six categories of competences were identified: Technical (1.1 Technical background, 1.2 Design, 1.3 ICT skills, 1.4 Modelling and simulation, 1.5 Equipment handling skills, 1.6 Manufacturing, 1.7 Diverse other technical competences) Quality, risk & safety (2.1 Quality, 2.2 Risk & safety), Management & entrepreneurship (3.1 Business development, 3.2 Operational management, 3.3 Entrepreneurship) Communication: Innovation, Emotional intelligence (6.1 Self-management, 6.2 Social skills).

Annex A: Core KETs competences, knowledge and skills

- Year 2014 document, "THE PUGLIA DELLE KEY ENABLING TECHNOLOGIES" by ARTI Regional Agency for Technology and Innovation:

- *"..In the ket advanced production technologies have participated 44 companies of which 6 spin off. It is KET that records the largest number of companies. "*
- *Impact of technological trajectories In advanced production technologies, the application sectors impacted by the technological trajectories declared by the participants are the following:*
- *The KETs were linked to the 3 areas of innovation identified in the Smart Specialization Strategy document of the Puglia Region11 (S3): • Sustainable Manufacturing • Human and Environmental Health • Digital, creative and inclusive communitiesSez. KET 6 TECNOLOGIE DI PRODUZIONE AVANZATA, Impatto delle traiettorie tecnologiche, "I settori applicativi su cui impattano le traiettorie tecnologiche dichiarate dai soggetti partecipanti sono i seguenti": aerospaziale/aeronautica, agroalimentare/agroindustria, ambiente e territorio, beni culturali, diagnostica biomedicale, manifatturiero, meccatronica, social innovation, tecnologia per l'energia, terapie innovative e farmaceutiche, trasporti (automotive, ferroviario e navale).*

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DATA COLLECTED

	1	2	3	4	5	6	7	8	9	10
Indirizzi specialistici a carattere tecnico-tecnologico presenti nell'istituzione scolastica:										
TECNICO	**BIOTECNOLOGIE AMBIENTALI**	**ELETTRONICA, ELETTROTECNICA ED AUTOMAZIONE**	**INFORMATICA E TELECOMUNICAZIONI**	**MECCANICA, MECCATRONICA ED ENERGIA**	**SISTEMI INFORMATIVI AZIENDALI**	**LICEO SCIENTIFICO SCIENZE APPLICATE**	**TRASPORTI E LOGISTICA**	**CHIMICA, MATERIALI E BIOTECNOLOGIA**	**TECNICO TECNOLOGICO (GRAFICA - COMUNICAZIONE)**	**COSTRUZIONI, AMBIENTE E TERRITORIO**
I.I.S.S. Ferraris Molfetta (BA)	X	X	X	X						
I.I.S.S. Fiore Modugno (BA)					X	X				
I.I.S.S. Marconi/Hack - Bari			X	X					X	
I.I.S.S. Righi - Taranto		X	X	X		X	X			
I.I.S.S. Sette - Santeramo in Colle (BA)					X			X		
I.T.I.S. Jannuzzi - Andria (BT)		X	X	X						
I.T.T. Altamura/Da Vinci - Foggia		X	X	X			X	X		
I.I.S.S. Ferraris - Brindisi									X	
I.T.T. Panetti - Bari		X	X					X		X
ITS A. Cuccovillo - Bari				X						
Totale	**1**	**5**	**6**	**6**	**2**	**2**	**2**	**3**	**2**	**1**
PROFESSIONALE	**MANUTENZIONE E ASSISTENZA TECNICA**	**INDUSTRIA ED ARTIGIANATO PER IL MADE IN ITALY**								
I.I.S.S. Sette - Santeramo in Colle (BA)	X	X								
I.I.S.S. Ferraris - Brindisi	X	X								
Totale	**2**	**2**								

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	1	2	3	4	5	6	7	8	9	10
	CHIMICA.BIOTECN ELETTR.AUTOM INFORM.TEL MECC.MECCATR.	LICEO SCIENT. SIST.INFORM.	INFORM.TEL. MECC.MECCATR.	ELETTR.AUTOM INFORM.TEL. MECC.MECCATR. LICEO SCIENT. TRASP.LOGIST.	LICEO SCIENT. CHIMICA, BIOTECN	ELETTR.AUTOM INFORM.TEL. MECC.MECCATR.	ELETTR.AUTOM INFORM.TEL. MECC.MECCATR.	TECNICO (GRAFICA COMUNICAZIONE)	ELETTR.AUTOM INFORM.TEL. CHIMICA, BIOTECN COSTRUZIONI	MECC. MECCA
1. Risorse materiali	I.I.S.S. Ferraris Molfetta (BA)	I.I.S.S. Fiore Modugno (BA)	I.I.S.S. Marconi/Hack - Bari	I.I.S.S. Righi - Taranto	I.I.S.S. Sette - Santeramo in Colle (BA)	I.T.I.S. Jannuzzi - Andria (BT)	I.T.T. Altamura/Da Vinci - Foggia	I.I.S.S. Ferraris - Brindisi	I.T.T. Panetti - Bari	ITS A. Cuccovillo - Bari
A. Numero di sedi di cui la scuola è composta (compresi edifici separati)	2	3	1	2	2	1	2	3	2	2
B. Numero di aule utilizzate per la normale attività didattica	50	41	52	95	47	39	66	42	40	8
C. Numero di aule didattiche con connessione a internet e PC	50	41	17	95	47	0	66	42	40	8
D. Numero di computer (fissi e portatili) a disposizione degli studenti	350	100	210	240	100	250	180	70	210	40
E. Numero di aule adibite a laboratori informatici	8	7	7	12	2	6	10	6	4	2
	16%	17%	13%	13%	4%	15%	15%	14%	10%	25%
E.1 Sono stati realizzati investimenti sui laboratori informatici negli ultimi 3 anni?	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI
E.2 Se si, tali investimenti hanno rinnovato:										
Tutti i laboratori tecnologici informatici			X							X
Una buona parte dei laboratori tecnologici informatici	X	X		X	X	X		X		
Una piccola parte dei laboratori tecnologici informatici							X		X	
F. Numero di aule adibite a laboratori linguistici	2	1	1	2	2	1	2	3	1	0
G. Numero di laboratori tecnologici (sia fissi che mobili) disponibili	5	0	16	20	12	13	27	13	14	5
G1. Specificare tipologie e numero di laboratori tecnologici disponibili:										
Laboratorio meccanica, pneumatica, meccatronica	1					6		4		
Laboratorio robotica	1					1				
Laboratorio PLC										1
Laboratorio Industria 4.0										1
Laboratorio di sistemi e reti	1									
Laboratorio di elettronica, elettrotecnica e sistemi elettrici;	1			5		2	2	2	2	1
Laboratorio di TPSE e telecomunicazioni;	1						2			
Disegno, Disegno elettrico e CAD			3				2		4	
Elettrica								1		
Elettronica			1						2	
Meccanica			6				2			
Grafica e comunicazione			1					1		
Chimica e biologia			3			1	7	1	4	
Fisica			2			1	2	1	3	
Tecnologico, macchine a fluido, sistemi ed automazione				3			1			
Officina meccanica, laboratori CAD/CAM				2						
Laboratorio per montatore aeronautico								1		
Galleria del vento e costruzioni aeronautiche				2			2			
Informatica				7		3	6			
Laboratori scientifici					6					
Laboratori tecnologici					5					
Laboratorio multidisciplinare					1		3			2
Laboratorio scienze							2		1	
Sistemi informatici ed elettronici							1			
Navigazione aerea							1			
Sistemi automatici							1			
Energie alternative							1			
Termotecnica							1			
Macchine termiche							1			
Macchine idrauliche							1			
Laboratorio costruzioni									1	
Modellismo									1	
Topografia									1	
G2. Sono stati realizzati investimenti sui laboratori tecnologici negli ultimi 3 anni?	SI		SI	SI	SI	SI	SI	SI	SI	SI
G.2 Se si, tali investimenti hanno rinnovato:										
Tutti i laboratori tecnologici										X
Una buona parte dei laboratori tecnologici	X		X	X	X	X		X	X	
Una piccola parte dei laboratori tecnologici							X			

2. Risorse professionali	1	2	3	4	5	6	7	8	9	10	ELABORAZIONI	
(AREA CONOSCENZE) A. Presenza di docenti con specializzazione nelle seguenti categorie di discipline: SI / NO	I.I.S.S. Ferraris Molfetta (BA)	I.I.S.S. Fiore Modugno (BA)	I.I.S.S. Marconi/Hack - Bari	I.I.S.S. Righi - Taranto	I.I.S.S. Sette - Santeramo in Colle (BA)	I.T.I.S. Jannuzzi - Andria (BT)	I.T.T. Altamura/Da Vinci - Foggia	I.I.S.S. Ferraris - Brindisi	I.T.T. Panetti - Bari	ITS A. Cuccovillo - Bari	numero di risorse professionali su 9	% di copertura nell'insegnam. della disciplina
MANAGEMENT ED IMPRENDITORIALITÀ											5,50	55%
§ Marketing		X	X		X	X	X	X	X	X	8	80%
§ Project Management	X		X		X	X	X	X		X	7	70%
§ Modellizzazione dei costi (budgeting e controllo di gestione)		X				X	X	X		X	5	50%
§ Fund raising (Acquisizione di finanziamenti)		X				X	X				3	30%
§ Gestione della proprietà intellettuale		X	X			X	X			X	5	50%
§ Internazionalizzazione		X		X		X	X			X	5	50%
QUALITA', GESTIONE DEL RISCHIO E SICUREZZA											8,00	80%
§ Quality Management		X	X	X		X	X	X		X	7	70%
§ Risk Management		X	X	X		X	X	X		X	7	70%
§ Sicurezza ed igiene nei luoghi di lavoro	X	X	X	X	X	X	X	X	X	X	10	100%
TECNOLOGIE E SISTEMI DI AUTOMAZIONE PER LA PRODUZIONE											6,75	68%
§ Robotica	X		X	X	X	X	X	X	X	X	9	90%
§ Sistemi per l'automazione e la comunicazione industriale	X	X	X	X	X	X	X	X		X	9	90%
§ Tecnologie di produzione avanzate			X	X		X	X			X	5	50%
§ Sistemi flessibili per la produzione			X	X		X				X	4	40%
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI											7,00	70%
§ Programmazione linguaggi	X	X	X	X	X	X	X	X	X	X	10	100%
§ Progettazione e sviluppo di applicazioni Web	X	X	X	X	X	X	X	X	X		9	90%
§ Software per l'automazione di sistemi produttivi		X	X	X	X	X	X			X	7	70%
§ Piattaforme web per la condivisione, partecipazione e servizi	X	X	X	X	X	X	X	X		X	9	90%
§ Tecnologie web based per la manutenzione		X	X							X	3	30%
§ Tecnologie ICT per l'integrazione di servizi	X	X	X	X	X				X	X	7	70%
§ Applicazioni Cloud-based		X	X	X	X	X		X		X	7	70%
§ Web-based Control e Workeforce Automation			X	X				X		X	4	40%
§ Standard di comunicazione ed interoperabilità di dispositivi		X	X	X		X		X	X	X	7	70%
§ Altro (Specificare…)												
TECNOLOGIE INNOVATIVE INDUSTRY 4.0											4,67	47%
§ Big Data e Analytics		X	X			X				X	4	40%
§ Sensori e sistemi intelligenti	X		X	X	X	X		X	X	X	8	80%
§ IoT e Machine Interaction	X		X	X		X				X	5	50%
§ Realtà virtuale e aumentata			X	X		X			X	X	5	50%
§ Tecnologie di processo avanzate basate sull'ingegnerizzazione			X	X		X		X		X	5	50%
§ Tecnologie RFID (Radio Frequency IDentification)			X	X		X				X	4	40%
§ Tecniche per Human Machine Interface		X		X			X	X		X	5	50%
§ Tecnologie per la simulazione e collaudo				X				X	X	X	4	40%
§ Communication technology per Industry 4.0				X						X	2	20%
§ Altro (PATENTINO PER LA ROBOTICA - COMAU)									X		1	10%
PROCESSI PRODUTTIVI INNOVATIVI											3,25	36%
§ Additive manufacturing			X	X		X	X			X	5	56%
§ Processi al plasma			X	X						X	3	33%
§ Hot forming										X	1	11%
§ Formatura e polimerizzazione di laminati in materiale composito				X			X	X		X	4	44%
§ Altro (Specificare…)												
TECNICHE DI OTTIMIZZAZIONE E GESTIONE DEI SISTEMI PRODUTTIVI											6,50	68%
§ Ottimizzazione di processi produttivi		X	X	X	X	X	X	X		X	8	80%
§ Lean Manufacturing			X	X	X	X				X	5	50%
§ Gestione logistica di supply chain avanzate			X	X	X	X				X	5	50%
§ Organizzazione e gestione dei sistemi produttivi		X	X	X	X	X	X	X		X	8	80%
§ Sistemi per la gestione ed il controllo della produzione		X	X	X	X	X	X	X		X	8	80%
§ Altro (Specificare…)												
SOLUZIONI TECNICHE E TECNOLOGICHE ECO-SOSTENIBILI											3,00	30%
§ Soluzioni tecniche e tecnologiche ecosostenibili d'avanguardia			X	X			X				3	30%
§ Packaging eco-sotenibile			X								1	10%
§ Tecnologie per l'efficientamento dei processi produttivi			X	X			X	X		X	5	50%
§ Altro (Specificare…)												

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2. Risorse professionali	1	2	3	4	5	6	7	8	9	10		
(AREA DELLE ABOLITA' COMPORTAMENTALI) Nello svolgimento delle attività curriculari ed extra curriculari, sono previsti insegnamenti o vengono adottati metodi/metodologie didattiche che supportano lo sviluppo delle seguenti capacità? SI / NO	I.I.S.S. Ferraris Molfetta (BA)	I.I.S.S. Fiore Modugno (BA)	I.I.S.S. Marconi/Hack - Bari	I.I.S.S. Righi - Taranto	I.I.S.S. Sette - Santeramo in Colle (BA)	I.T.I.S. Jannuzzi - Andria (BT)	I.T.T. Altamura/Da Vinci - Foggia	I.I.S.S. Ferraris - Brindisi	I.T.T. Panetti - Bari	ITS A. Cuccovillo - Bari	numero di risorse professionali su 10	% di copertura nell'insegnam. della disciplina
COMPETENZE PER IL MANAGEMENT E L'IMPRENDITORIALITA'											6,00	60%
§ Orientamento al cliente		X	X			X		X		X	5	50%
§ Team working	X	X	X	X		X	X	X	X	X	9	90%
§ Negoziazione		X	X			X		X			4	40%
Se si descrivere sinteticamente metodi/metodologie didattiche adottate	Il team working viene utilizzato in alcuni progetti di alternanza scuola/lavoro laddove le aziende lo utilizzano come politica di organizzazione del lavoro	Cooperative learning, problem solving, debate	Cooperative learning	Progetti problem, posing and solution		Project based learning		Cooperative learning, peer tutoring, problem solving, lezione frontale, esercitazioni applicative guidate, lezione dialogata				
COMPETENZE PER LA COMUNICAZIONE											8,00	80%
§ Capacità nei rapporti interpersonali		X	X	X		X	X	X	X	X	8	80%
§ Comunicazione verbale	X	X	X	X	X	X	X	X	X	X	10	100%
§ Comunicazione scritta	X	X	X	X	X	X	X	X	X		9	90%
§ Elaborazione ed esposizione di presentazioni		X	X	X		X	X	X	X	X	8	80%
§ Public Speaking			X	X	X	X	X	X	X		7	70%
§ Collaborazione virtuale			X	X		X	X		X	X	6	60%
Se si descrivere sinteticamente metodi/metodologie didattiche adottate		Didattica digitale, Cooperative learning, debate	L'attività didattica prevede lo sviluppo di competenze comunicative anche con presentazioni realizzate con la metodologia della flipped classroom	Exponi le tue idee (We world); Progetto psicologia e comunicazione verbale e non verbale; Attività alternanza scuola-lavoro	Metodologia debate, didattica metacognitiva, isnegnamento reciproco (costruttivismo sociale)	Alternanza scuola-lavoro, utilizzo di strumenti presenti nella G-suite		Cooperative learning, peer tutoring, problem solving, lezione frontale, esercitazioni applicative guidate, lezione dialogata	Classi digitali, peer education, team work, uso della web radio come strumento didattico per lo sviluppo della comunicazione e del public speaking, scrittura creativa			
COMPETENZE PER L'INNOVAZIONE											6,50	65%
§ Capacità di integrazione			X	X	X		X	X		X	6	60%
§ Design mind-set (mentalità progettuale)			X	X		X	X		X		5	50%
§ Sperimentazione			X	X			X			X	4	40%
§ Soluzione dei problemi	X	X	X	X	X	X	X	X	X	X	10	100%
§ Creatività		X	X	X		X	X	X	X	X	8	80%
§ Pensiero sistemico			X	X	X		X	X		X	6	60%
Se si descrivere sinteticamente metodi/metodologie didattiche adottate	Il problem solving è una metodologia didattica integrata nel curriculum del settore Tecnologico Informatico	Problem solving, Didattica digitale	Problem solving	Progetti coding; Attività alternanza scuola-lavoro	Problem solving, pedagogia interculturale	Progettazione di oggetti IoT; Design Thinking		Cooperative learning, peer tutoring, problem solving, lezione frontale, esercitazioni applicative guidate, lezione dialogata	Tutte le attività laboratoriali sono basate sulla progettazione, simulazione, verifica e collaudo e sulla creatività nella ricerca di soluzioni progettuali non precostituite. Nel biennio è molto utilizzato il coding, la robotica educativa ed il problem solving			
COMPETENZE DI INTELLIGENZA EMOTIVA											5,22	52%
§ Tolleranza dello stress			X				X			X	3	30%
§ Adattabilità			X				X	X		X	4	40%
§ Capacità di fronteggiare i fallimenti			X				X	X	X	X	5	50%
§ Proattività			X							X	2	20%
§ Orientamento al miglioramento continuo		X	X		X		X	X		X	6	60%
§ Decision making			X	X				X		X	4	40%
§ Leadership		X	X		X	X	X	X		X	7	70%
§ Cooperazione		X	X	X	X	X	X	X	X	X	9	90%
§ Orientamento alla multiculturalità	X		X	X	X		X	X	X		7	70%
Se si descrivere sinteticamente metodi/metodologie didattiche adottate	Attività di orientamento extracurriculari alla multiculturalità con metodologia ricerca azione e role-play	Problem solving, Cooperative learning		Progetto "Educarsi al futuro - Sustain" in collbaorazione con ENEA	Cooperative learning, protocolli di accoglienza, pedagogia interculturale			Cooperative learning, peer tutoring, problem solving, lezione frontale, esercitazioni applicative guidate, lezione dialogata	Lavori di gruppo, peer education, sportello ascolto			
Qual è l'utilizzo di metodologie interattive e/o laboratoriali nell'insegnamento delle discipline tecniche-tecnologiche:												
≤ 25 % del monte ore complessivo											0	
≤ 50 % del monte ore complessivo	X	X							X		3	
oltre il 50 % del monte ore complessivo			X	X	X	X	X	X		X	7	
Indicare il numero medio annuale di ore che i docenti dedicano all'aggiornamento nelle materie di insegnamento	40	30	10	80	40	25	25	30	dato non disponibile	dato non disponibile		

3.Rapporti con le imprese	1	2	3	4	5	6	7	8	9	10
A. Presenza di convenzioni con PMI (piccole e medie imprese) per realizzare attività di alternanza scuola-lavoro e di stage in azienda: SI / NO	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI
B. Presenza di collaborazioni con PMI che operano nei seguenti settori: SI / NO	I.I.S.S. Ferraris Molfetta (BA)	I.I.S.S. Fiore Modugno (BA)	I.I.S.S. Marconi/Hack - Bari	I.I.S.S. Righi - Taranto	I.I.S.S. Sette - Santeramo in Colle (BA)	I.T.I.S. Jannuzzi - Andria (BT)	I.T.T. Altamura/Da Vinci - Foggia	I.I.S.S. Ferraris - Brindisi	I.T.T. Panetti - Bari	ITS A. Cuccovillo - Bari
3. AMBIENTE E TERRITORIO	X	X	X	X	X	X		X	X	
6. MANIFATTURIERO		X	X	X	X	X	X	X	X	X
7. MECCATRONICO	X		X	X	X	X	X	X		X
9. TECNOLOGIE PER L'ENERGIA	X		X	X		X	X	X	X	
4. BENI CULTURALI	X	X	X	X	X				X	
1. TRASPORTI (settori automotive, ferroviario, navale, aereonautico)		X	X	X			X	X		X
5. BIOMEDICALE	X	X	X		X				X	X
2. AGROALIMENTARE - AGROINDUSTRIA			X		X		X			
8. SOCIAL INNOVATION		X		X		X				X
10. FARMACEUTICO					X					X
	5	6	8	7	7	5	5	5	5	6
C. Numero di allievi diplomandi che hanno realizzato attività di alternanza scuola-lavoro e di stage nell'ultimo anno (2018)	180	110	151	239	138	501	260	120	TUTTI	150
D. Altri progetti di collaborazione con PMI:	Rete di scopo "Promuovere il territorio" con la partecipazione delle Associazioni imprenditoriali del distretto produttivo e degli enti locali	Informatizzazione della contabilità gestionale ed industriale; Gestione del front end con la clientela	Apprendistato	Corso sui controlli non distruttivi e saldatura a filo continuo con rilascio patentino da parte RINA; Corso taratura valvole; Progetti di cooperazione internazionale con paesi africa subsaariana; Sistemi di produzione ed impiego tecnologie basate su produzione di energia da fonte solare				8 PROGETTI IN COLLABORAZIONE CON IMPRESE (cfr questionario)		

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OFFERTA FORMATIVA		1	2	3	4	5	6	7	8	9	10				
1. SEZIONE COMPETENZE TRASVERSALI															
Nell'ambito dei PERCORSI ad INDIRIZZO TECNICO-TECNOLOGICO erogati dall'Istituto, sono presenti Unità Formative che forniscono le sotto elencate competenze? SI / NO												**1**	**2**	**3**	**4**
Se si, qual è la media delle ore dedicate alla formazione di queste competenze nell'arco dell'intero periodo curriculare? ≤ 25 - ≤ 50 - oltre		I.I.S.S. Ferraris Molfetta (BA)	I.I.S.S. Fiore Modugno (BA)	I.I.S.S. Marconi/Hack - Bari	I.I.S.S. Righi - Taranto	I.I.S.S. Sette - Santeramo in Colle (BA)	I.T.I.S. Jannuzzi - Andria (BT)	I.T.T. Altamura/Da Vinci - Foggia	I.I.S.S. Ferraris - Brindisi	I.T.T. Panetti Bari	ITS A. Cuccovillo - Bari	0	≤ 25	≤ 50	oltre
MANAGEMENT ED IMPRENDITORIALITA'	Marketing	≤ 25	oltre	≤ 50	≤ 25	oltre	oltre	≤ 25	oltre	≤ 25	≤ 25	0	4	1	4
MANAGEMENT ED IMPRENDITORIALITA'	Project Management	≤ 50	oltre	≤ 50	≤ 50	oltre	oltre	≤ 25	oltre	≤ 25	≤ 25	0	2	3	4
MANAGEMENT ED IMPRENDITORIALITA'	Time Management		≤ 50			oltre			oltre			6	0	1	2
MANAGEMENT ED IMPRENDITORIALITA'	Modellizzazione dei costi (Controllo di gestione e budgeting)		oltre		≤ 25		≤ 25		oltre			4	2	0	2
MANAGEMENT ED IMPRENDITORIALITA'	Fund raising (Acquisizione di finanziamenti)		oltre		≤ 25		≤ 25		oltre			5	2	0	2
MANAGEMENT ED IMPRENDITORIALITA'	Gestione della proprietà intellettuale						≤ 25		oltre			7	1	0	1
MANAGEMENT ED IMPRENDITORIALITA'	Internazionalizzazione	≤ 50	oltre	≤ 25	≤ 25	oltre	≤ 50	≤ 25	oltre	≤ 25	≤ 25	0	4	2	3
MANAGEMENT ED IMPRENDITORIALITA'												**3,1**	**2,1**	**1,0**	**2,6**
Se si, qual è la media delle ore dedicate alla formazione di queste competenze nell'arco dell'intero periodo curriculare? ≤ 25 - ≤ 50 - oltre		I.I.S.S. Ferraris Molfetta (BA)	I.I.S.S. Fiore Modugno (BA)	I.I.S.S. Marconi/Hack - Bari	I.I.S.S. Righi - Taranto	I.I.S.S. Sette - Santeramo in Colle (BA)	I.T.I.S. Jannuzzi - Andria (BT)	I.T.T. Altamura/Da Vinci - Foggia	I.I.S.S. Ferraris - Brindisi	I.T.T. Panetti Bari	ITS A. Cuccovillo - Bari	0	≤ 25	≤ 50	oltre
QUALITA', GESTIONE DEL RISCHIO E SICUREZZA	Quality Management	≤ 50	oltre	oltre	≤ 50	≤ 50	oltre	≤ 50	oltre	≤ 50	≤ 50	0	0	5	4
QUALITA', GESTIONE DEL RISCHIO E SICUREZZA	Risk Management	≤ 25	oltre	oltre	≤ 25	≤ 25	≤ 50	≤ 25	oltre	≤ 25	≤ 25	0	5	1	3
QUALITA', GESTIONE DEL RISCHIO E SICUREZZA	Sicurezza ed igiene nei luoghi di lavoro	≤ 25	oltre	oltre	oltre	oltre	oltre	≤ 50	oltre	≤ 50	≤ 25	0	1	2	6
QUALITA', GESTIONE DEL RISCHIO E SICUREZZA												**0,0**	**2,0**	**2,7**	**4,3**
Se si, qual è la media delle ore dedicate alla formazione di queste competenze nell'arco dell'intero periodo curriculare? ≤ 25 - ≤ 50 - oltre		I.I.S.S. Ferraris Molfetta (BA)	I.I.S.S. Fiore Modugno (BA)	I.I.S.S. Marconi/Hack - Bari	I.I.S.S. Righi - Taranto	I.I.S.S. Sette - Santeramo in Colle (BA)	I.T.I.S. Jannuzzi - Andria (BT)	I.T.T. Altamura/Da Vinci - Foggia	I.I.S.S. Ferraris - Brindisi	I.T.T. Panetti Bari	ITS A. Cuccovillo - Bari	0	≤ 25	≤ 50	oltre
2. SEZIONE COMPETENZE TECNICHE															
TECNOLOGIE E SISTEMI DI AUTOMAZIONE PER LA PRODUZIONE	Robotica	oltre	≤ 50	oltre	oltre	oltre	oltre	≤ 50	oltre	≤ 50	≤ 50	0	0	3	6
TECNOLOGIE E SISTEMI DI AUTOMAZIONE PER LA PRODUZIONE	Sistemi per l'automazione e la comunicazioni industriale	oltre	oltre	oltre	oltre	oltre	oltre	oltre	oltre	oltre	oltre	0	0	0	9
TECNOLOGIE E SISTEMI DI AUTOMAZIONE PER LA PRODUZIONE	Tecnologie di produzione avanzate	≤ 50	≤ 50	oltre	oltre	oltre	oltre	oltre	oltre	≤ 50	≤ 50	0	0	3	6
TECNOLOGIE E SISTEMI DI AUTOMAZIONE PER LA PRODUZIONE	Sistemi flessibili per la produzione	≤ 50	≤ 50	oltre	oltre	oltre	oltre	oltre	≤ 50	≤ 50	≤ 50	0	0	4	5
TECNOLOGIE E SISTEMI DI AUTOMAZIONE PER LA PRODUZIONE	Altro, specificare											9	0	0	0
TECNOLOGIE E SISTEMI DI AUTOMAZIONE PER LA PRODUZIONE												**0,0**	**0,0**	**2,5**	**6,5**
Se si, qual è la media delle ore dedicate alla formazione di queste competenze nell'arco dell'intero periodo curriculare? ≤ 50 - ≤ 100 - oltre		I.I.S.S. Ferraris Molfetta (BA)	I.I.S.S. Fiore Modugno (BA)	I.I.S.S. Marconi/Hack - Bari	I.I.S.S. Righi - Taranto	I.I.S.S. Sette - Santeramo in Colle (BA)	I.T.I.S. Jannuzzi - Andria (BT)	I.T.T. Altamura/Da Vinci - Foggia	I.I.S.S. Ferraris - Brindisi	I.T.T. Panetti Bari	ITS A. Cuccovillo - Bari	0	≤ 50	≤ 100	oltre
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Programmazione e linguaggi	oltre	oltre	oltre	oltre	oltre	oltre	oltre	oltre	oltre	≤ 100	0	0	0	9
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Progettazione e sviluppo di applicazioni Web	≤ 50	oltre	oltre	oltre	≤ 50	oltre	≤ 50	oltre	≤ 50		0	4	0	5
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Software per l'automazione di sistemi produttivi	oltre	oltre	oltre	oltre	oltre	oltre	oltre	≤ 100	≤ 100	≤ 100	0	0	2	7
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Piattaforme web per la condivisione, partecipazione e servizi	≤ 100	oltre	≤ 100	oltre	≤ 100	≤ 100	≤ 50	oltre	≤ 50	≤ 50	0	2	4	3
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Tecnologie web based per la manutenzione	≤ 100	oltre	≤ 100	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	0	6	2	1
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Tecnologie ICT per l'integrazione di servizi	≤ 50	oltre	≤ 100	≤ 100	≤ 100	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	0	5	3	1
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Applicazioni Cloud-based		≤ 100	≤ 50	≤ 100		≤ 100		≤ 100	≤ 50		3	2	4	0
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Web-based Control e Workeforce Automation								≤ 100			8	0	1	0
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Standard di comunicazione ed interoperabilità di dispositivi	≤ 50	oltre	≤ 100	≤ 100	≤ 50	oltre	≤ 100	≤ 50	≤ 100	≤ 50	0	3	4	2
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI	Altro, specificare											9	0	0	0
ICT E APPLICAZIONI SOFTWARE PER L'AUTOMAZIONE DEI SISTEMI PRODUTTIVI												**1,2**	**2,4**	**2,2**	**3,1**
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	Big Data e Analytics		≤ 50				≤ 50					7	2	0	0
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	Sensori e sistemi intelligenti	≤ 100	≤ 50	≤ 100	oltre	≤ 50	oltre	≤ 50	oltre	≤ 100	≤ 50	0	3	3	3
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	IoT e Machine Interaction	≤ 100	≤ 50	≤ 100	≤ 100	≤ 50	oltre	≤ 50	≤ 50	≤ 50	≤ 50	0	5	3	1
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	Realtà virtuale e aumentata	≤ 50	≤ 50	≤ 100	≤ 100	≤ 50	≤ 100	≤ 50	≤ 50	≤ 100	≤ 50	0	5	4	0
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	Tecnologie di processo avanzate basate sull'ingegnerizzazione	≤ 50	≤ 50	≤ 100	≤ 100	≤ 50	≤ 100	≤ 50	≤ 50	≤ 50	≤ 50	0	6	3	0
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	Tecnologie RFID (Radio Frequency IDentification)			≤ 50			≤ 50					7	2	0	0
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	Tecniche per Human Machine Interface	≤ 50	oltre	≤ 50	≤ 100	≤ 50	≤ 50	≤ 100	≤ 50	≤ 50	≤ 50	0	6	2	1
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	Tecnologie per la simulazione e collaudo	≤ 50	≤ 50	≤ 50	≤ 100	≤ 50	≤ 50	≤ 50	oltre	≤ 50	≤ 50	0	7	1	1
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	Communication technology per Industry 4.0	≤ 50	≤ 50	≤ 50	≤ 100	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	0	8	1	0
TECNOLOGIE INNOVATIVE INDUSTRY 4.0	Altro, specificare											9	0	0	0
TECNOLOGIE INNOVATIVE INDUSTRY 4.0												**1,6**	**4,9**	**1,9**	**0,7**
PROCESSI PRODUTTIVI INNOVATIVI	Additive manufacturing	≤ 50	≤ 50	≤ 100	oltre	≤ 50	≤ 100	≤ 100	≤ 50	≤ 50	≤ 50	0	5	3	1
PROCESSI PRODUTTIVI INNOVATIVI	Processi al plasma			≤ 50	≤ 50							7	2	0	0
PROCESSI PRODUTTIVI INNOVATIVI	Hot forming											9	0	0	0
PROCESSI PRODUTTIVI INNOVATIVI	Formatura e polimerizzazione di laminati in materiale composito				≤ 50							7	1	0	0
PROCESSI PRODUTTIVI INNOVATIVI	Altro, specificare											9	0	0	0
PROCESSI PRODUTTIVI INNOVATIVI												**5,8**	**2,0**	**0,8**	**0,3**
TECNICHE DI OTTIMIZZAZIONE E GESTIONE DEI SISTEMI PRODUTTIVI	Ottimizzazione processi produttivi	≤ 50	oltre	oltre	oltre	≤ 100	≤ 100	≤ 100	≤ 50	≤ 50	≤ 50	0	3	3	3
TECNICHE DI OTTIMIZZAZIONE E GESTIONE DEI SISTEMI PRODUTTIVI	Gestione logistica di supply chain avanzate	≤ 50	≤ 50	oltre	≤ 100	≤ 100	≤ 100	≤ 50	≤ 50	≤ 50	≤ 50	0	5	3	1
TECNICHE DI OTTIMIZZAZIONE E GESTIONE DEI SISTEMI PRODUTTIVI	Organizzazione e gestione dei sistemi produttivi	≤ 100	oltre	oltre	oltre	oltre	oltre	oltre	oltre	≤ 100	≤ 100	0	0	2	7
TECNICHE DI OTTIMIZZAZIONE E GESTIONE DEI SISTEMI PRODUTTIVI	Sistemi per la gestione ed il controllo della produzione	≤ 100	oltre	oltre	oltre	oltre	oltre	oltre	oltre	≤ 100	≤ 100	0	0	2	7
TECNICHE DI OTTIMIZZAZIONE E GESTIONE DEI SISTEMI PRODUTTIVI	Altro, specificare CAD/CAM - CNC				oltre							8	0	0	1
TECNICHE DI OTTIMIZZAZIONE E GESTIONE DEI SISTEMI PRODUTTIVI												**0,0**	**2,0**	**2,5**	**4,5**
SOLUZIONI TECNICHE E TECNOLOGICHE ECO-SOSTENIBILI	Soluzioni tecniche e tecnologiche ecosostenibili d'avanguardia			≤ 50	≤ 50				≤ 50			5	3	0	0
SOLUZIONI TECNICHE E TECNOLOGICHE ECO-SOSTENIBILI	Packaging eco-sotenibile			≤ 50	≤ 50							7	2	0	0
SOLUZIONI TECNICHE E TECNOLOGICHE ECO-SOSTENIBILI	Tecnologie per l'efficientamento dei processi produttivi	≤ 50	≤ 50	≤ 100	≤ 100	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	0	7	2	0
SOLUZIONI TECNICHE E TECNOLOGICHE ECO-SOSTENIBILI	Altro, specificare											9	0	0	0
SOLUZIONI TECNICHE E TECNOLOGICHE ECO-SOSTENIBILI												**4,0**	**4,0**	**0,7**	**0,0**

ORIENTAMENTO	1	2	3	4	5	6	7	8	9	10
1. Azioni di orientamento intraprese nei confronti dei giovani	I.I.S.S. Ferraris Molfetta (BA)	I.I.S.S. Fiore Modugno (BA)	I.I.S.S. Marconi/Hack - Bari	I.I.S.S. Righi - Taranto	I.I.S.S. Sette - Santeramo in Colle (BA)	I.T.I.S. Jannuzzi - Andria (BT)	I.T.T. Altamura/Da Vinci - Foggia	I.I.S.S. Ferraris - Brindisi	I.T.T. Panetti Bari	ITS A. Cuccovillo - Bari
Q1.1 Durante il percorso di studi viene realizzata una specifica attività di orientamento a favore degli allievi sull'importanza delle Key Enabling Technologies?										
A. Non è un tema trattato nelle attività di orientamento a favore degli studenti					X		X			
B. E' un tema trattato solo nel caso di progetti attivati ad hoc su specifiche tecnologie abilitanti	X		X						X	
C. E' un tema incluso nelle attività di orientamento in uscita verso gli ITS o l'Università		X	X	X		X		X	X	X
D. Altri progetti di collaborazione con PMI:										
Q1.2 Attraverso quali canali l'Istituto promuove, a favore degli allievi, l'importanza delle Key Enabling Technologies?										
A. Attraverso il loro parziale inserimento nei curricula scolastici			X	X				X	X	X
B. Attraverso workshop e seminari realizzati ad hoc		X	X	X		X			X	X
C. Attraverso specifiche attività extracurriculari finanziate con fondi ministeriali o fondi FSE	X	X		X					X	X
D. Attraverso testimonianze delle imprese	X	X	X	X		X		X	X	X
E. Non sono ad oggi attivate azioni specifiche					X		X			
F. Altro, specificare…										
Q1.3 Attraverso quali modalità vengono presentate agli allievi le possibili opportunità di carriera nei settori che impiegano le Key Enabling Technologies?										
A. Attraverso workshop e seminari dedicati realizzati da esperti di settore		X	X			X			X	X
B. Attraverso incontri con le Imprese e/o visite aziendali	X	X	X	X		X		X	X	X
C. Non sono ad oggi attivate azioni specifiche					X		X			
D. Altro, specificare…										
Q1.4 Attraverso quali azioni è possibile, a suo avviso, rendere più attrattivo per i ragazzi lo studio delle Key Enabling Technologies?										
A. Intensificando l'introduzione di queste materie nei curricula scolastici		X	X	X			X			X
B. Creando specifici raccordi nei percorsi curriculari tra scuola, ITS/Università e imprese	X	X	X	X		X	X	X	X	X
C. Intensificando le attività di tirocinio ed alternanza scuola-lavoro in collaborazione con le imprese che utilizzano t	X	X	X	X		X		X	X	X
D. Creando azioni specifiche di orientamento in itinere ed in uscita	X		X	X		X			X	X
E. Altro, specificare…										

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DT1.3 Data Collections

Version n. 1

"SMEs and Training Institutions assessment" 06/2019

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Document History

Version	Date	Author	Description
0.0	26.04.2019	Angela Abrescia, Simone Balletta, Giuseppe Cavallo, Fabio Abbrescia/ NAPS LAB	Analysis of the Italian SMEs' needs for Skills in enabling technologies (Apulian companies). 1st draft.
1.0	06.06.2019	Cosmo Albertini, Vito Macina, Giuseppe Storelli / Chamber of Commerce of Bari	Analysis of the Italian SMEs' needs for Skills in enabling technologies (Apulian companies). 2 st draft.

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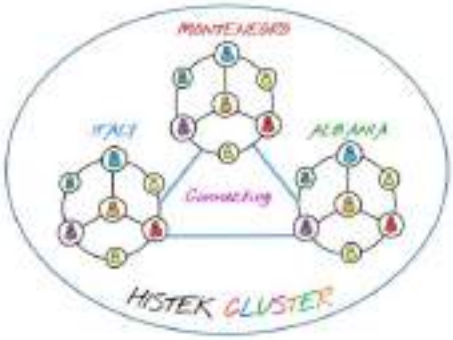
HISTEK: main project objectives



The HISTEK project aims at strengthening the competitive capacity of **Italian, Albanian and Montenegrin SMEs**, through the creation of a **new Cluster** (made up of SMEs, Educational Institutions and Public Institutions), which will act as a "**connector**" between the world of education and the world of companies for empowering human capital, as a strategic lever to support growth and development.

The small and medium-sized enterprises of the three countries are today **engaged in considerable efforts to internationalize and innovate** their organizations. Many Italian companies already have, or are planning to open branches in Albania and Montenegro or vice versa.

To make these **processes more sustainable**, HISTEK proposes the cross-border definition of tools that can facilitate **training, transnational mobility and the inclusion in the SMEs of "high technicians / middle-skilled workers"** truly aligned with their current need for advanced technical skills, fundamental for supporting innovation processes.

First of all, the Cluster will define the architecture of a **new transnational short-cycle path (EQF Level 5)**, conceived according to the dual system, co-designed with the participating SMEs. Transnationality will imply the creation of **common and shared training standards between the 3 countries** and the prospect of the future joint delivery of the path, partly in Italy, partly in Montenegro and partly in Albania, with the cooperation of companies and training institutions of the 3 territories.

With the support of the **Chambers of Commerce, project partners,** in the design of the new training offer, a robust cross-sector preparation will be developed in line with the **main development and innovation trajectories indicated by SMEs** in the needs analysis phase.

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To this end, particular attention will be given to the technical and transversal skills required for the use of **new enabling technologies (KETs)**, recognized by the European Commission as the indispensable background to support, today, product and process innovation.

In addition, **other services will be developed for SMEs** in line with the implementation of dual systems, (which foresee the realization of at least 50% of training activities directly by company internal staff). In particular, **guidelines** will be produced to improve the ability of business referents to provide **on-the-job training** and to train young people during their **curricular internships**. A toolkit will also be created to support companies in **selecting future technicians.**

Lastly, the project foresees the signing of a **Consortium Agreement**, which will commit the partners to the implementation of the new training path immediately after the conclusion of the project, with a strong impact of the project results on SMEs at the CB level in the mid term.

Main Benefits / Expected Impacts for SMEs after the implementation of the new path:

- ***Improved acquisition of talents and skills*** through the inclusion of **young Italians, Albanians and Montenegrins** trained in the specific skills required, with standards common to the three countries;
- ***Reduction of indirect costs for lacking and fast integration in the corporate culture at CB level***, and to the transition from the training world to that of SMEs, with its peculiarities and characteristics;
- ***Reduction of indirect*** costs related to the **loss of business opportunities** deriving from the lack of skills in terms of innovation, knowledge of the markets, use of technologies, etc;
- ***Higher internationalization capacity*** aimed at expanding outlet markets.

Project partners:

- Ministry of Education of Montenegro – LP (Montenegro)
- Chamber of Economy of Montenegro – P2 (Montenegro)
- Fondazione ITS “Antonio Cuccovillo" – P3 (Italy)
- Chamber of Commerce of Bari – P4 (Italy)
- Faculty of Business, “Aleksandër Moisiu” University, Durrës – P5 (Albania)
- Chamber of Commerce of Tiranë – P6 (Albania)

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Survey description

Interviewing Method

The selected method is a CAWI (Computer Assisted Web Interviewing) questionnaire, through Google's free online form for the collection of responses. The questionnaire is about the Italian situation, since the activity has been originally conceived as diversified among Italy, Albania and Montenegro, to respect the entrepreneurial and societal differences. For instance, Italy is treated first as a technology producer, while Albania and Montenegro are to be considered as ICT "demand" and market. That's why the questions in the Italian survey should be turned from sellers' point of view to purchasers' perspective in the Albanian and Montenegrin surveys.

Detection Technique

The Questionnaire has been detected through a qualitative and quantitative method, composed by a data set of 24 variables.

Technical Assessments (Activity T1.4)

The analysis and elaboration of the results have been carried out by the HISTEK's partners (one for each Country) and the result is going to be showcased in this document via graphs and comment (discursive).

Detection Period

The period in which questionnaire has been available is end of May 2019.

Code of conduct

The survey has been designed and spread in compliance with the provisions of EU General Data Protection Regulation (GDPR) of May 25th 2016. The answers to the questionnaire are used in aggregate form and only for statistical purposes.

Communication

The following survey has been disseminated via e-mail and it is also accessible through the institutional website and social networks. The survey contained brief information about the project and. It followed the communication policy of the project (information and publicity) and, at the end, there was a link with a call to action button to access to the fillable questionnaire (as stated in the Picture below):

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PRODUCI MACCHINE INDUSTRIALI? VENDI TECNOLOGIE ICT? OFFRI SERVIZI DI ASSISTENZA IN TECNOLOGIE AVANZATE?

Se hai risposto sì, la Tua azienda ha l'identikit perfetto per il progetto HISTEK.
Cosa faremo. Cosa ci serve sapere per coinvolgerTi nelle attività.

La Camera di Commercio di Bari e l'ITS A. Cuccovillo hanno lanciato HISTEK, un progetto Interreg con Albania e Montenegro che può interessare molto le aziende pugliesi che vendono macchinari o tecnologie, specialmente se hanno anche propensione all'estero.
In questa fase ci serve capire dalle imprese pugliesi quali prodotti o quali soluzioni propongono e soprattutto per quali aziende-clienti.
Dopo di che, la sfida è comprendere se si possano formare tecnici specializzati per lavorare su quelle tecnologie o occuparsi della loro manutenzione.
Lo faremo insieme ai nostri partner di progetto d'oltremare, Ministeri e Camere di Commercio albanesi e montenegrine, che ci accompagnano in questa importante iniziativa.
Per poterTi coinvolgere nelle attività successive, senza alcun impegno né costo, chiediamo alla Tua azienda semplicemente di raccontarci qualcosa di sè:

PRESENTA LA TUA AZIENDA QUI

Clicca il bottone: in due minuti ci aiuterai a capire le opportunità che possiamo costruire insieme in HISTEK !

Interreg - IPA CBC
Italy - Albania - Montenegro
HISTEK

Un progetto a valere sull'Interreg IPA CBC Italy-Albania-Montenegro Programme, cofinanziato dall'Unione Europea grazie allo Strumento per l'Assistenza alla Preadesione (IPA II).

Figure 1 - Screenshot of the questionnaire

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Survey Summary Table

Data	Variable	Sec.
Personal Data	Name and Surname	**1**
	Company E-mail	
	Telephone	
	City	
	Region	
Company General Data	Company Name	**2**
	Company Role	
	What is the number of employees (regardless of the contractual form) of the company?	
	Market	
Company Technical Data	Does the company collaborate with other subjects (research centers, universities, ITS, high schools) in the design, research and development of new products / services?	
	Which of the following technologies are used within the company?	
	In your company, in a range from 0 to 10, what's the value of foreign market turnover over the total?	
	What are the 3 most important foreign countries for your turnover?	
	Does your company work with the following countries? (tick only if the answer is yes)	
	Does the company sell \ buy machinery or technology abroad?	
	Which technologies do the company buy \ sell?	
	How does the assistance work?	
Company Educational and Human Resources Needs	What is the professional figure related to innovation that the company needs most?	**3**
	Which products, processes or technologies should he be able to manage?	
	What kind of training the worker should have? [Università / University]	
	What kind of training the worker should have? Is necessary university, ITS or just upper secondary training? [ITS / Professional School Institute]	
	What kind of training the worker should have? Is necessary university, ITS or just upper secondary training? [Secondary School]	
	What kind of training the worker should have? Is necessary university, ITS or just upper secondary training? [Intermediary School]	
	Which subjects should be taught or which soft skills?	

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Target group clustering: lions, horses and cats

Mostly mechatronic companies and manufacturers of industrial machines, on the Italian side. Any company that uses technology on the Albanian-Montenegrin side and potentially all sectors. **Over a project target of 10 companies there was a final collection of 33 replies.**

Turnover	Number of employees						
	less than 5	from 5 to 10	from 11 to 25	from 25 to 50	from 50 to 100	from 100 to 500	Total
Less than 250k€	8						8
250k € - 500k €	2	1					3
500k € - 1M €	1	4	1				6
More than 1M €		4	1				5
More than 2.5M €			2	2			4
5-10M			1	1	1		3
10-25M					1	1	2
25-50M					1	1	2
Total	**11**	**9**	**5**	**3**	**3**	**2**	**33**

Figure 1 - Numeric Pivot Table of the 33 companies participating in the survey

Turnover [in euro]	Number of employees					
	Less than 5	5 to 10	11 to 25	25 to 50	50 to 100	100 to 500
< 250k	Ar Dream Srls Cnc Robot Hexit Srl Mipatech Srl Nextome Penta Srl Treebe Wideverse					
250k - 500k	Adesa Srl Eteco S.R.L.	Ecsa				
500k-1M	Centro Assistenza Bari Srl	Intesis Srl Mediaplot Srl Click Tecnologie Bautech Srl	Mtm Project			
1-2.5M		De Palma Thermofluid Diamec Technology Srl Depureco Spa Mbl Solutions	F.lli Resta Srl			
2.5-5M			Neetra Srl Sim Nt Srl	Item Oxygen Srl		

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				Molitecnica Sud		
5-10M			As Labruna Srl	Eureka-Its Sa	CETMA	
10-25M					ICAM S.R.L.	Farmalabor Srl
25-50M					Bruno Srl	MASMEC Spa

Figure 2 - Pivot Table with the list of 33 companies participating in the survey

CATS (Newcomers) **HORSES (Followers)** **LIONS (Leaders)**

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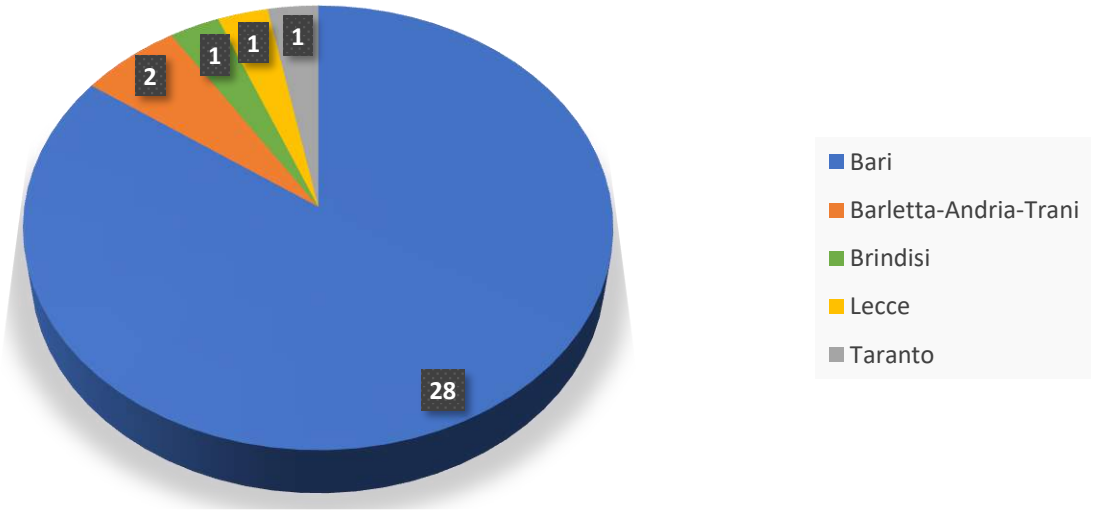
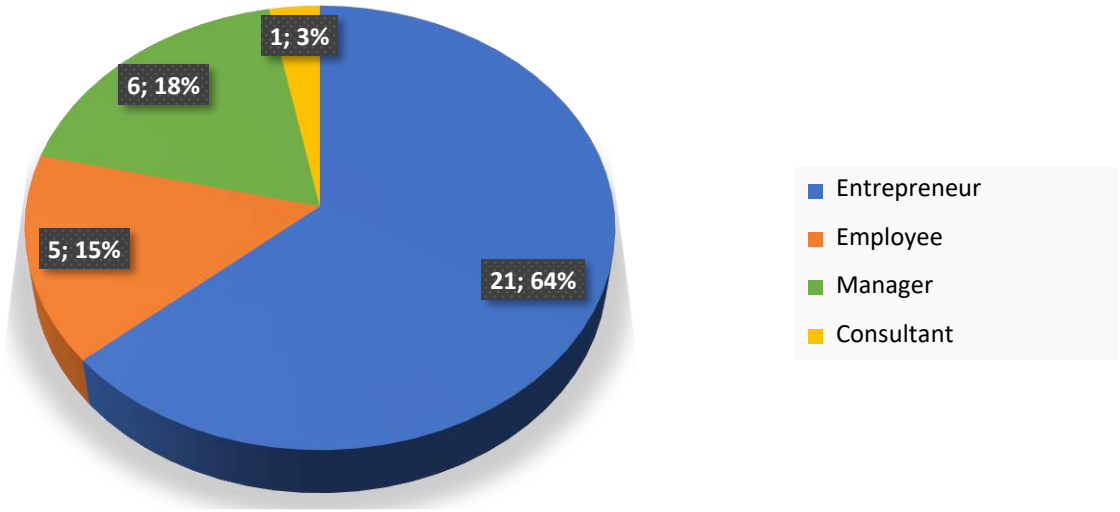
General overview

Provinces of respondent companies (Puglia region)



Most of participants are directly referred to the Chamber of Commerce territory (Bari and Barletta-Andria-Trani) with 30 answers over a total of 33. The remaining part is equally distributed among Brindisi, Lecce and Taranto.

Covered role of the interviewed within the company

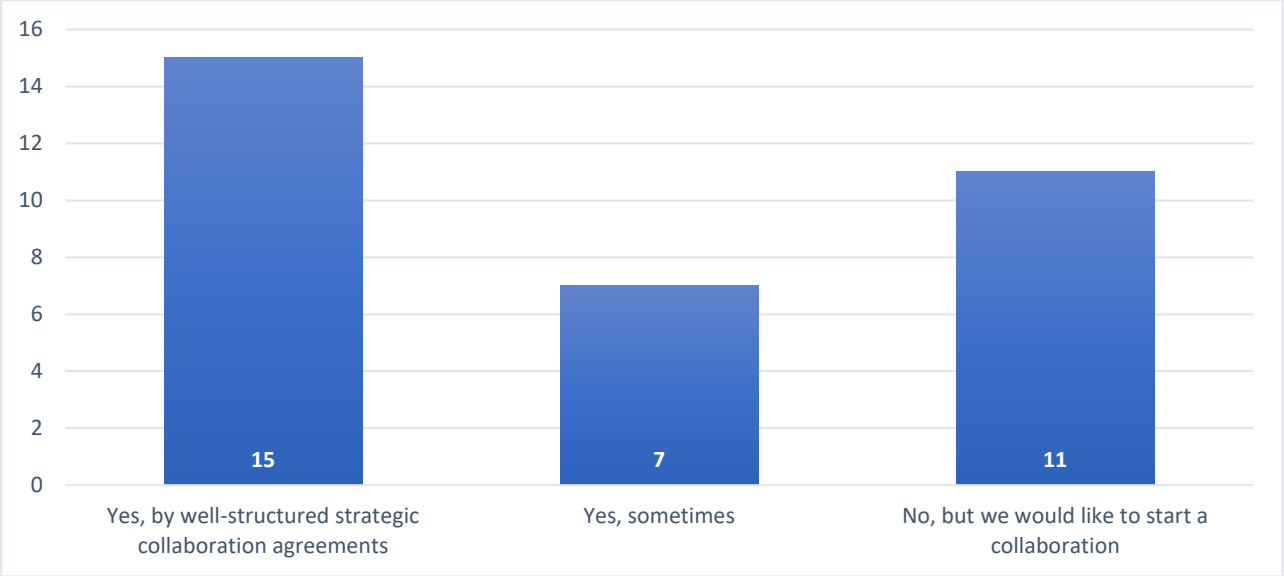


21 (64%) over 33 answers came from entrepreneurs and considering 6 from managers (18%). Therefore, we can confidently rely on the **quality of the respondents**, who are able to guarantee **a clear and comprehensive point of view on companies' educational needs and job requirements.**

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Company Collaborations with the world of Education / Technical Training

The company collaborates with other groups (research centres, universities, ITS, high schools) in the design, research and development of new products / services?



Most of the companies (67%) are already working with the world of education and technical training. Better, it looks like a habit and a behaviour for lions and horses (not so for cats).

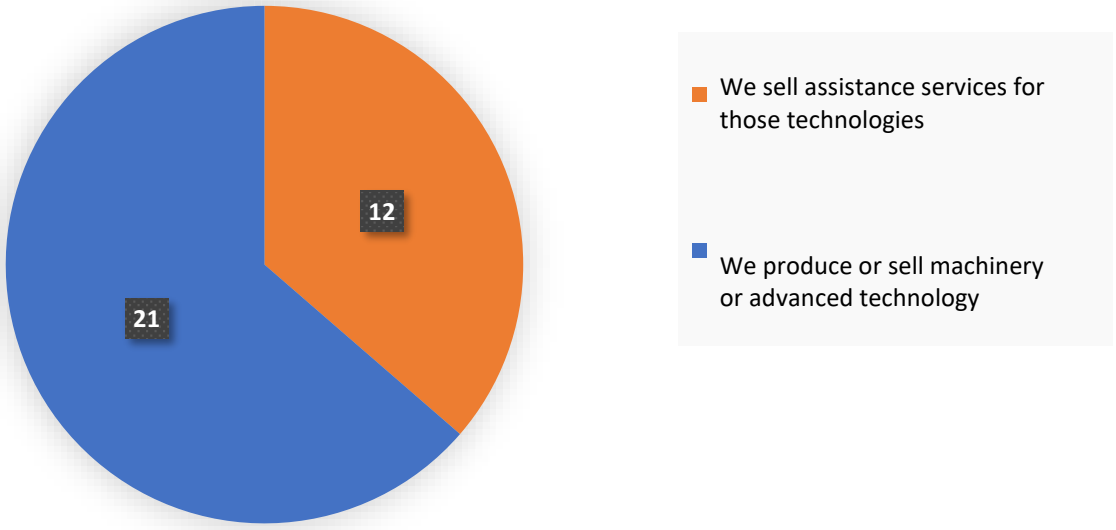
Bruno Srl	AS Labruna srl	Eureka-ITS sa
CETMA	ITEM OXYGEN SRL	
Farmalabor Srl	MOLITECNICA SUD	
ICAM S.r.l.		
Masmec SpA		
Neetra srl		
SIM NT srl		
De Palma Thermofluid snc	BAUTECH Srl	Click tecnologie Srl
DIAMEC TECHNOLOGY SRL	DEPURECO SPA	F.lli Resta srl
MBL SOLUTIONS SRL	Intesis srl	MEDIAPLOT SRL
MTM project		
AR dream srls	Treebe	Adesa srl
NEXTOME		CENTRO ASSISTENZA BARI SRL
Penta srl		CNC ROBOT s.a.s.

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

WIDEVERSE		ECSA
		ETECO S.r.l.
		HEXIT SRL
		MIPATECH Srl

Producer or assistance provider

Does the company produce / sell machinery or technology?



Two respondents out of three are machinery and advanced technology producers (64%), while one third acts as assistance provider (36%). The same balance crosses the three different clusters:

We produce or sell machinery or advanced technology	We sell assistance services for those technologies
AS Labruna srl	CETMA
Bruno Srl	Eureka-ITS sa
Farmalabor Srl	ITEM OXYGEN SRL
ICAM S.r.l.	
Masmec SpA	
MOLITECNICA SUD	
Neetra srl	
SIM NT srl	
De Palma Thermofluid snc	BAUTECH Srl
DEPURECO SPA	Click tecnologie Srl
DIAMEC TECHNOLOGY SRL	MEDIAPLOT SRL

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

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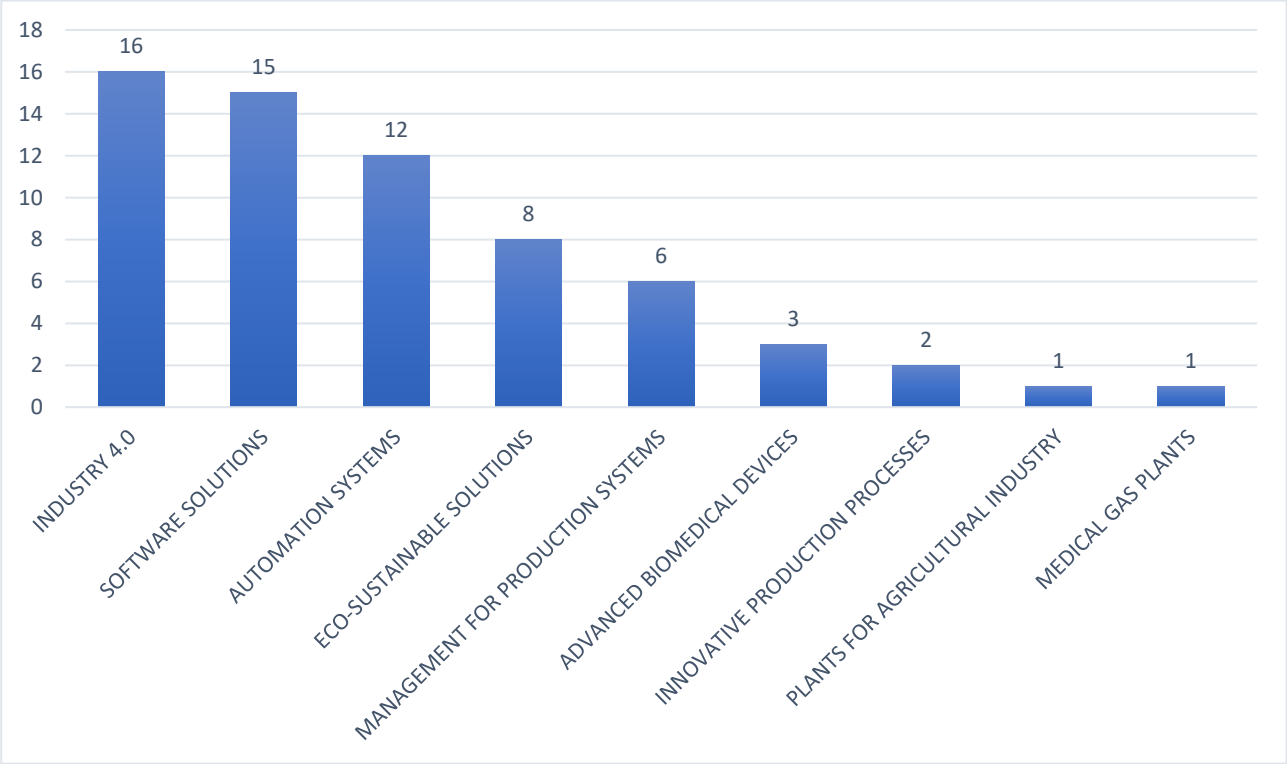
F.lli Resta srl	
Intesis srl	
MBL SOLUTIONS SRL	
MTM project	
	
Adesa srl	AR dream srls
CNC ROBOT s.a.s.	CENTRO ASSISTENZA BARI SRL
ETECO S.r.l.	ECSA
MIPATECH Srl	HEXIT SRL
NEXTOME	Penta srl
Treebe	WIDEVERSE

Technical area of intervention

Which innovative machinery or advanced technology does the company sell?



Over 85% of respondents declared to operate mostly within the industry 4.0 and automation systems, with a notable part involved in software solutions. Runners are eco sustainable solutions and highly specialized niche markets, such as medical gas plants, biomedical devices and agricultural industry.

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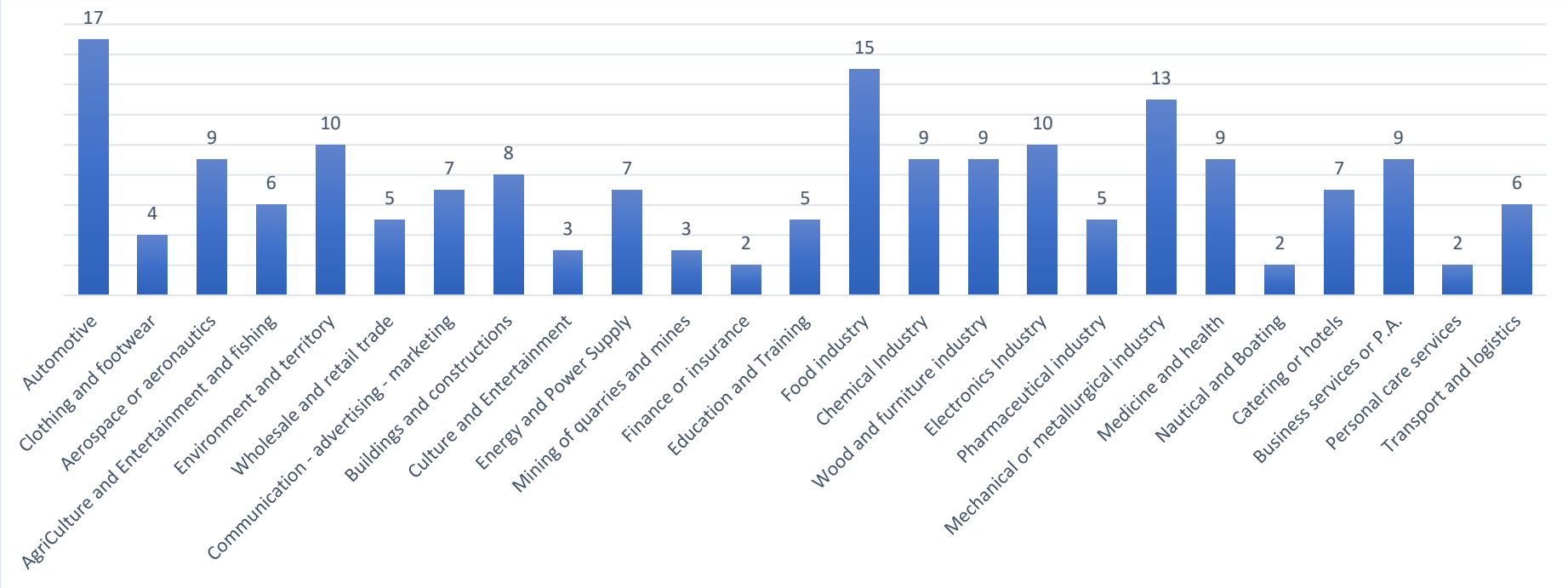
Market

To which categories of customers do you sell machinery, technology or assistance?



Talking about end markets of respondents, they hold **a remarkable ecosystem of B2B customers** in the **automotive market** (52% of respondents opted for this as primary) and the **mechanical\metallurgical industry** (39%). **Following, food industry** (45%), **wood and furniture** (30%) and then **aerospace** (29%). **Then, buildings, fashion, medicine, chemicals, environment, etc**. We obviously got a fair dispersion of answers on 25 options (a great diversification of proposed solutions leads to a proliferation of potential customers). Please consider that multiple answers were allowed.

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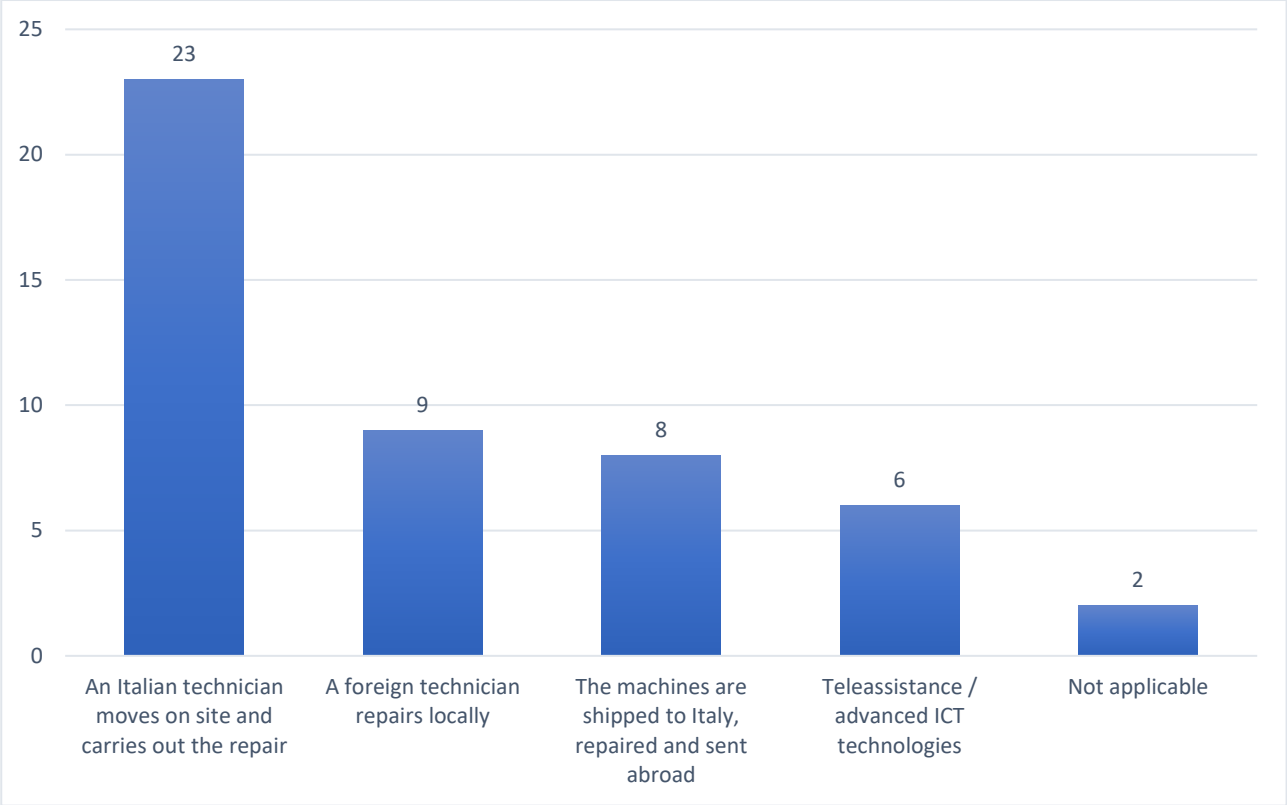
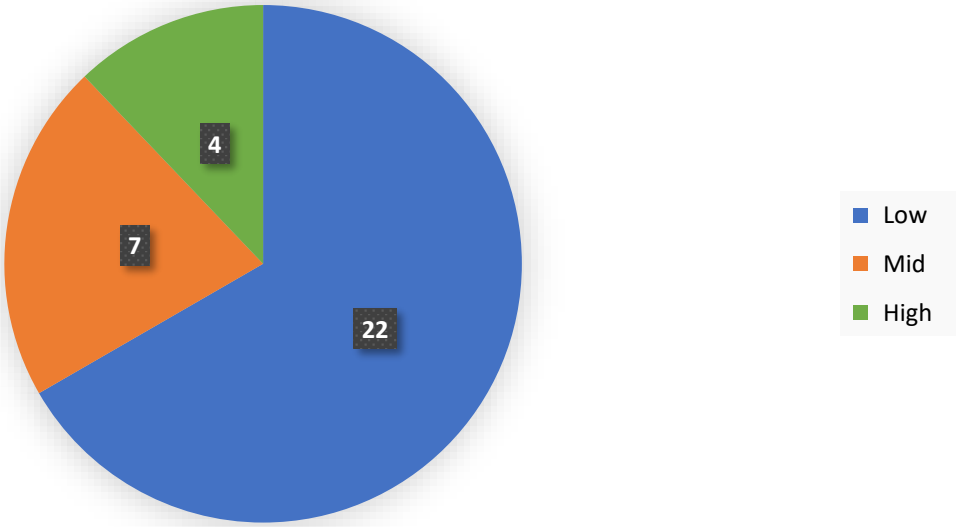
How is assistance with customers abroad?



Talking about assistance most of the responding companies **still prefer to send an Italian technician to the customer's location** (70% of answers). Second opportunity, rooted, but not that way, is **getting the machinery shipped back to Italy to be repaired** (24%), **while just few rely on foreign technician or teleassistance or predictive solutions**. The former represents a clear opportunity for HISTEK project, since this strategy might be provided with a clear educational offer upstream.

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Value of foreign sales over total turnover



Most of the companies grow in number of employees and turnover, an increasing of internationalization is a key driver in their strategies and revenues. **Lions and Horses show a clear international approach**, also taking into account that less than 20% for Lions is a fraction of a huge turnover, so it is a good result. **Most of the other respondents rely on the local or national market, instead**; in fact, they generally have a low incidence of foreign turnover over total (67%) or a medium incidence (21%).

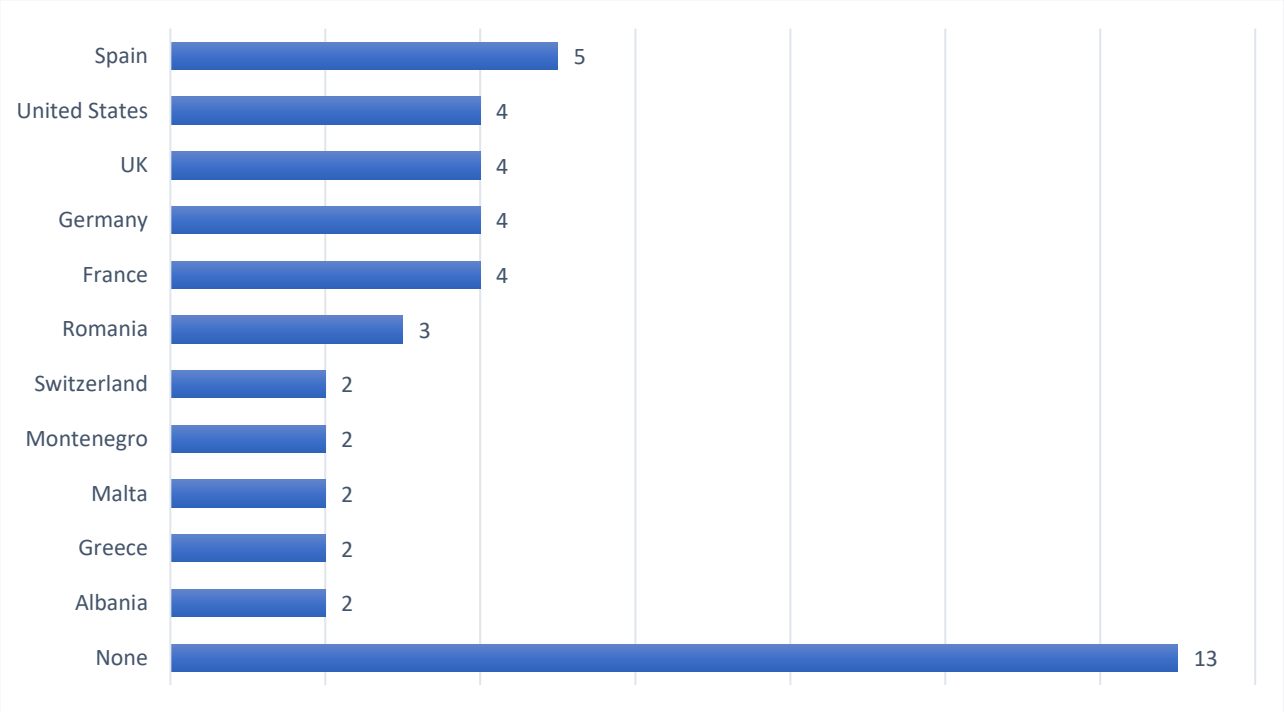
Low (less than 20%)	Medium (from 30% to 50%)	High (more than 60%)
AS Labruna srl	CETMA	Bruno Srl
Farmalabor Srl	ICAM S.r.l.	Eureka-ITS sa
ITEM OXYGEN SRL	Masmec SpA	Neetra srl
SIM NT srl	MOLITECNICA SUD	
BAUTECH Srl	De Palma Thermofluid snc	
Click tecnologie Srl	F.lli Resta srl	
DEPURECO SPA		
DIAMEC TECHNOLOGY SRL		
Intesis srl		
MBL SOLUTIONS SRL		
MEDIAPLOT SRL		
MTM project		

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Adesa srl	MIPATECH Srl	NEXTOME
AR dream srls		
CENTRO ASSISTENZA BARI SRL		
CNC ROBOT s.a.s.		
ECSA		
ETECO S.r.l.		
HEXIT SRL		
Penta srl		
Treebe		
WIDEVERSE		

Most important Foreign Markets

Foreign countries which the company works more with



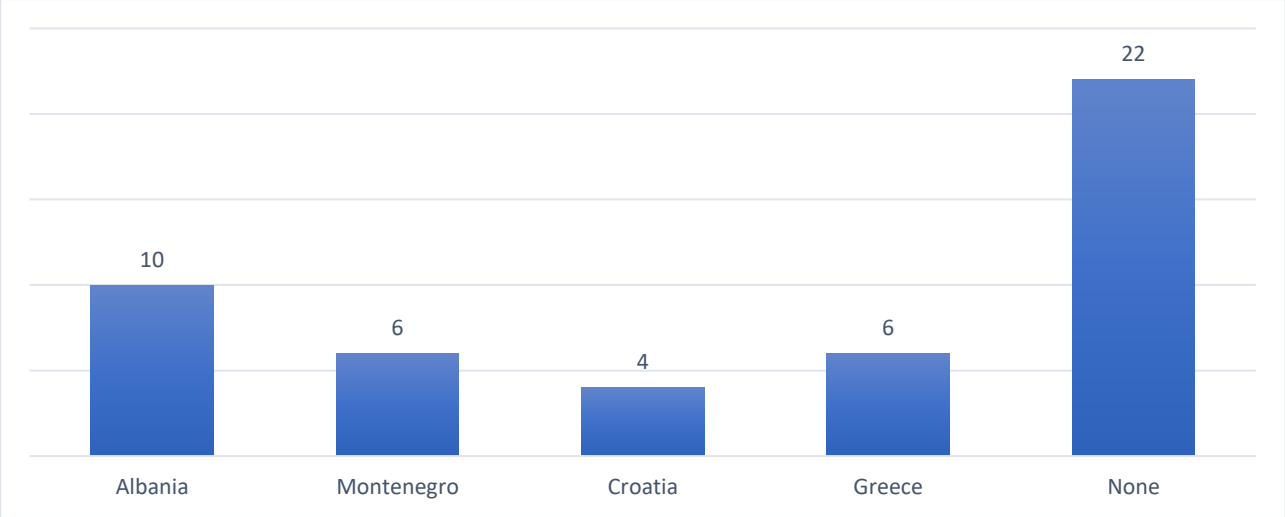
Companies working with foreign markets usually have relationship with European countries such as Spain, UK, Germany, France. The ones that move over, mostly stay within classical western targets such as **United States.**

These results show also that Puglia Region is currently working with a lot of Countries in the world. Other Countries currently working with Puglia are: Belgium, Portugal, Slovenia, Serbia, China, Russia, Korea, Mexico, North Africa, etc.

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Interreg Markets Focus (Albania, Montenegro, Greece and Croatia)

Does the company work with: Albania, Montenegro, Greece and Croatia?



There is a sample of companies (32%) already working with Albania and a minor part with Greece, Montenegro and Croatia (20%).

List of companies working with Albania and Montenegro


AS Labruna srl
Bruno Srl
CETMA
Farmalabor Srl
ICAM S.r.l.
MOLITECNICA SUD
Neetra srl

BAUTECH Srl
De Palma Thermofluid snc
DEPURECO SPA
F.lli Resta srl

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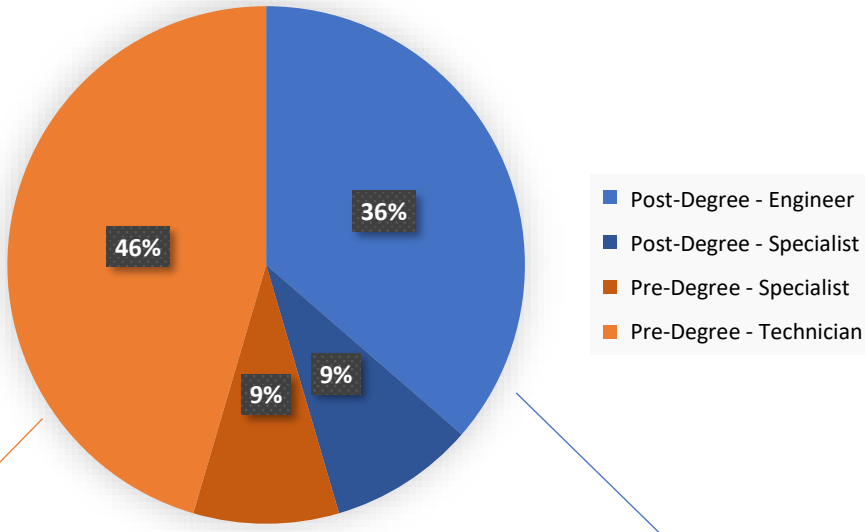
Focus on Cluster 1 LIONS (Leaders)

Most needed job role

Job role linked to the innovation most needed by the company

Results of interest for the project



Pre-Degree Focus

- **Specialist:** Solution Specialist
- **Technician:** Commercial, Expert in Robotics, Automation and Control, IT, Maintenance and Mechatronic Mounts

Post-Degree Focus

- **Engineer**: Mechanic, Electric, IT Professional, Research and Development
- **Specialist**: Innovation Specialist

Products, processes or technologies that he should know how to handle

Mechanical Assistance, Precision Assemblies Automation (PLC), Electric Control Units, Image Processing, AI and Collaborative Robots, Pneumatic Systems, ICT Integration and Monitoring in Production Processes, Design Reading, Assembly and Maintenance of Mechatronic Systems, Engines

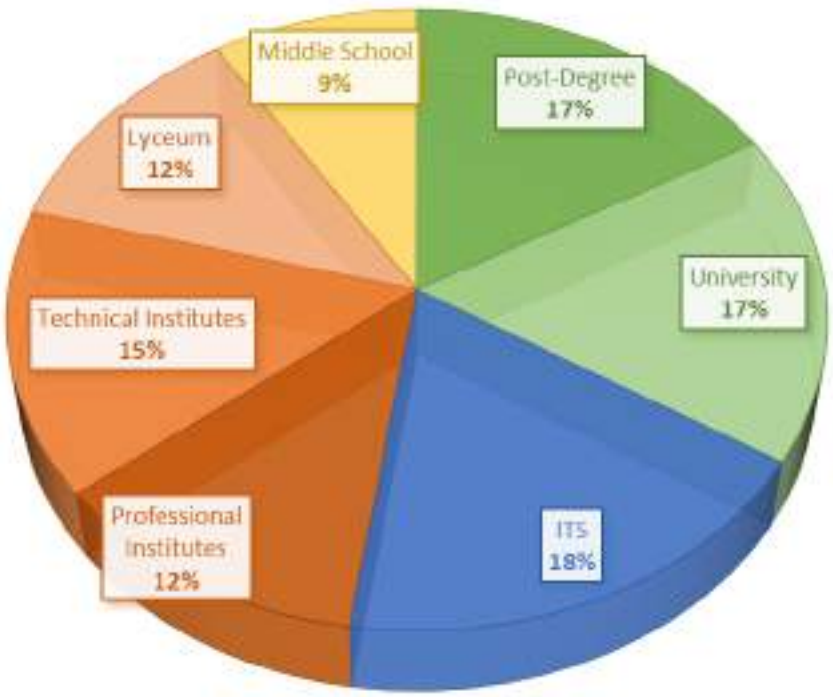
Products, processes or technologies that he should know how to handle

Integration of new technologies, Internet of Things, Production and service, Design, Electronic programming, Telemedicine

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

School level for required job roles

How the job roles should be trained (level)

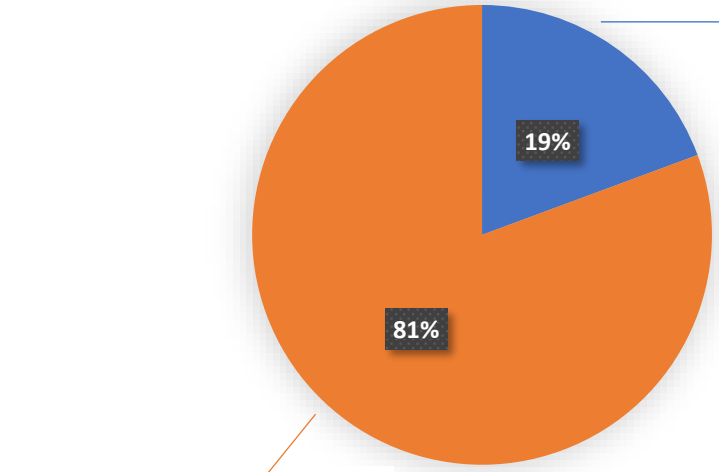


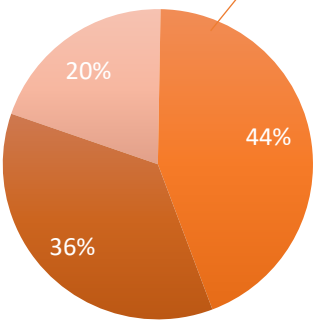
57% of lions are searching for people with no degree, but with clear skills (previous page). **It is a clear target group for an ITS on new topics, even with a transnational inclination.**

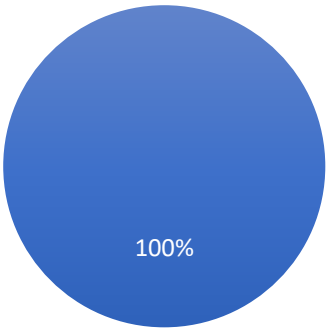
PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Topics to be taught

Subjects that an ideal candidate should study a lot







Results of interest for the project

- Electronic
- Information Technology
- Mechanic / Automation / Industrial

- Management \ Economy \ Languages

Examples

- **Industrial automation**
- **Big Data**
- **Automatic controls**
- **Drawing**
- **Electronics / Mechanical / Mechatronics**
- **Radiofrequency**
- **Software development**
- **ICT technologies**
- **Systems theory**

Examples

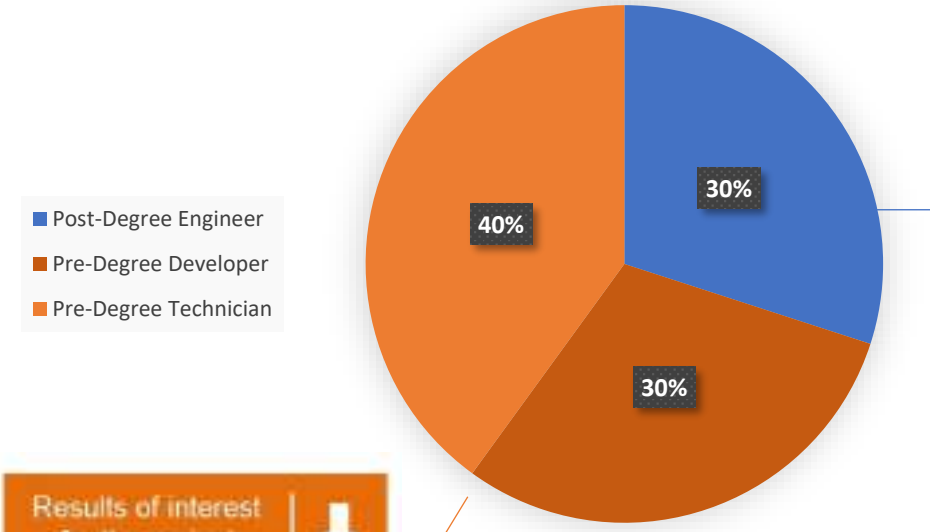
- **Languages** (English, German)
- **Technical planning**

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Focus on Cluster 2
HORSES (Followers)

Most needed job role

A job role linked to innovation that the company needs most



Results of interest for the project

Pre-Degree Focus

- **Developer:** Integrated Systems, PLC Software, Web
- **Technical**: Hardware, Mechatronic, Process, Production

Post-Degree Focus

- **Engineer**: Automation, IT, Mechanic

Products, processes or technologies that he should know how to handle

Industrial Automation, Production Cycle of the Dairy Industry, Cloud, Electronics, Programming Languages (Java, .NET), Products related to the management, production and distribution of thermal energy in process plants, PLC Programming, Robot, SCADA Software

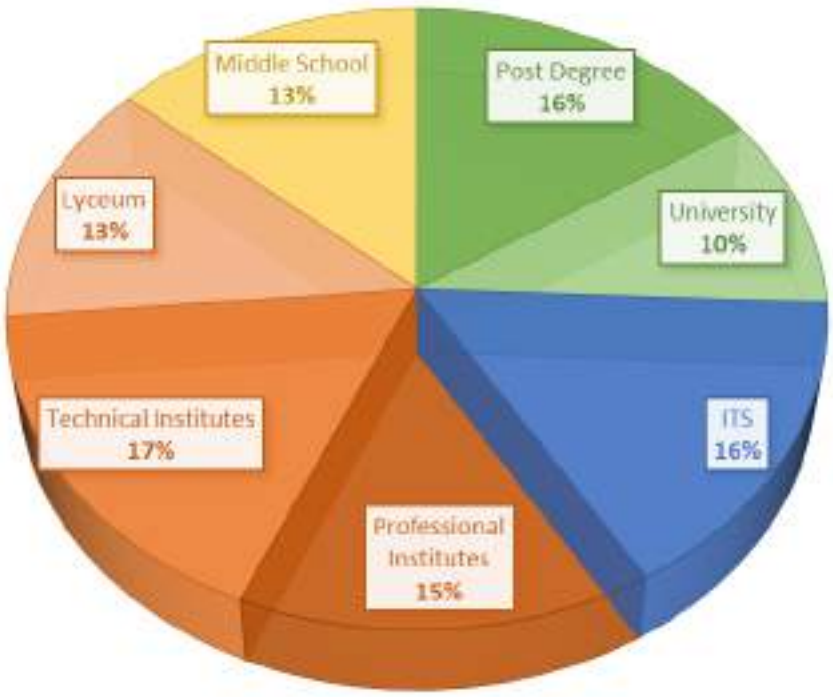
Products, processes or technologies that he should know how to handle

Electrical and technological plant engineering, Chemical, Biological and Hydraulic processes, PLC programming, SCADA software (supervision and data acquisition control)

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

School level for required job roles

How the job roles indicated should be trained

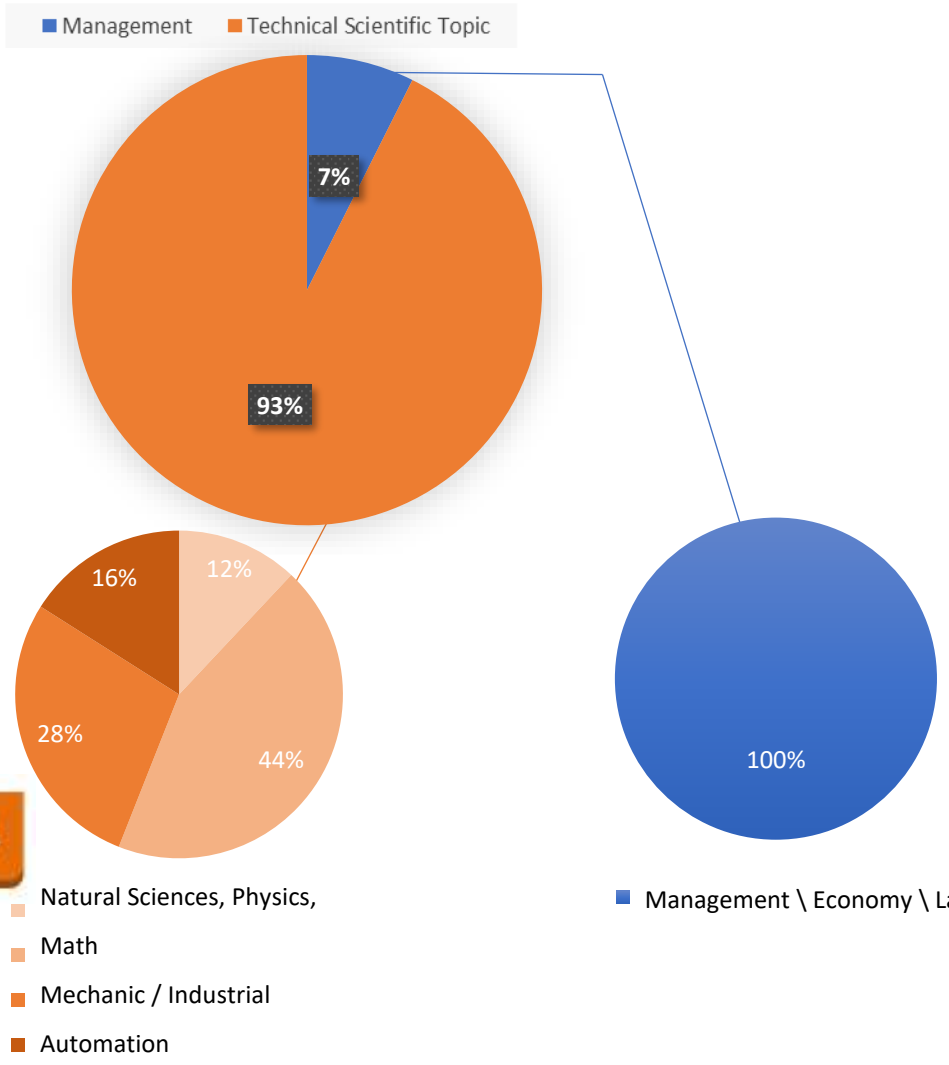


61% of Horses are searching for people with no degree, but with clear skills (previous page). **It is another clear target group for an ITS on new topics, even with a transnational inclination.**

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Topics to be taught

Subjects that an ideal candidate should study more



Results of interest for the project

Examples

- **Automation (PLC)**
- **Chemistry**
- **Electronics**
- **Physics**
- **Hydraulics**
- **Mechanical plants**
- **Computer technology**
- **Math**
- **Mechanics**
- **Software development**
- **Technology**
- **Heating topics**

Examples

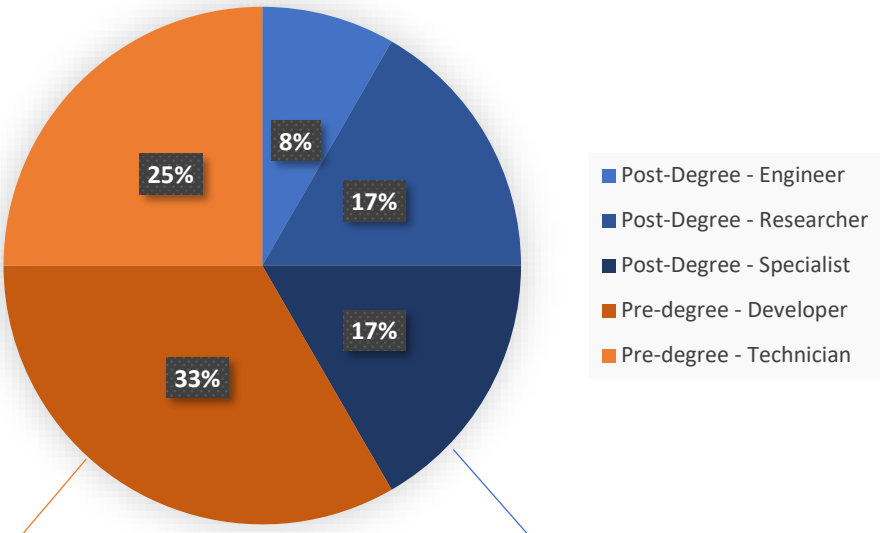
- **Languages** (English)

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Focus on cluster 3
CATS (Newcomers)

Most needed job role

A job role linked to innovation that the company needs most



Pre-Degree Focus

- **Developer**: Programmer Analyst (HTML 5, PHP, Java, Python), Embedded Systems, Software Developer
- **Technician**: Additive Manufactory, Electronic, Electrotechnical, Statistics, Mechatronic

Post-Degree Focus

- **Engineer**: Industrial Automation, IT
- **Researcher**: Technological
- **Specialist**: Innovation Manager, Project Manager

Products, processes or technologies that he should know how to handle

Business Intelligence, Construction and Service Machine Applications, DB PostgreSQL, EMI (electromagnetic interference) filters, waste management, HMI (Human Machine Interface), 3D CAD Design, PLC Programming, Python 2.7 / Python 3.6, 3D Scanning, Apache Server, SCADA Software, 3D Printing, Process Instrumentation

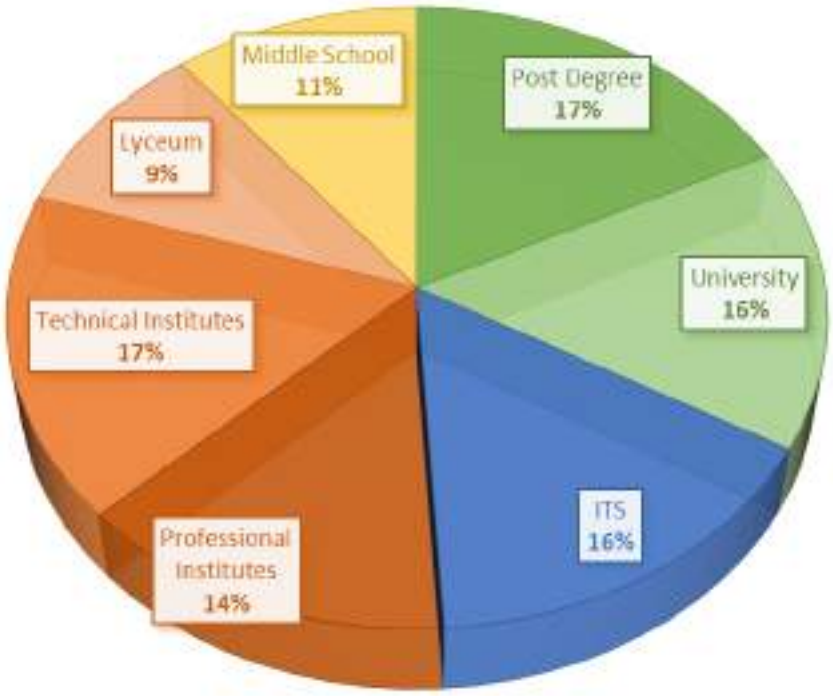
Products, processes or technologies that he should know how to handle

Big Data Management and Analytics, Cloud Computing, Systems Integration, Artificial Intelligence, IOT, Machine Learning, MES (Manufacturing Execution System), Mixed Reality, Innovation Processes, PLC Programming, Process Tracing Systems, SCADA Software

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

School level for required job roles

How the job roles indicated should be trained

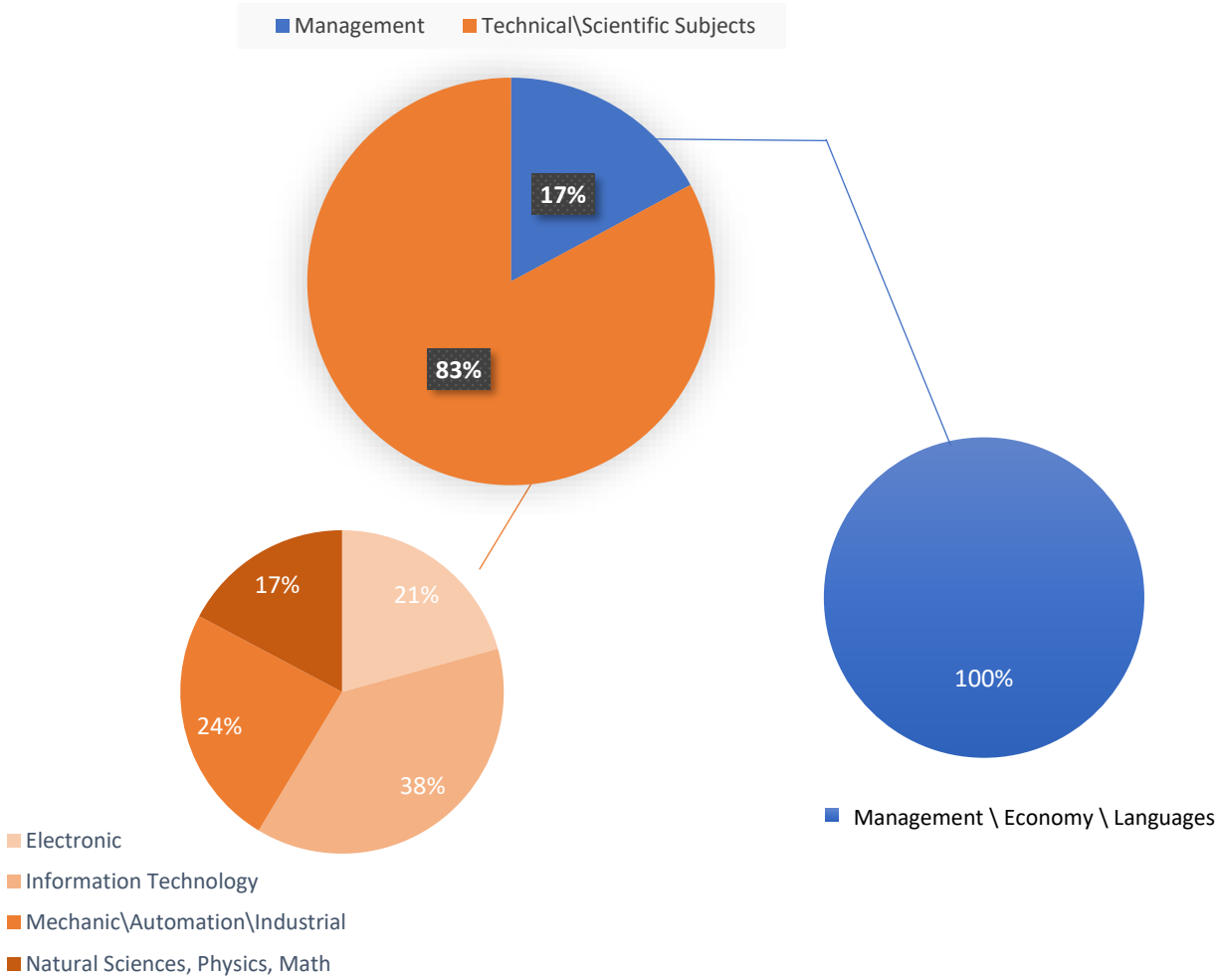


56% of Cats are searching for people with no degree, but with clear skills (previous page). **We would prefer not to consider those answers as major expectations expressed by the companies, preferring those coming from Lions and Horses, more structured companies.** Anyway, these choices seem to confirm the existence of a potential target group for a transnational ITS on the topics addressed and might be considered by Project Partners to confirm the outputs given by the other two clusters.

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Topics to be taught

Subjects that an ideal candidate should study more



Examples

- **Industrial applications**
- **Electronics**
- **Robotics**
- **Industrial Automation**
- **Engineering**
- **Software engineering**
- **Artificial intelligence**
- **Maths**
- **Materials**
- **Mechatronics**
- **3D modeling**
- **Programming**
- **Statistics**

Examples

- **Business**
- **Languages (English)**
- **Management**
- **Design**
- **Operative research**

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

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Appendix: relevant analysis on the topics addressed in this report

Emerging topics, trends and job roles (Excerpts from World Economic Forum - The Future of Jobs Report 2018)

As technological breakthroughs rapidly shift the frontier between the work tasks performed by humans and those performed by machines and algorithms, global labour markets are undergoing major transformations. These transformations, if managed wisely, could lead to a new age of good work, good jobs and improved quality of life for all, but if managed poorly, pose the risk of widening skills gaps, greater inequality and broader polarization.

What about drivers of change? Four specific technological advances—ubiquitous **high-speed mobile internet**; **artificial intelligence**; widespread adoption of **big data analytics**; and **cloud technology**—are set to dominate the 2018–2022 period as drivers positively affecting business growth. They are flanked by a range of socio-economic trends driving business opportunities in tandem with the spread of new technologies, such as national economic growth trajectories; expansion of education and the middle classes, in particular in developing economies; and the move towards a greener global economy through advances in new energy technologies.

Large proportions of companies are likely or very likely to have expanded their adoption of technologies such as the internet of things and app- and web- enabled markets, and to make extensive use of cloud computing. **Machine learning and augmented** and **virtual reality** are poised to likewise receive considerable business investment.

Companies expect **a significant shift on the frontier between humans and machines** when it comes to existing work tasks between 2018 and 2022. In 2018, an average of 71% of total task hours across the 12 industries covered in the report are performed by humans, compared to 29% by machines. By 2022 this average is expected to have shifted to 58% task hours performed by humans and 42% by machines.

Across all industries, by 2022, growth **in emerging professions is set to increase their share of employment** from 16% to 27% (11% growth) of the total employee base of company respondents, **whereas the employment share of declining roles is set to decrease** from currently 31% to 21% (10% decline). About half

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of today's core jobs—making up the bulk of employment across industries—will remain stable in the period up to 2022.

One set of estimates indicates that 75 million jobs may be displaced by a shift in the division of labour between humans and machines, while 133 million new roles may emerge that are more adapted to the new division of labour between humans, machines and algorithms.

Change in workforce transformations will be the following: 1) large-scale decline in some roles as tasks within these roles become automated or redundant, and 2) large-scale growth **in new products and services—and associated new tasks and jobs— generated by the adoption of new technologies** and other socio-economic developments such as the rise of middle classes in emerging economies and demographic shifts.

Emerging in-demand roles are in the period up to 2022 are **Data Analysts** and Scientists, **Software and Applications Developers**, and **Ecommerce and Social Media Specialists**, roles that are significantly based on and enhanced by the use of technology. Also expected to grow are roles that leverage distinctively 'human' skills, such as **Customer Service Workers**, **Sales and Marketing Professionals**, as well as **Innovation Managers**.

Moreover, our analysis finds extensive evidence of accelerating demand for a variety of wholly new specialist roles related to understanding and leveraging the latest emerging technologies: **AI and Machine Learning Specialists, Big Data Specialists, Process Automation Experts, Information Security Analysts, User Experience and Human-Machine Interaction Designers, Robotics Engineers, and Blockchain Specialists.**

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WORLD ECONOMIC FORUM

Top 10 skills

in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity

Source: Future of Jobs Report, World Economic Forum

Table 2: Trends set to impact business growth positively/negatively up to 2022, top ten

Trends set to positively impact business growth up to 2022	Trends set to negatively impact business growth up to 2022
Increasing adoption of new technology	Increasing protectionism
Increasing availability of big data	Increase of cyber threats
Advances in mobile internet	Shifts in government policy
Advances in artificial intelligence	Effects of climate change
Advances in cloud technology	Increasingly ageing societies
Shifts in national economic growth	Shifts in legislation on talent migration
Expansion of affluence in developing economies	Shifts in national economic growth
Expansion of education	Shifts of mindset among the new generation
Advances in new energy supplies and technologies	Shifts in global macroeconomic growth
Expansion of the middle classes	Advances in artificial intelligence

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Table 3: Examples of stable, new and redundant roles, all industries

Stable Roles	New Roles	Redundant Roles
Managing Directors and Chief Executives	Data Analysts and Scientists*	Data Entry Clerks
General and Operations Managers*	AI and Machine Learning Specialists	Accounting, Bookkeeping and Payroll Clerks
Software and Applications Developers and Analysts*	General and Operations Managers*	Administrative and Executive Secretaries
Data Analysts and Scientists*	Big Data Specialists	Assembly and Factory Workers
Sales and Marketing Professionals*	Digital Transformation Specialists	Client Information and Customer Service Workers*
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	Sales and Marketing Professionals*	Business Services and Administration Managers
Human Resources Specialists	New Technology Specialists	Accountants and Auditors
Financial and Investment Advisers	Organizational Development Specialists*	Material-Recording and Stock-Keeping Clerks
Database and Network Professionals	Software and Applications Developers and Analysts*	General and Operations Managers*
Supply Chain and Logistics Specialists	Information Technology Services	Postal Service Clerks
Risk Management Specialists	Process Automation Specialists	Financial Analysts
Information Security Analysts*	Innovation Professionals	Cashiers and Ticket Clerks
Management and Organization Analysts	Information Security Analysts*	Mechanics and Machinery Repairers
Electrotechnology Engineers	Ecommerce and Social Media Specialists	Telemarketers
Organizational Development Specialists*	User Experience and Human-Machine Interaction Designers	Electronics and Telecommunications Installers and Repairers
Chemical Processing Plant Operators	Training and Development Specialists	Bank Tellers and Related Clerks
University and Higher Education Teachers	Robotics Specialists and Engineers	Car, Van and Motorcycle Drivers
Compliance Officers	People and Culture Specialists	Sales and Purchasing Agents and Brokers
Energy and Petroleum Engineers	Client Information and Customer Service Workers*	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers
Robotics Specialists and Engineers	Service and Solutions Designers	Statistical, Finance and Insurance Clerks
Petroleum and Natural Gas Refining Plant Operators	Digital Marketing and Strategy Specialists	Lawyers

Table 4: Comparing skills demand, 2018 vs. 2022, top ten

Today, 2018	Trending, 2022	Declining, 2022
Analytical thinking and innovation	Analytical thinking and innovation	Manual dexterity, endurance and precision
Complex problem-solving	Active learning and learning strategies	Memory, verbal, auditory and spatial abilities
Critical thinking and analysis	Creativity, originality and initiative	Management of financial, material resources
Active learning and learning strategies	Technology design and programming	Technology installation and maintenance
Creativity, originality and initiative	Critical thinking and analysis	Reading, writing, math and active listening
Attention to detail, trustworthiness	Complex problem-solving	Management of personnel
Emotional intelligence	Leadership and social influence	Quality control and safety awareness
Reasoning, problem-solving and ideation	Emotional intelligence	Coordination and time management
Leadership and social influence	Reasoning, problem-solving and ideation	Visual, auditory and speech abilities
Coordination and time management	Systems analysis and evaluation	Technology use, monitoring and control

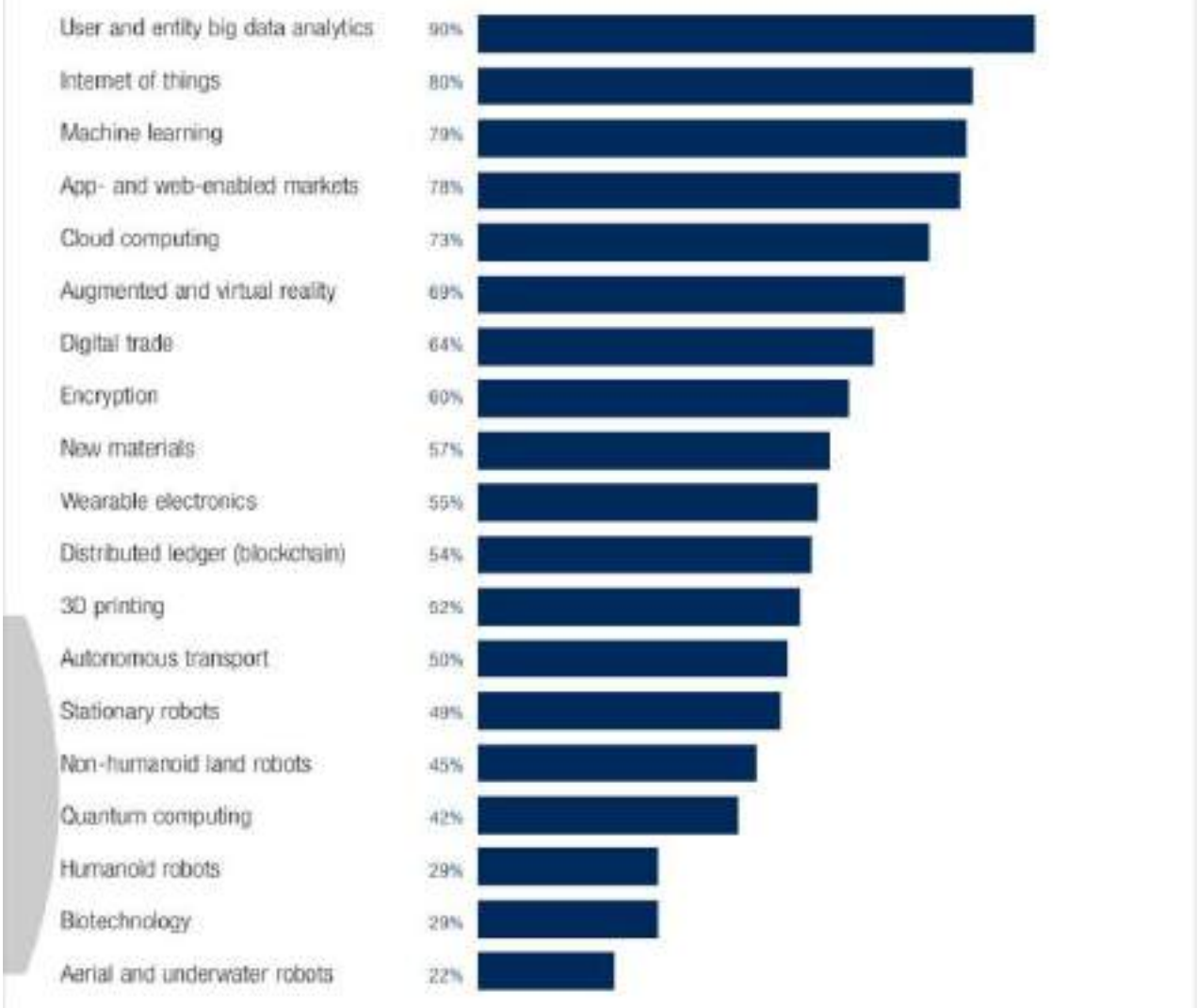
PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Regional Profile Western Europe

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Sales and Marketing Professionals
Data Analysts and Scientists
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial and Investment Advisers
Financial Analysts
Assembly and Factory Workers

Technology adoption *(share of companies surveyed)*

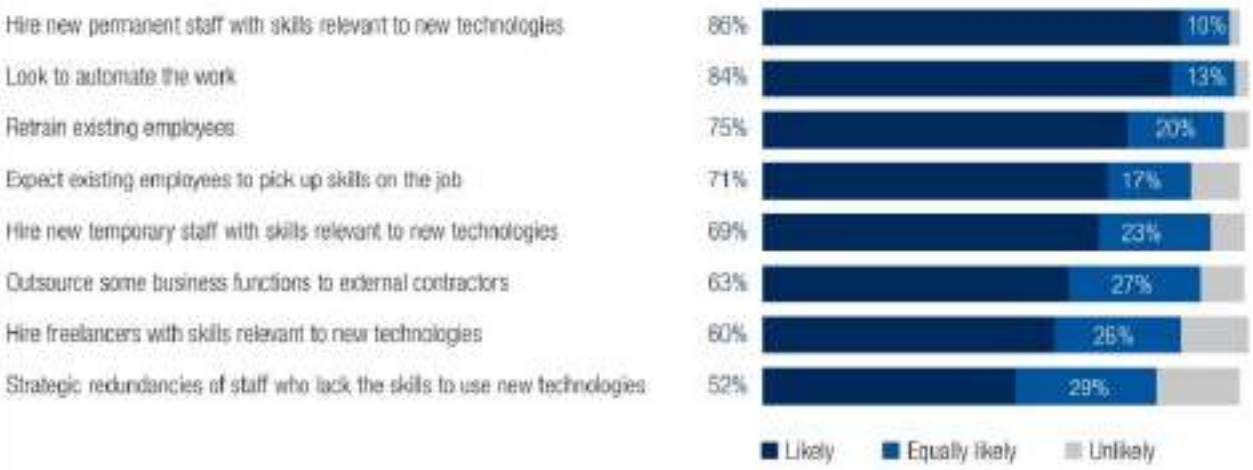


PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Emerging skills

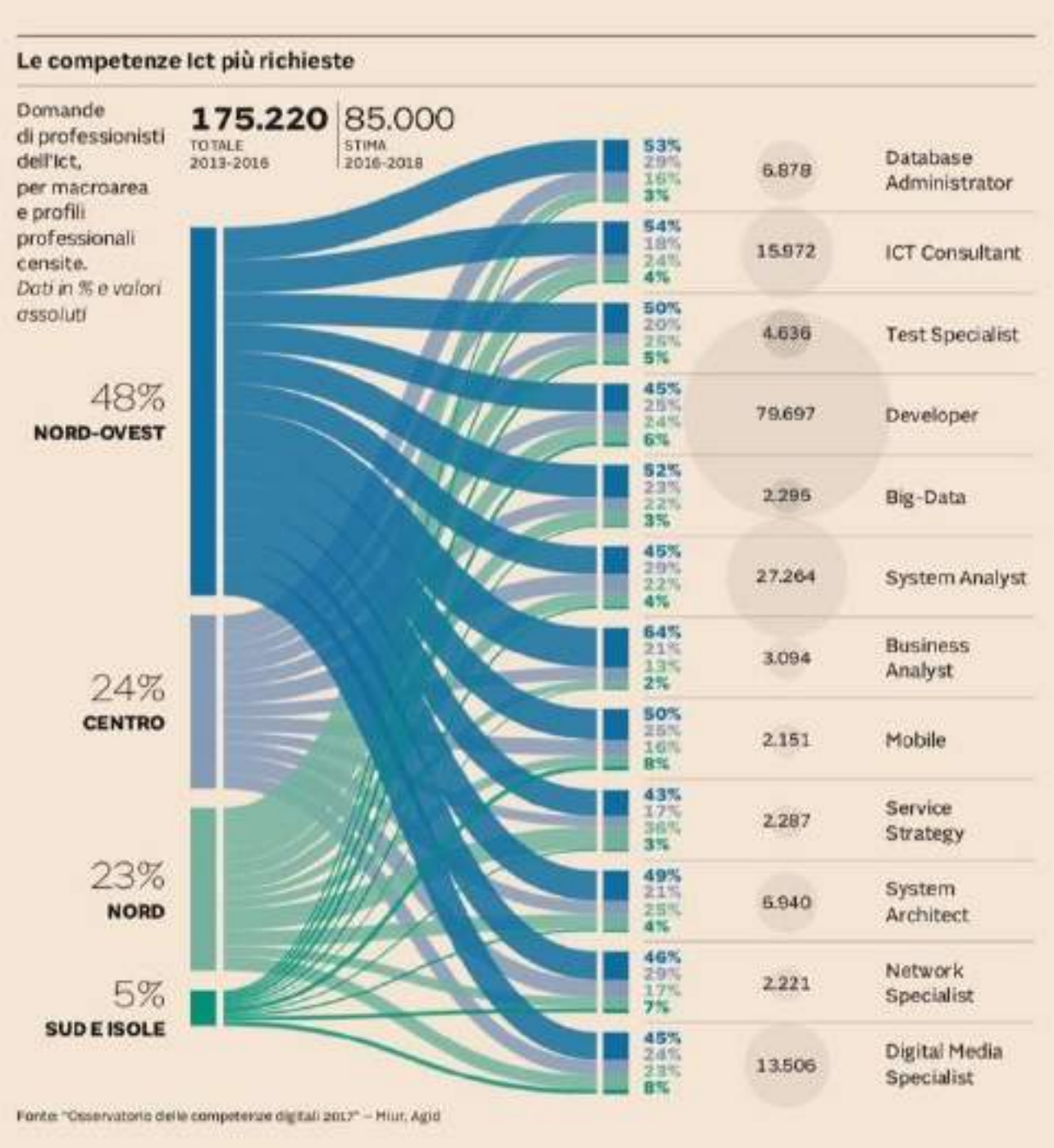
- Creativity, originality and initiative
- Analytical thinking and innovation
- Active learning and learning strategies
- Technology design and programming
- Complex problem-solving
- Critical thinking and analysis
- Leadership and social influence
- Emotional intelligence
- Systems analysis and evaluation
- Reasoning, problem-solving and ideation

Responses to shifting skills needs *(share of companies surveyed)*



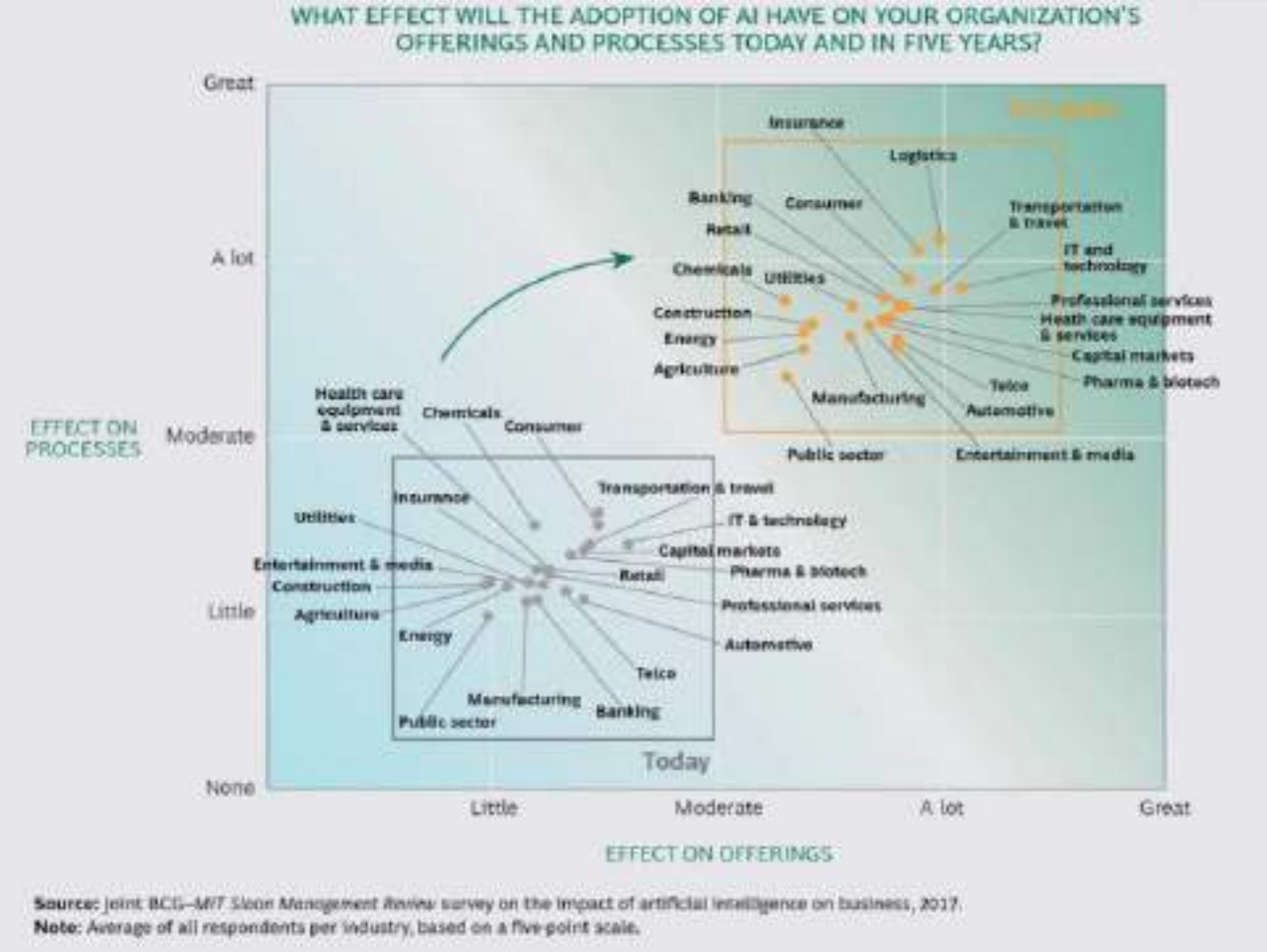
PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Most requested ICT competences in Italy (Sole 24 Ore, 2018, taken from MIUR-AGID, Digital Competences Observatory)



PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

Expectations for AI's effect on business across industries (Boston Consulting Group, Sloan Management Review, 2017)



Source: Joint BCG–*MIT Sloan Management Review* survey on the impact of artificial intelligence on business, 2017.
Note: Average of all respondents per industry, based on a five-point scale.

PROJECT NAME: "HIGH SPECIALIZED TECHNICIANS IN KETs" - **ACRONYM**: HISTEK - **PROJECT NUMBER:** 229

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Technical Assessment of the Training offer in the technological field

UAMD, Albania

Version n. 01

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I. Introduction

The report summarizes the results of a questionnaire on the offer of training for key enabling technologies carried out among Educational Institutions, from different regions of Albania. The questionnaire aims to identify current experiences and future competences requirements of Key Enabling Technologies (KETs).

The survey cluster is composed of 10 Educational institutions belonging to the 3°, 4° and 5° Educational Level (compared with the European Qualification Framework), with technical-technological orientation (with study programs relating to subjects such as technology, IT, electronics, industry, biotechnology, energy, etc.) located in different municipalities of Albania.

II. The importance of Key Enabling Technologies (KETs) in Europe

Key Enabling Technologies (KETs) are a group of six technologies that have a wide range of product applications such as developing low carbon energy technologies, improving energy and resource efficiency, and creating new medical products. They have huge potential to fuel economic growth and provide jobs.

KETs comprise micro and nanoelectronics, nanotechnology, industrial biotechnology, advanced materials, photonics, and advanced manufacturing technologies. They provide the basis for innovation in a wide range of industries such as automotive, food, chemicals, electronics, energy, pharmaceuticals, construction, and telecommunications. They can be used in emerging and traditional sectors.

They make steel stronger and more durable; they make cars lighter and safer; and they make a range of other products from medicines and bio-fuels to mobile devices, more effective and sustainable.

Because of their potential to help industry grow, KETs are a priority for European industrial policy. The European Strategy for KETs aims to accelerate the rate of exploitation of KETs in the EU and to reverse the decline in manufacturing to stimulate growth and jobs.

Small and medium-sized enterprises (SMEs) are expected to account for the majority of future jobs in KETs.

Countries and regions that fully exploit KETs will be at the forefront of advanced and sustainable economies. KETs deployment will contribute to achieving reindustrialization,

energy, and climate change targets simultaneously, making them compatible and reinforcing their impact on growth and job creation.

The Educational Institutions programs (3° and 4° EQF Levels) are not yet fully aligned to the skills needs for enabling technologies expressed by companies, which today require a wide range of advanced technical skills, as well as entrepreneurial skills, ICT skills, skills related to multidisciplinarity and creativity, capacity for project management and problem solving, ability to work with safety and quality standards, etc.

The potential growth of KETs depends largely on both the quality of the skills possessed by current and future employees, and the number of qualified people available to work in sectors that employ these new technologies.

The development of a short-cycle training offer, at a transnational level, aimed at preparing this specific target of qualified technicians, implemented according to the dual system to favor the rapid transition from the training world to that characteristic of small and medium-sized enterprises, seems to be the most effective and timely response to the concrete needs of technological development and innovation expressed by SMEs across borders.

III. HISTEK project

HISTEK aims at enhancing SMEs' capacities of competitiveness, innovation and internationalization, through the creation of a new CBC cluster whose members are SMEs, Training Organizations and Public Institutions, strongly committed to set-up and carry on, with a co-responsible approach, a cross-border innovation community. In order to improve SMEs' competitiveness and innovation, one of the most important leverage is represented by human resources, i.e. companies, especially those ones that have already or intend to establish new branches in CB area, need very highly qualified technicians according to CB common standards, to allow and to favor their mobility in the 3 Countries. For this reason HISTEK, will create the CBC cluster that will work soundly to develop common tools for assessing SMEs' needs in terms of human resources, and to create common standards to be adopted in the education systems for developing young highly qualified technicians. This represents in fact a strategic framework condition for the development of SME's cross-border market.

The CBC Cluster will be immediately operative, through a pilot action whose key elements are: 1) creation of a CB Assessment Tool Kit to be used by SMEs in recruiting activities of young technicians; 2) design of a new join (IT-AL-ME) CB tertiary education course, to be implemented soon after the end of the project, able to train high specialized technicians with advanced high technical preparation, particularly focused on Key Enabling Technologies. In fact, KETs are considered essential for growth and employment, since they provide the basis for

innovation in a wide range of industries; 3) dedicated toolkits and guidelines for improving the capacity of SMEs to deal with practical learnings inside the company and with mentoring activities. HISTEK wants to offer an effective and sustainable response to CB SMEs regarding the challenge of innovation against the economic crisis.

The First Step of the project focuses on a cross-analysis, conducted in the three countries, between SMEs' needs for highly specialized technicians with a specific basic preparation on new enabling technologies (KETs) and the training offer proposed by Educational Institutions (3°, 4° and 5° EQF Levels) on these technologies, in order to outline the possible gaps and identify an innovative technical profile (and related skills kit) to be trained through a new transnational short cycle path.

IV. Legislation

- Law no. 15/2017 "On Vocational Education and Training in the Republic of Albania"

This is the basic law on which the entire system of professional education in the Republic of Albania functions. The law basically provides basic concepts of vocational education, explains the necessary rules for how this education, duties, and responsibilities are realized and highlights the key institutions responsible for managing VET.

The main institution is the Ministry of Education, which has the responsibility to provide the development policies of this sector and, on the other hand, oversees the progress by seeing and evidencing the deficiencies in both legislation and its implementation.

The National Agency for Vocational Education:

  - compiles and maintains the National List of Professions;
  - compiles and maintains the National Catalog of Vocational Qualifications for Levels 2-5 of the Albanian Qualifications Framework;
  - Develop national programs and support materials for vocational qualifications at Levels 2-5 of the Albanian Qualifications Framework.

- Law no. 10247 dated 4.03.2010 "On the Albanian Qualifications Framework", amended by Law 23/2018. This law provides two important elements:

This law links the Albanian Qualifications Framework with the European Framework of Qualifications and the Qualifications Framework of the European Area of Higher Education.

The Framework contains 8 levels of qualifications, out of which we have separated 3°, 4° and 5° Educational Levels which are an important part of this project.

V. Methodology

The European Commission has given KETs a strategic role, recognizing them as one of the cornerstones of the technological development strategies of companies, especially SMEs, and identifying six of them:

KET 1 — MICRO/NANOELECTRONICS
KET 2 — NANOTECHNOLOGIES
KET 3 — INDUSTRIAL BIOTECHNOLOGY
KET 4 — PHOTONICS
KET 5 — ADVANCED MATERIALS
KET 6 — ADVANCED MANUFACTURING TECHNOLOGIES

From a methodological point of view, with the aim of facilitating the definition of a technical profile that can be effectively spent in the SMEs of the 3 countries (whose smart specializations are different), the analysis of the training offer will be verticalized, as initial first pilot action, on Advanced Manufacturing Technologies (KET 6). Their particularly transversal nature, in fact, compared to a wide range of application sectors, will allow the identification of an initial technical profile with a highly common technological preparation base but functional to the satisfaction of the diversified needs of the three territories.

The questionnaire cluster is composed of 10 Educational institutions belonging to the 3°, 4° and 5° Educational Level (compared with the European Qualification Framework), with technical-technological orientation (with study programs relating to subjects such as technology, IT, electronics, industry, biotechnology, energy, etc.).

The selection of the cluster of the educational institutions was made through a couple of steps.

The database of the Educational institutions belonging to the 3°, 4° and 5° Educational Level was made available by the National Agency for Vocational Training and Employment.

From this database it was made a selection of the educational institution taking into consideration the territorial division in the Republic of Albania in order to have a full coverage of the territory. The educational institutions were also selected pursuant to the objectives of the HISTEK project.

Initially, it was sent a Letter of Interest to all the selected institutions and it was given a deadline to respond to their readiness. After many difficulties in taking a response from the contacted institutions, 10 of the educational institutions were ready to be involved in the project.

The questionnaire was sent to the selected institutions which had to return it back filled and signed by the educational institution's legal person and sealed by him.

During this period were found:

• Difficulties and delays in returning the response after sending the "Letter of Interest". This is due to the lack of practice of online communication, as in our communication culture the most effective communication is face to face. As a consequence the working group had to communicate several times with the institutions providing vocational education.

• Difficulties and delays in completing the questionnaire. This difficulty has come because some institutions did not understand some of the terms or the difference between a term and another. Numerous consultations have been made by the working group with persons charged by educational institutions for filling in the questionnaires via email, phone or assistance in their offices to facilitate this process.

On March 6, 2019, the questionnaire submission process was completed.

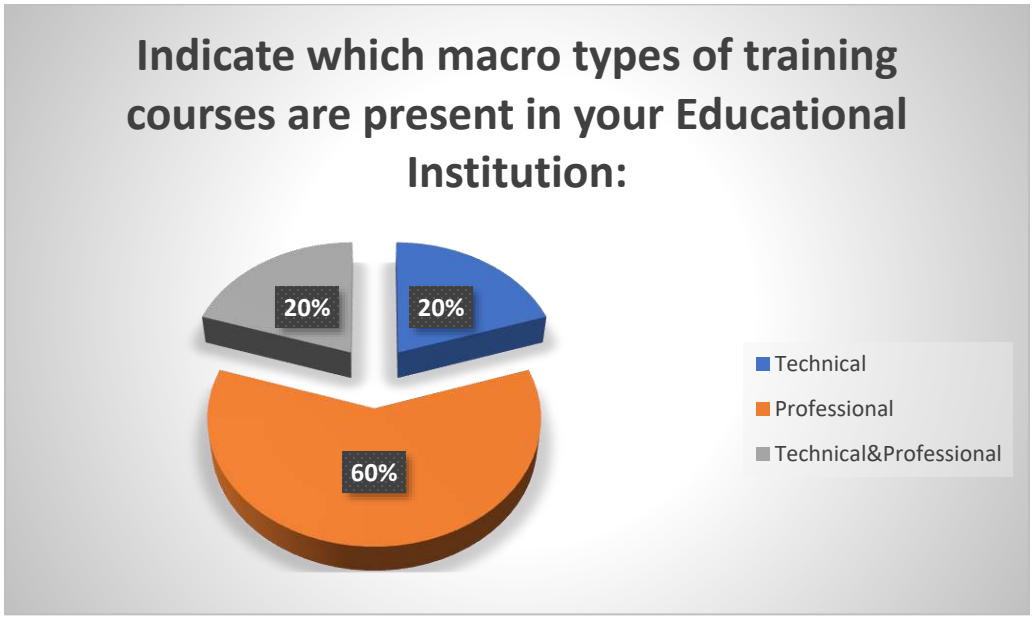
The Training Institutes taking part in the survey will then be invited to join the new HISTEK transnational Cluster.

Our analysis focused on skills in Advanced Manufacturing Technologies (KET 6), which, due to their cross-cutting nature, can be applied to different contexts, sectors and a wide range of occupations. In addition to the technical skills, the analysis were also directed to other groups of skills, of a more transversal and multidisciplinary nature, which are considered fundamental to operate within innovative contexts that use enabling technologies.

VI. Analysis of the database/ Results

6.1.Educational Institution Data

From the interviewed educational institutions, 60% of them provide *professional training courses*, 20% provide *technical training courses* and only 20% of them provide both *technical & professional training courses*.



Graph 1 : Macro types of training courses

From the analysis it results that there are different technical-technological pathways for different educational institutions. The most present pathway in these institutions is Information and Communication Technology (ICT), followed by thermo-plumbing, auto mechanics and electro-technics. Below there is a detailed table with the areas of expertise for the following educational institutions:

Educational Institution	**Area of expertise**
BeqirCela Vocational High School	Auto mechanics; Electro-mechanics; Information and Communication Technology; Thermo-plumbing
Vocational ICT School	Information and Communication Technology (ICT)
Industrial High School "Pavarësia"	Mechanics; Public service transport; IT; Thermo-plumbing; Electro-Technics
Regional Directorate of Public Vocational Training of Durres	technicians for solar panels, electricians, mechanics for vehicle repairs, information technology specialists, social workers, cooking, tailoring, hairdressing and barbers, masonry, foreign languages (English, Italian, German).
HysenCela	Tourism hotel; Food technology; Economy; Textile confection; Sailorly
Vocational Technical " DemirProgri"	Transport vehicle service; Mechanics; Electro-Technics

Table 1 Detailed table with the areas of expertise for the following educational institutions

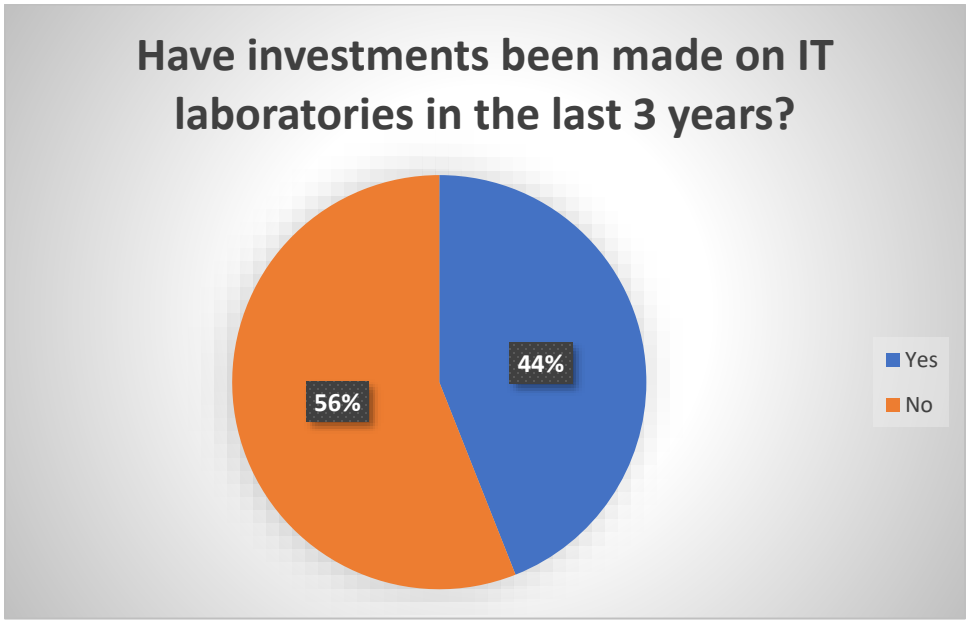
6.2.Material Resources

Depending on the size of the educational institutions there is a number of locations of minimum 1 to a maximum of 7 locations per institution. Regarding the number of classroom devoted to normal teaching activities it results in a range of minimum 5 classes to a maximum of 74 classes. It is to be noted that only one institution (Vocational Technical School "Demir Progri") has no classrooms with internet and PC. The number of classrooms with internet and PC reaches a maximum of 35 for one of the educational institutions.
All the institutions have computers available to students with a minimum of 10 computers and a maximum of 100 computers per institution. Also every interviewed institution has IT labs with a minimum of 1 to a maximum of 7 laboratories per institution.
Only 9 of the interviewees answered these questions.

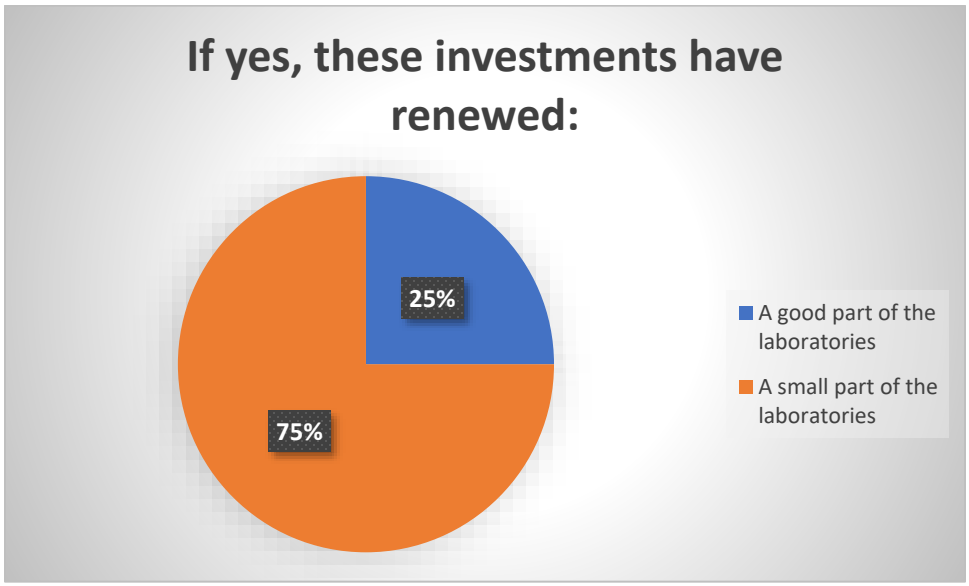
	Minimum	Maximum
A. Number of locations of which your Institution is composed (including separate buildings)	1	7
B. Number of classrooms devoted to normal teaching activities	5	74
C. Number of classrooms with internet and PC connection	0	35
D. Number of computers (fixed and portable) available to students	10	100
E. Number of IT labs	1	7

Table 2: Material Resources

From the analysis it results that 44% of the interviewed institutions have made investments on IT laboratories made in the last three years from which only 1 institution has made investments in a good part of the laboratories. The rest of them have made investments only in a small part of the laboratories. Only 9 of the interviewees answered these questions.



Graph 2: Have investments been made on IT laboratories in the last 3 years?



Graph 3: %. of the renewed laboratories

Regarding the number of classrooms used for linguistic laboratories, it results that only one institution (Regional Directorate of Public Vocational Training Durres) has 3 classrooms for linguistic laboratories. Other 2 institutions have only one classroom for linguistic laboratories. The rest of the interviewed institutions have no classrooms for linguistic laboratories.

	Minimum	Maximum
Number of classrooms used for linguistic laboratories	0	3

Table 3: No. of classrooms used for linguistic laboratories

On the other side there is a larger number of technological laboratories reaching a number of 26 laboratories in one of the interviewed institutions (BeqirCela Vocational High School). The other parts of the institutions have a number of technological laboratories ranging from a minimum of 3 to a maximum of 9 laboratories. Three of the interviewed educational institutions have no technological laboratories.

	Minimum	Maximum
Number of technological laboratories (both fixed and mobile) available	0	26

Table 4: No. of technological laboratories (both fixed and mobile) available

There are various types and number of technological laboratories available through the interviewed institutions detailed as follows:

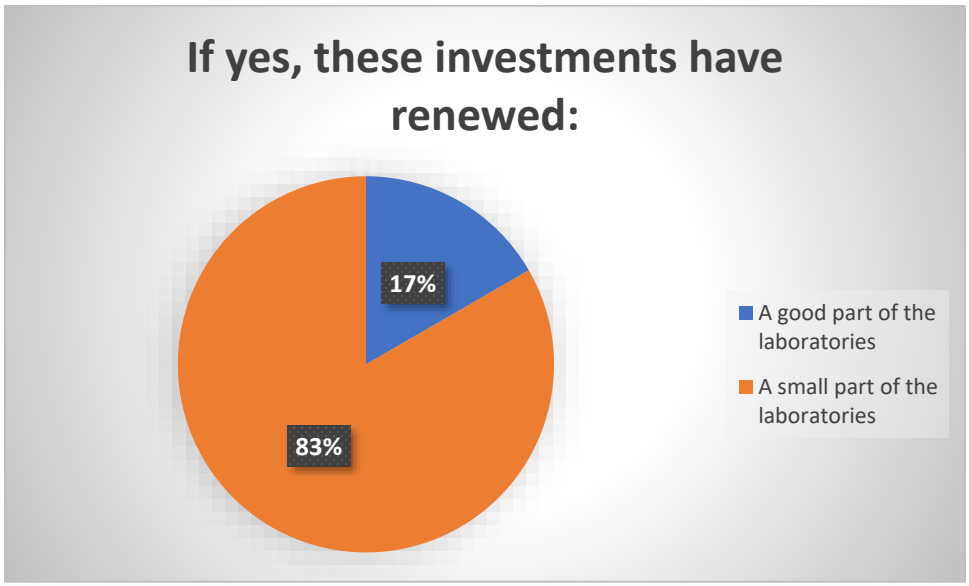
Educational Institution	**Area of expertise**	**Number**

BeqirCela Vocational High School	1. Automechanics 2. Electromechanics 3. ICT 4. Thermoplumbing 5. Technical drawing 6. Chemistry	10 5 7 2 1 1
Vocational ICT School	1. ICT	1
Regional Directorate of Public Vocational Training of Durres	2. Solar panels 3. Electric wiring 4. Vehicle repair 5. ICT 6. Cooking 7. Tailoring 8. Hairdressing and barber 9. Masonry	1 1 1 1 1 1 1 1
HysenCela	1. Kitchen 2. Bar/Restaurant 3. Confectionery 4. Textile confection 5. Control of food analysis 6. Sailorly	2 2 1 1 1 1
Vocational Technical ” DemirProgri”	1. Mechanics lab 2. Automobile lab 3. Electrotechnics	1 1 1
Regional Directorate of Public Vocational Training of Elbasan	1. simulator of electrician connection 2. simulator of car mechanical connection 3. simulator of car plumber connection 4. computer labs for english course	1 1 1 1
"Aleksander Moisiu" University, Durres	1. Energy Efficiency laboratory 2. Automotive laboratory 3. Electrical laboratory 4. Navigation laboratory 5. Physics laboratory	1 1 1 1 1

Table 5: Types and number of technological laboratories

From the analysis it results that 67% of the institutions have made investments on technological laboratories in the last three years. Only one of the institutions has made investments in a good part of the laboratories. The rest of them have made investments only in a small part of the laboratories. Only 9 of the interviewees answered this question.

Graph 4: Have investments been made on technological laboratories in the last 3 years?

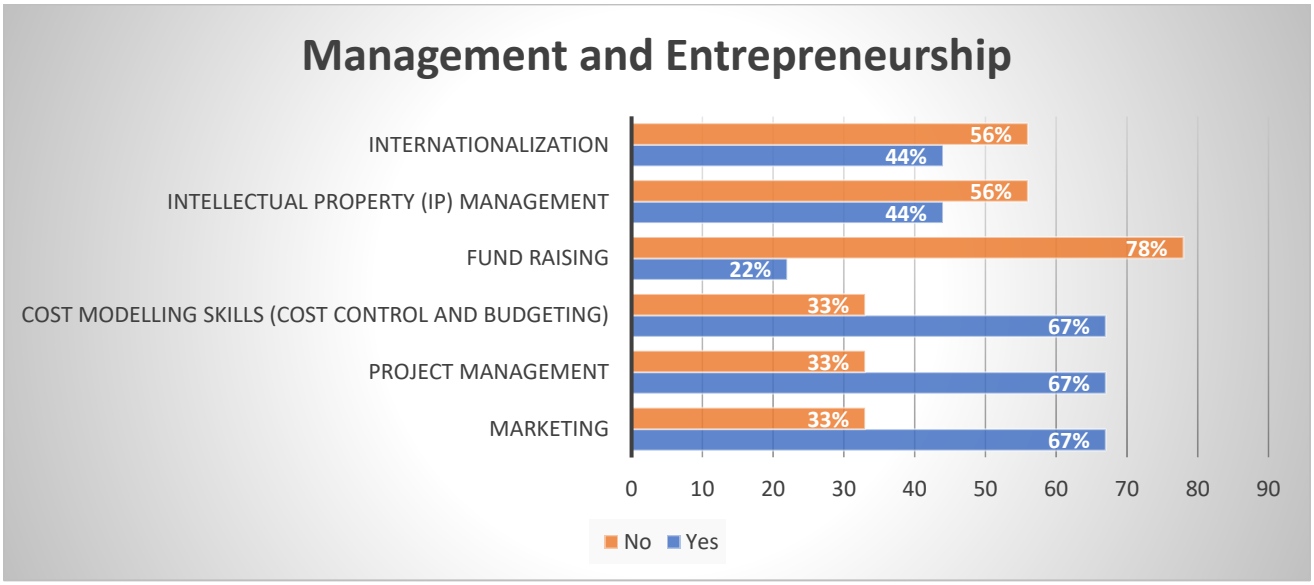


Graph 5: No. of renewed laboratories

6.3.Professional Resources

The questionnaire also investigated the adequacy of skills and occupations of involved professional resources. A large part of the educational institutions, specifically 67% of them have teachers specialized in *Marketing, Project Management and Cost modeling skills*. Only 44% of them have teachers in specialized *Intellectual Property Management and Internationalization*. It should be noted that only 2 of the educational institutions have teachers specialized in "*Fund raising*" discipline.

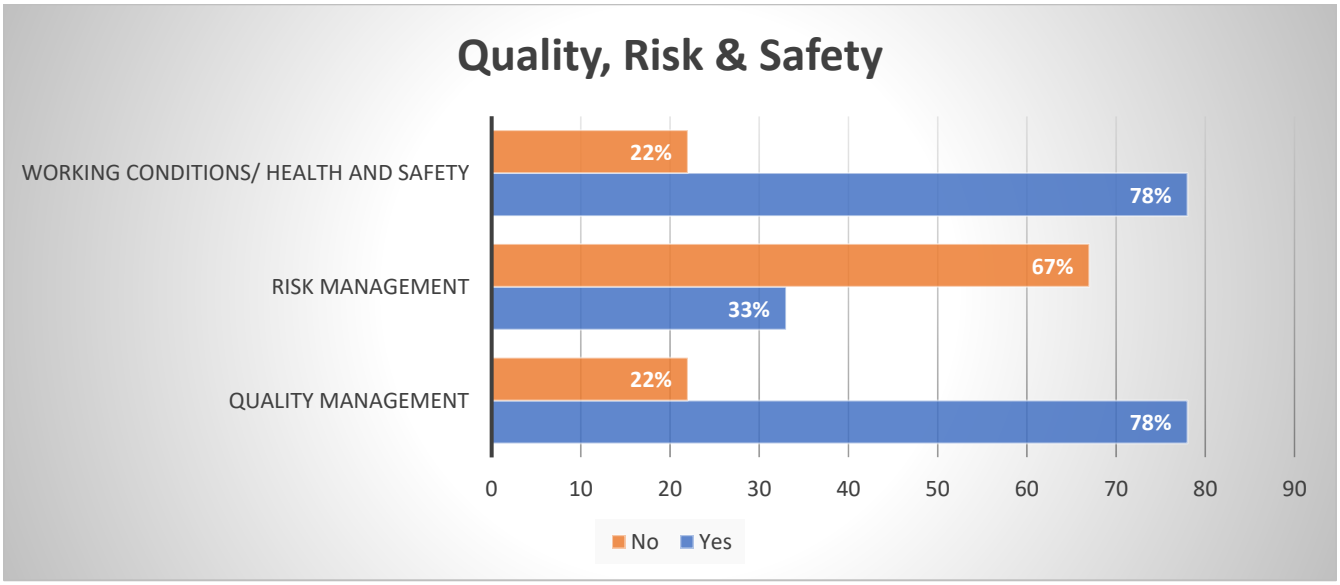
Only 9 of the interviewees answered these questions.



Graph 6: Management and Entrepreneurship

Regarding the presence of teachers in Quality, Risk & Safety disciplines, it results that 78% of the interviewed institutions have teachers specialized *in Quality Management and Working conditions/ Health and safety*. On the other hand only 3 of the interviewed institutions have teachers specialized in *Risk Management*.

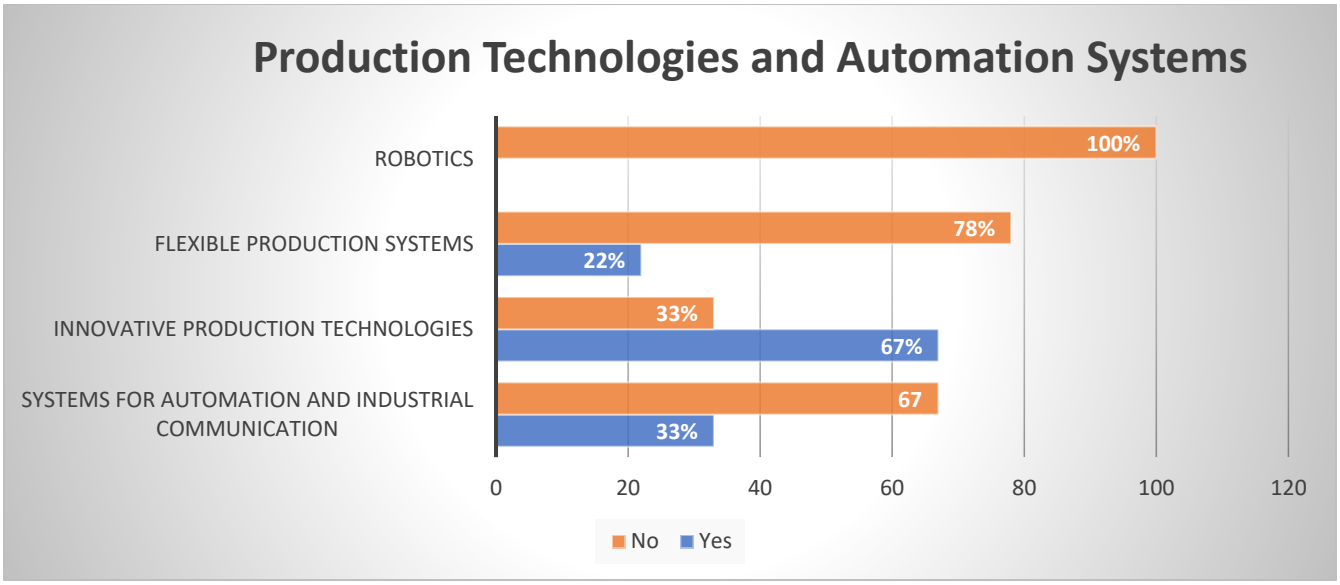
Only 9 of the interviewees answered these questions.



Graph 7: Quality, Risk & Safety

From the answers of the interviewed educational institutions, on 67% of the institutions there is a presence of teachers specialized in *Innovative production technologies*.

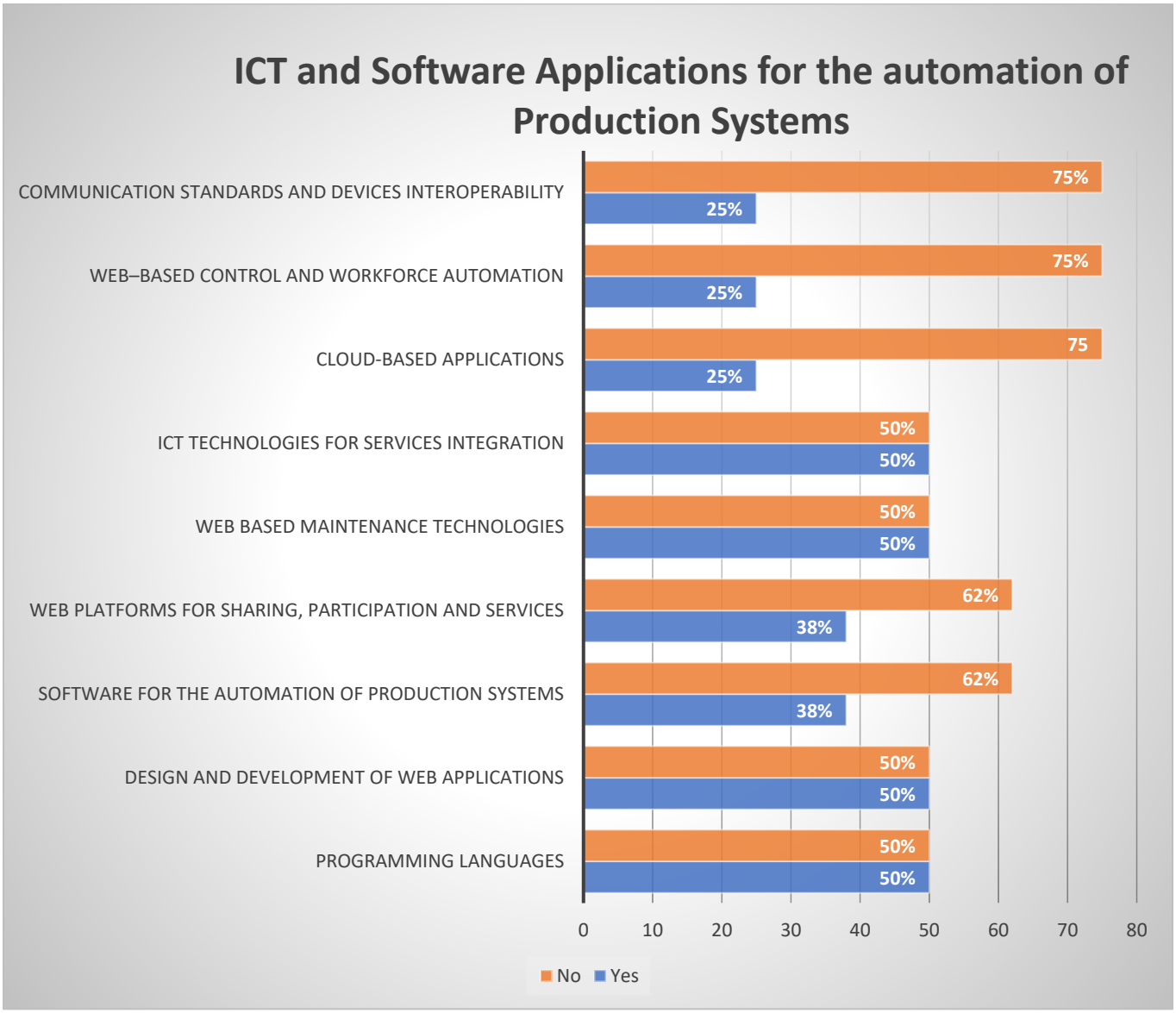
It should be noted that in the interviewed institutions there are no teachers specialized in Robotics. Only 9 of the interviewees answered these questions.



Graph 8: Production Technologies and Automation Systems

It is seen a lack of teachers specialized in communication standards and devices interoperability, web-based control and workforce automation and cloud based applications where only 25% of the interviewed institutions have teachers specialized in these fields. Also there are only 38% of the interviewed institutions that have teachers specialized on *web platforms for sharing, participation and services and software for the automation of productions systems*.

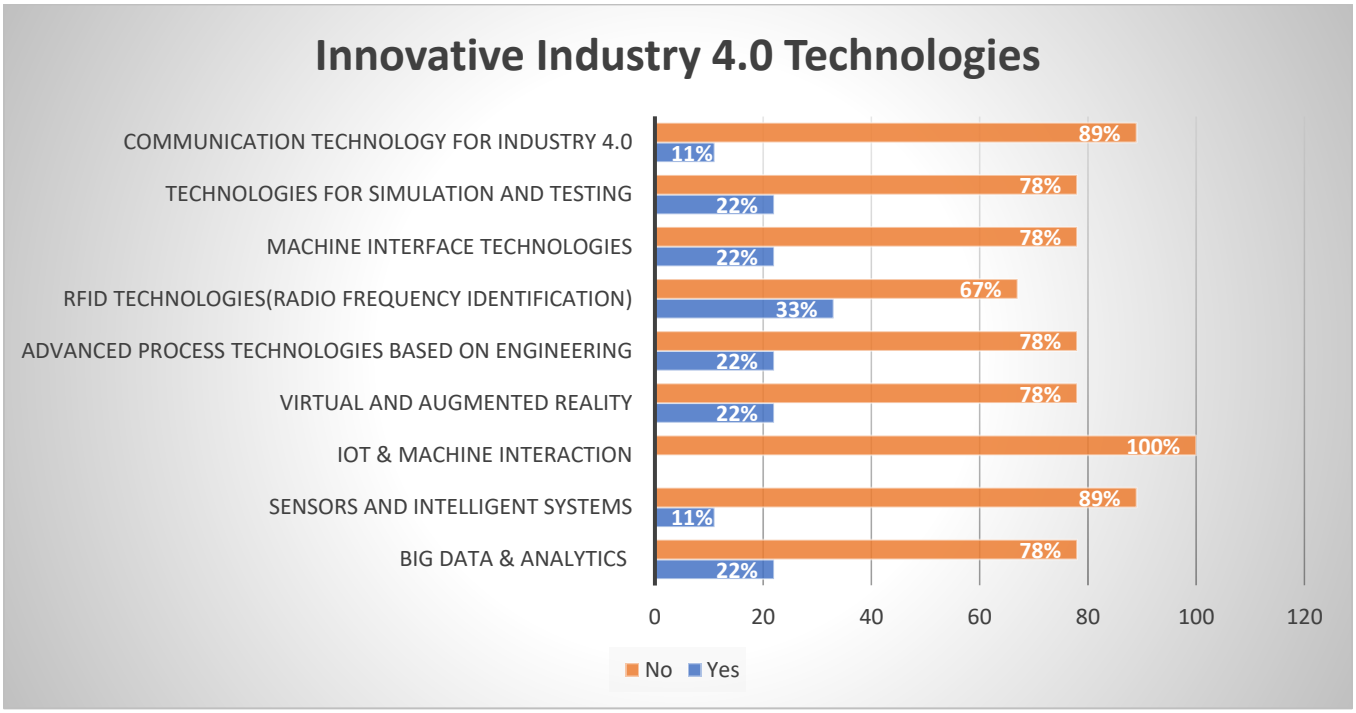
Only 8 of the interviewees answered these questions.



Graph 9: ICT and Software Applications for the automation of Production Systems

From the interviewed educational institutions it is seen a lack of teachers specialized in *Innovative Industry 4.0 Technologies* where only one or two institutions have teachers specialized on its subcategories. *Also there are no institutions with teachers specialized on IOT & Machine Interaction.*

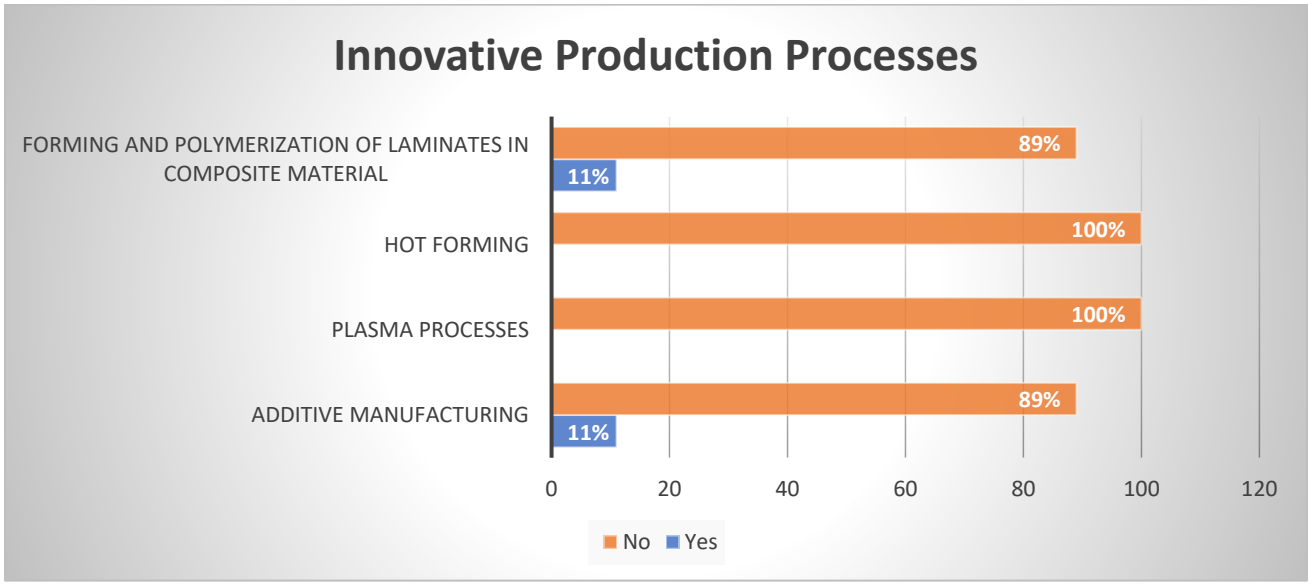
Only 9 of the interviewees answered these questions.



Graph 10: Innovative Industry 4.0 Technologies

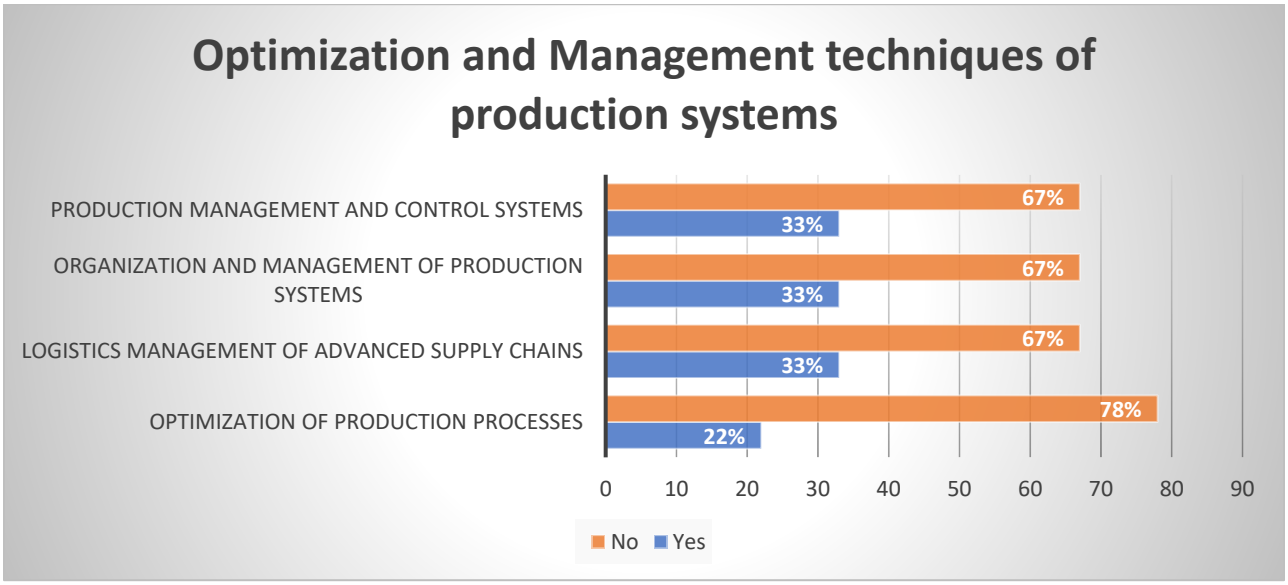
Innovative production processes is another field where the interviewed educational institutions have a lack of specialized teachers. There is only one interviewed institution that has teachers specialized on *Forming and Polymerization of laminates in composite material and Additive Manufacturing*. *There are no teachers specialized on Hot Forming and Plasma Processes.*

Only 9 of the interviewees answered these questions.



Graph 11: Innovative Production Processes

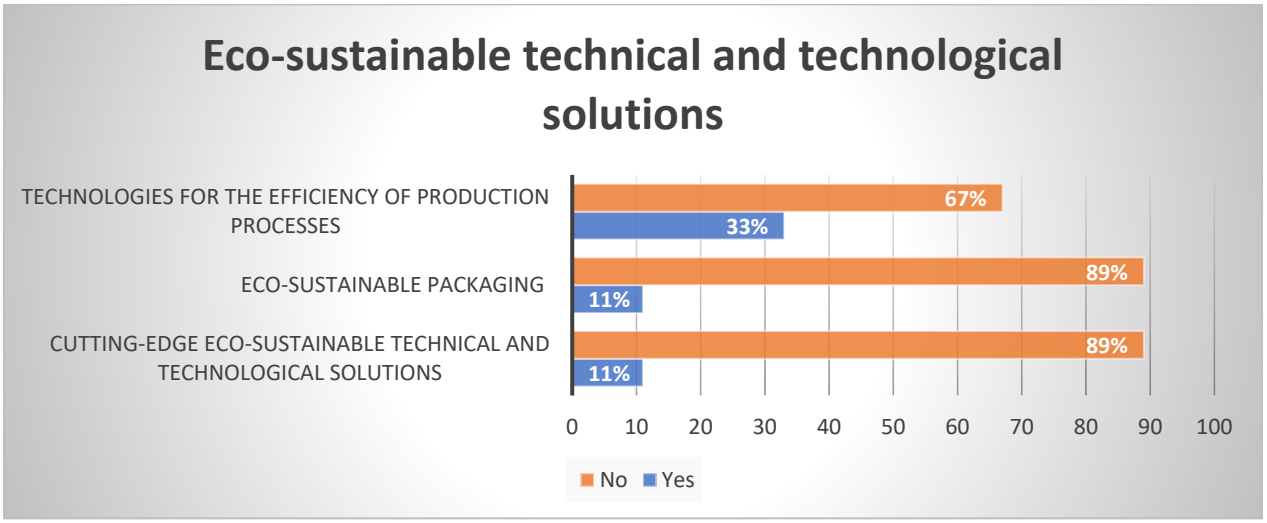
Regarding optimization and management techniques of production systems, from the interviewed institutions only 33% of them have teachers specialized on *Production Management and Control Systems, Organization and Management of Production systems and Logistics management of advanced supply chain*s. On the other side only two of the institutions have teachers specialized on *Optimization of Production processes.* Only 9 of the interviewees answered these questions.



Graph 12: Optimization and Management Techniques of productions systems

It is seen a presence of teachers specialized on *Eco-sustainable packaging and Cutting-edge eco-sustainable technical and technological solutions* in only one of the interviewed institutions. Whereas there are three interviewed institutions that have teachers specialized on *Technologies for the efficiency of production processes.*

Only 9 of the interviewees answered these questions.



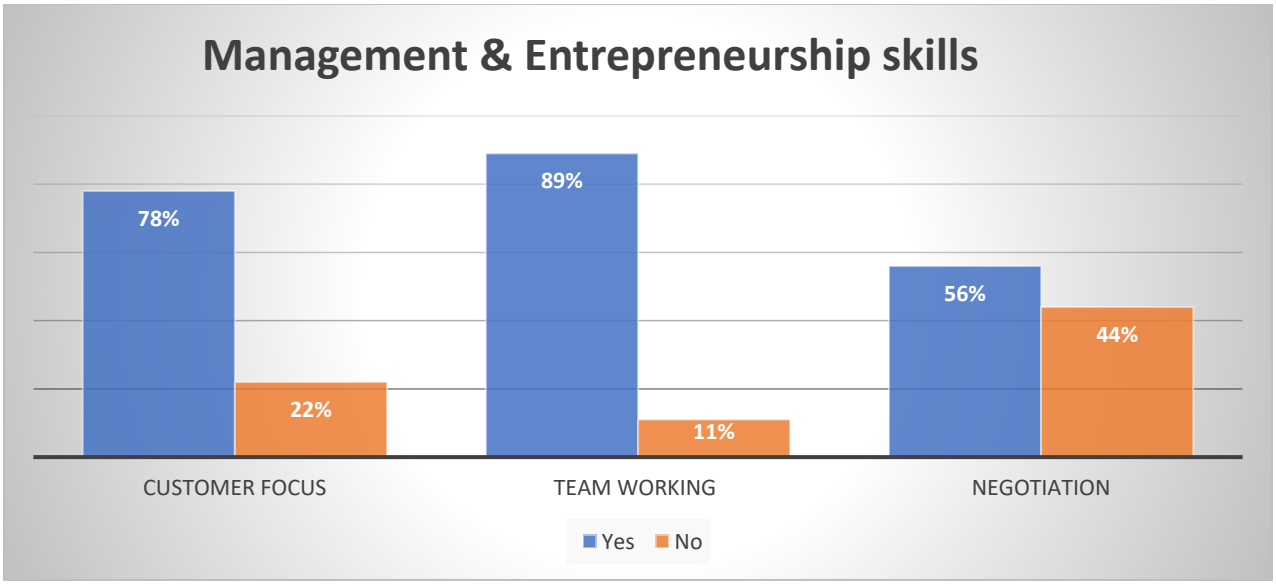
Graph 13: Eco-sustainable technical and technological solutions

6.4.Area of Behavioral Skills

Regarding *Management and Entrepreneurship skills* during the curricular and extra-curricular activities, courses are mainly arranged in *Team Working* for 89% of the interviewed institutions. 78% of them plan their curricular activities on *Costumer Focus*.

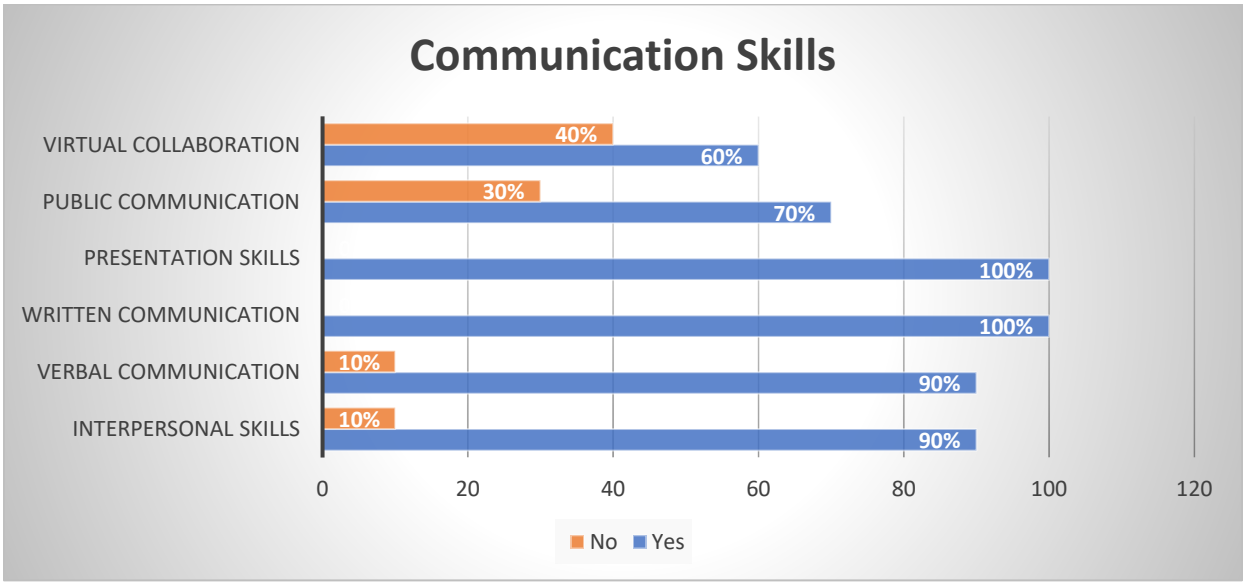
Each vocational training course curriculum includes topics specific to each vocation intended to offer management and entrepreneurial skills. The course assignments are given to students, so that it can be realized by working in groups.

Only 9 of the interviewees answered these questions.



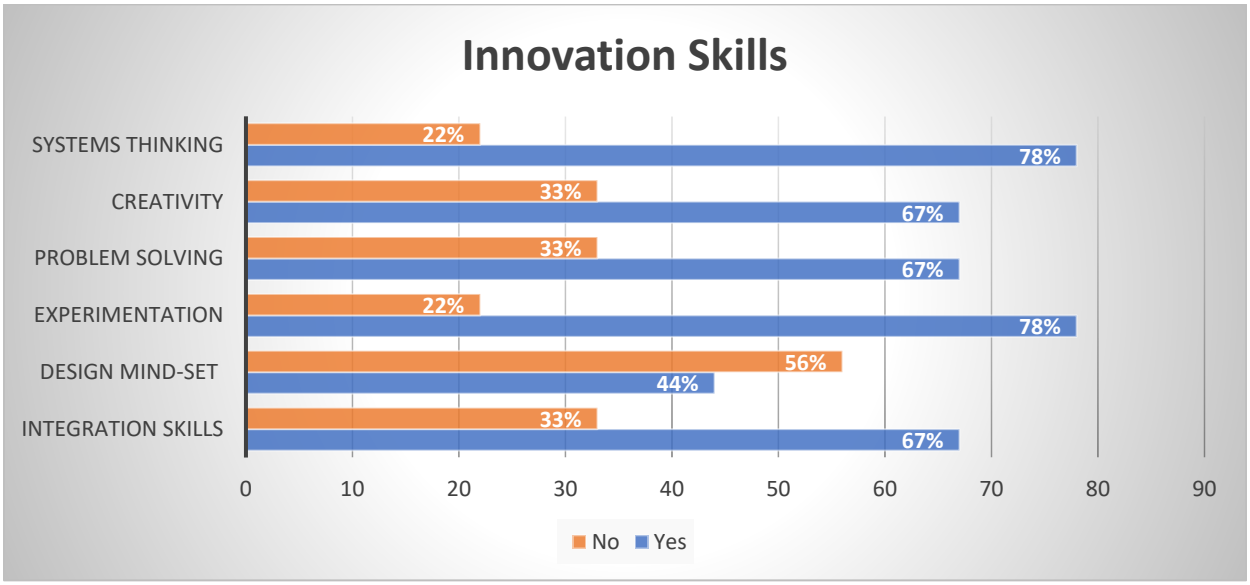
Graph 14: Management & Entrepreneurship skills

For the interviewed institutions the *communication skills* are an important pillar that almost 100% of them include in their teaching methods. *Virtual Collaboration* is the category that is included in the teaching methods by only 60% of the interviewed institutions. Teachers require that students complete visual projects and present them to their peers. Additionally, extra-curricular activities that develop communication skills are available. Also they are organized in team work, demonstration, cooperation, discussion, round table talk, and brainstorming.
Only 9 of the interviewees answered these questions.



Graph 15: Communication Skills

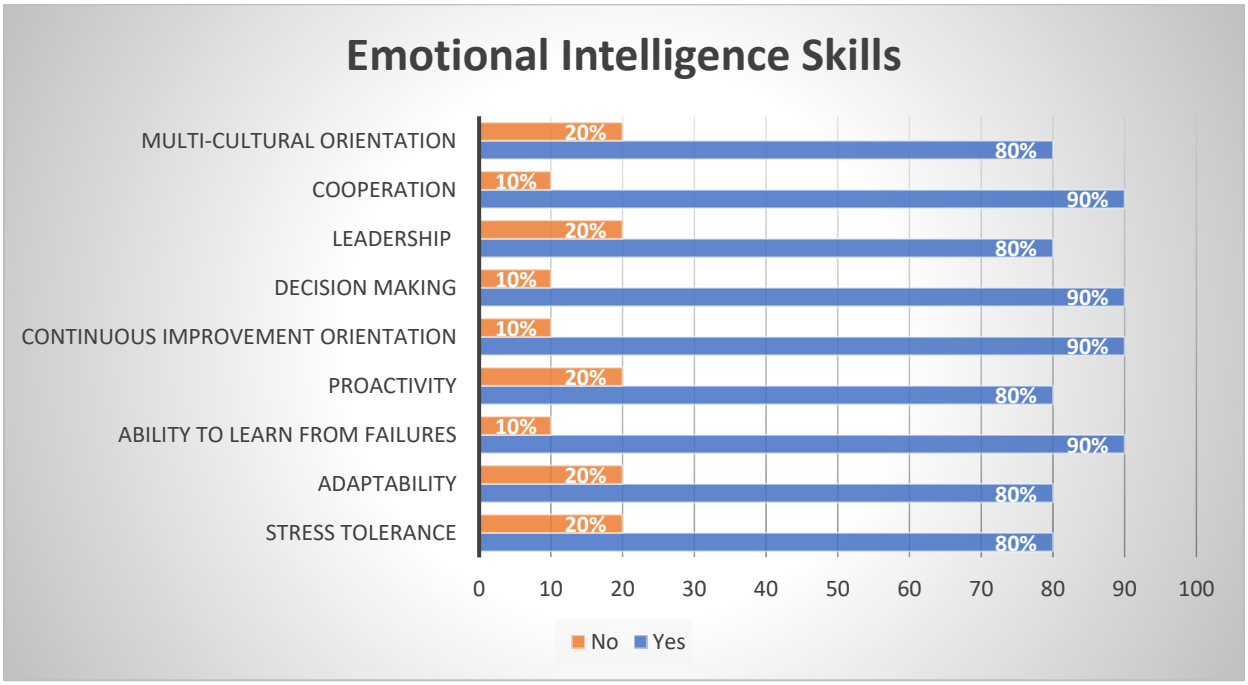
A large part of the interviewed institutions include *innovation skills* in their teaching methods. It should be highlighted that *design mind-set* is not broadly included in the teaching methods of the interviewed educational institutions, where only 44% of them include it. Innovation opportunities are provided through weekly practicum days. The classes are done through Project based teaching, national and international projects.
Only 9 of the interviewees answered these questions.



Graph 16: Innovation Skills

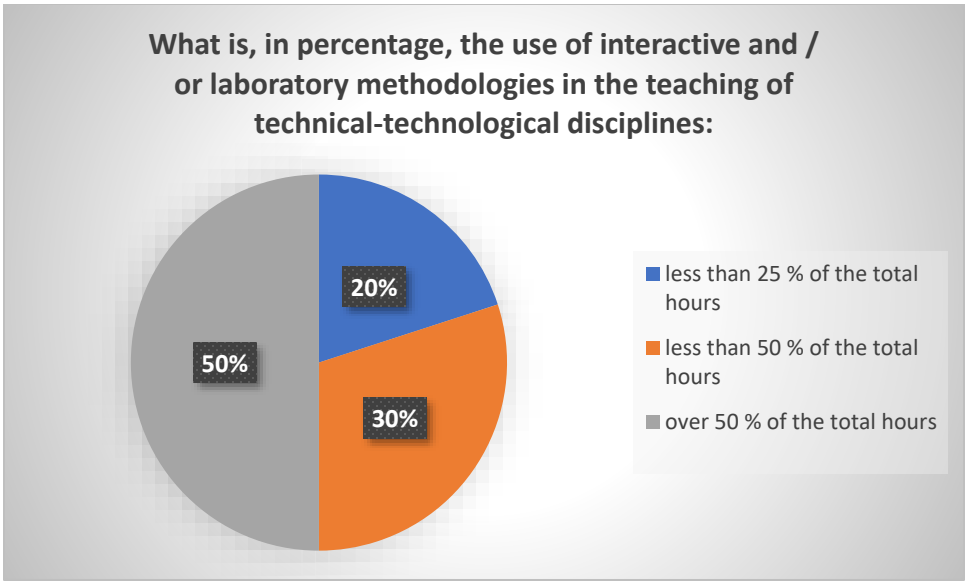
Emotional Intelligence skills and its subcategories is also vastly included where more than 80% of the interviewed institutions include them in their teaching methods. Project based teaching, awareness campaigns with teacher-parent collaboration, case studying, team work, discussion, Start Smart, soft skills, demonstration etc.

Only 9 of the interviewees answered these questions.



Graph 17: Emotional Intelligence Skills

The use of interactive and/or laboratory methodologies in the teaching of technical-technological disciplines is over 50% of the total hours for 50% of the interviewed institutions. The other 30% use laboratory methodologies for less than 50% of the total hours and the remaining 20% use laboratory methodologies for less than 25% of the total hours.



Graph 18: % of the use of interactive and /or laboratory methodologies in the teaching of technical-technological disciplines

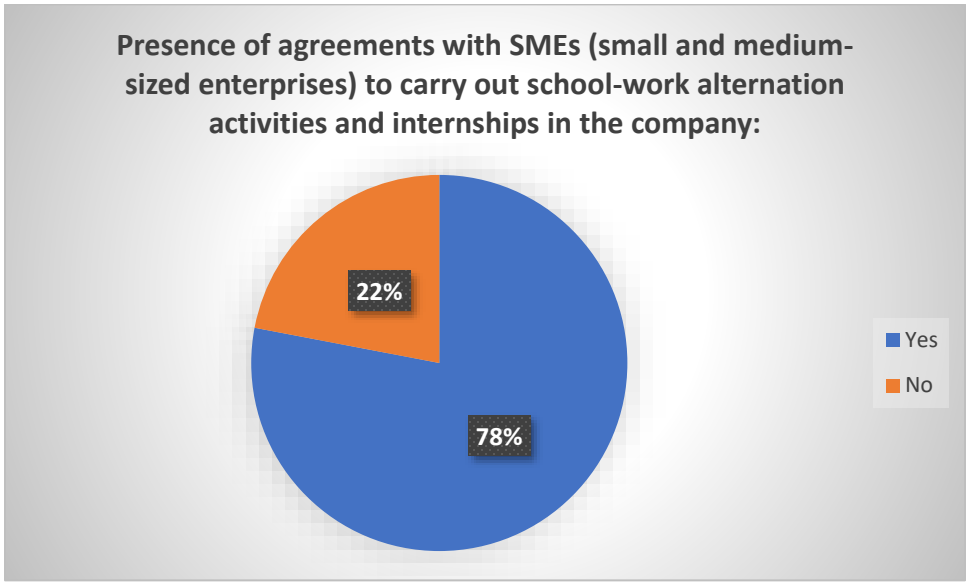
The average annual number of hours that teachers dedicate to updating teaching subjects is different for each educational institution. It ranges from 20 hours to 1200 hours per year.

No. of hours	1080	1200	126	20	240	30	70	720
%	10	10	10	20	10	10	10	10

Table 6: Average annual number of hours that teachers dedicate to updating in teaching subjects

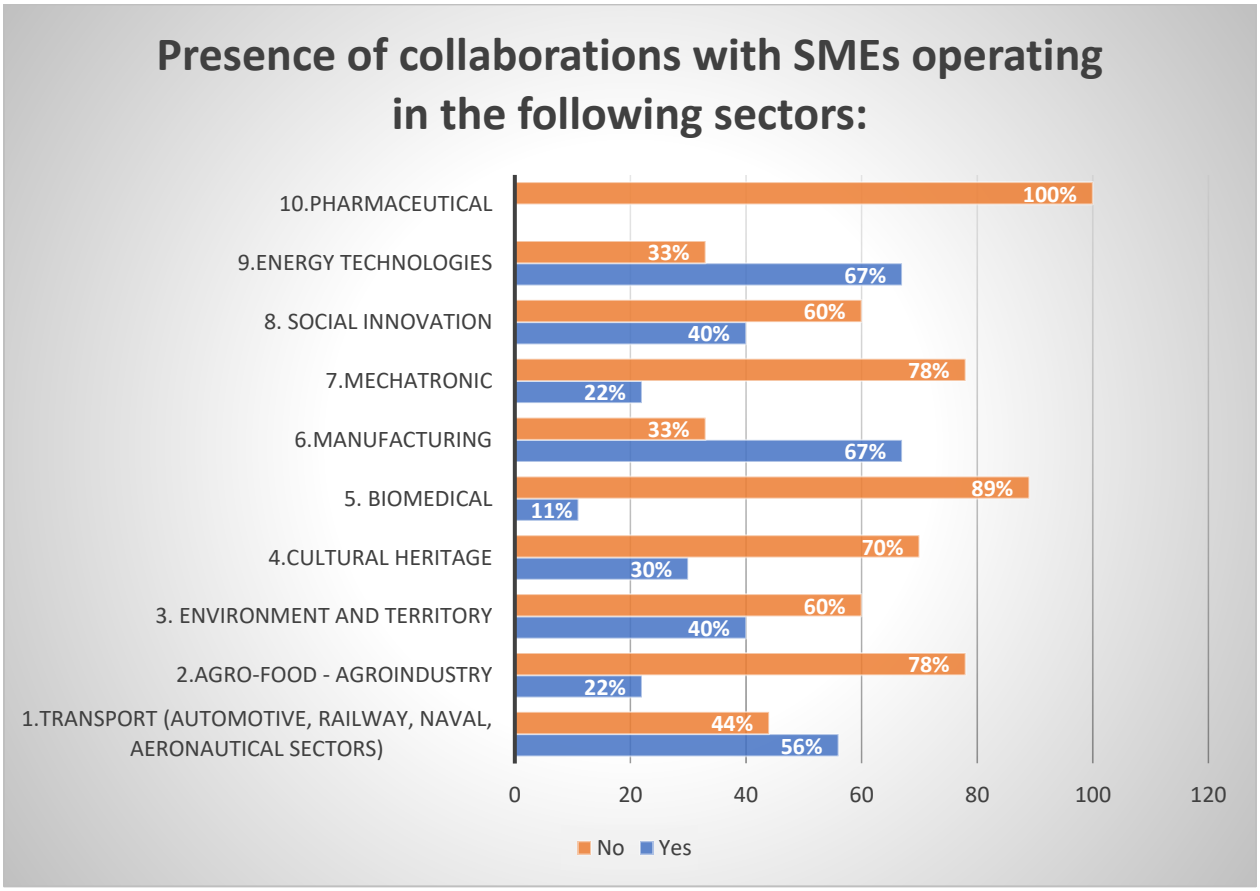
6.5.Relations with companies

78% of the interviewed educational institutions have made agreement with SMEs to carry out school-work alternation activities and internships in various companies.



Graph 19: Presence of agreements with SMEs (small and medium-sized enterprises) to carry out school-work alternation activities and internships in the company

It is seen a considerable amount of collaborations by the educational institutions especially with SMEs operating in *Energy Technologies, Manufacturing, Transport* for 67% of the institutions. From the analysis it is seen a lack of collaborations in Mechatronic, Biomedical and Agro industry where only 1 or 2 of the interviewed institutions had collaborations with SMEs in these sectors. Only 9 of the interviewees answered these questions.



Graph 20: Presence of collaborations with SMEs operating in the following sectors

There is a different range regarding the number of students who have carried out school-work alternation activities and internships in the last year depending on the size of the educational institutions. The is a average of 200 students in these institutions with one institution having only 10 students and another one having a total of 450 students for the last year.

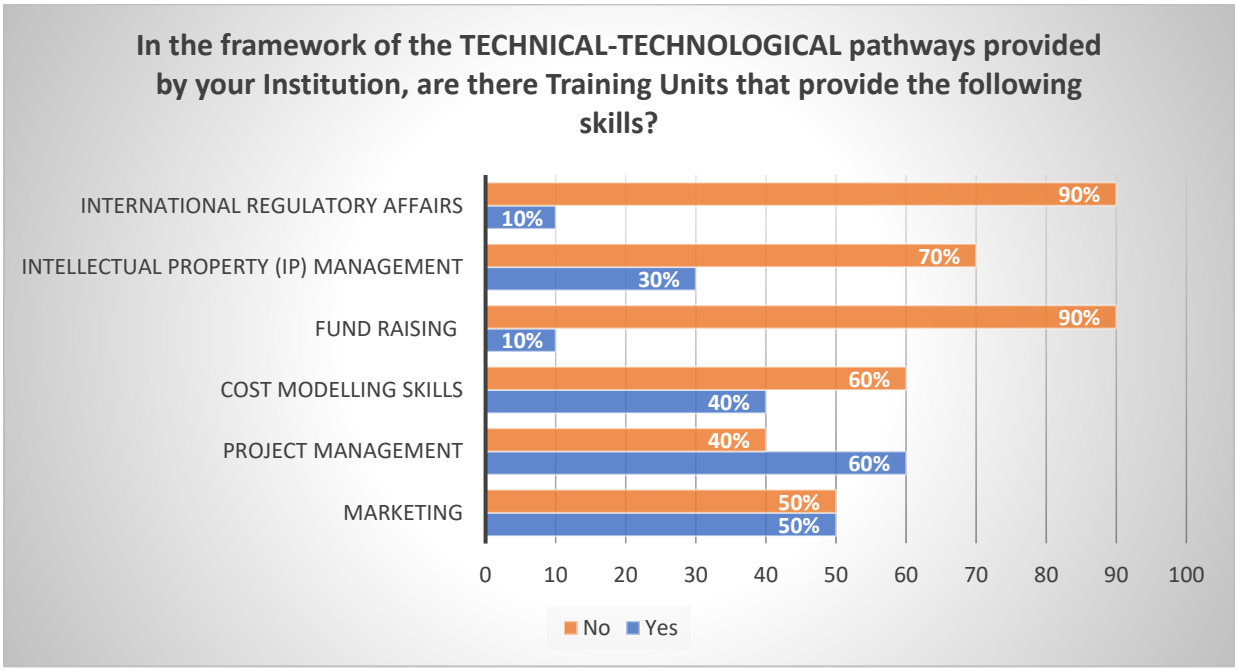
Number of students who have carried out school-work alternation activities and internships in the last year (2018)	10	150	200	280	300	451

Table 7: Number of students who have carried out school-work alternation activities and internships in the last year (2018)

6.6.Training Offer

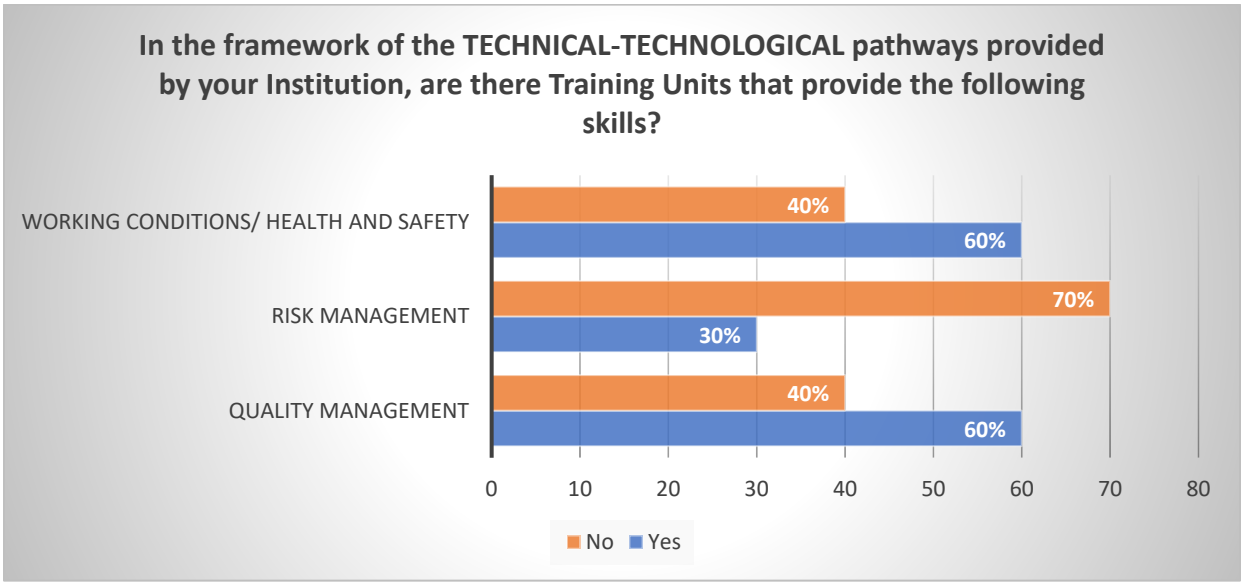
Regarding the management and entrepreneurship, 50% of the training units of the interviewed educational institutions provide *marketing* skills with lower than 25 dedicated hours throughout the entire curriculum period. 60% of the training units provide *project management* skills from which 60% of them have lower than 25 dedicated hours, 20% of them have lower than 50 dedicated hours and only one institution has over than 50 dedicated hours throughout the entire curriculum period.

Cost modeling skills and *intellectual property management* are two of the skills less present to the interviewed institutions where only a couple of the institutions provide them in their training units. Three of the institutions have lower than 25 hours dedicated to *cost modeling skills* and only one of the institutions has over 50 dedicated hours to this skill. *Intellectual property management* is provided only by three institutions. One of them (Beqir Cela Vocational High School) has lower than 25 dedicated hours, the other has lower than 50 dedicated hours and the last one (Hysen Cela institution) has over 50 dedicated hours to this skill. Lastly there is only one institution that provides *International Regulatory Affairs* and *Fund Raising* skills with lower than 50 dedicated hours to these skills throughout the entire curriculum period.



Graph 21: Transversal Skills Sections

With respect to quality, risk and safety, 60% of the interviewed institutions provide trainings *for Health & Safety* and *Quality Management*. *Quality Management* is provided for lower than 25 hours on three of the institutions and for over 50 dedicated hours for other 2 institutions. *Health & Safety* is provided for less than 25 hours for two institutions, for less than 50 hours for one institution and for over 50 dedicated hours for another two institutions. Only three of them provide *Risk Management* skills in their training units with lower than 25 dedicated hours.



Graph 22: Quality, Risk & Safety

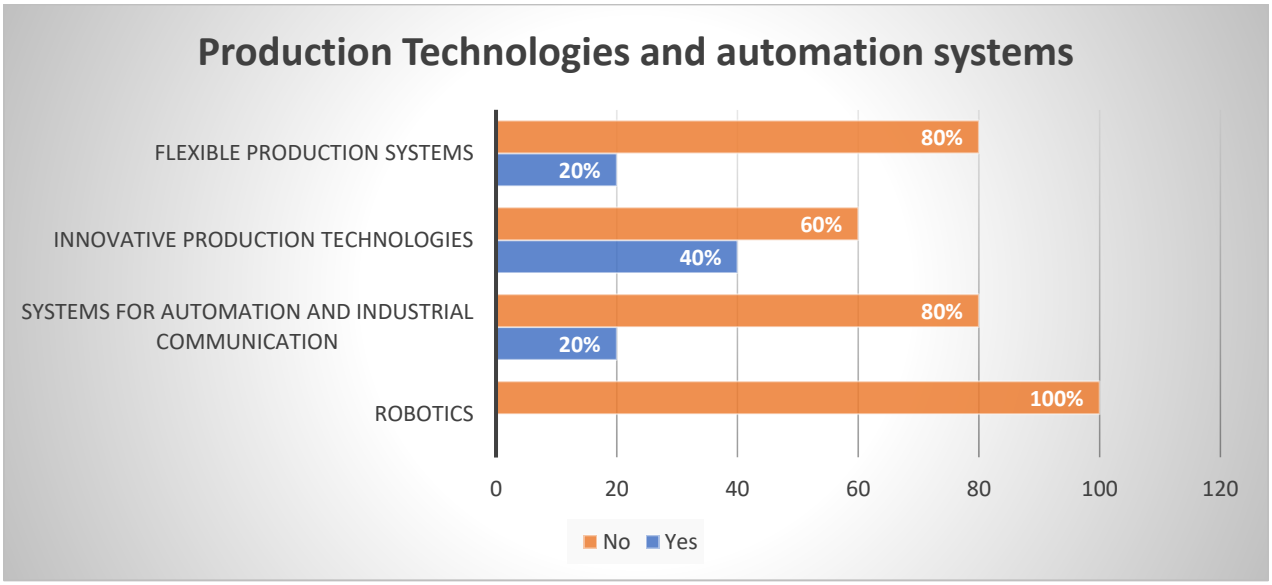
6.7.Technical Skills Section

This section of the analysis represents the most important part as it analyses the capacities and the presence of KET 6: Advanced Manufacturing Technologies and its sub-categories in the Albanian educational institutions. It describes which of the technical disciplines are provided by the interviewed training units and the average of the hours dedicated to training these skills throughout the entire curriculum period.

From the first sub-category of KET 6: Advanced Manufacturing Technologies, Productions Technologies and automation system, there is a presence of Innovative productions technologies on 4 of the interviewed institutions. Two of these institutions have lower than 25 dedicated hours and the other two have lower than 50 dedicated hours dedicated to training these skills throughout the entire curriculum period.

Only two of the interviewed institutions provide *Flexible Production Systems and Systems for Automation and Industrial communication* for lower than 50 dedicated hours.

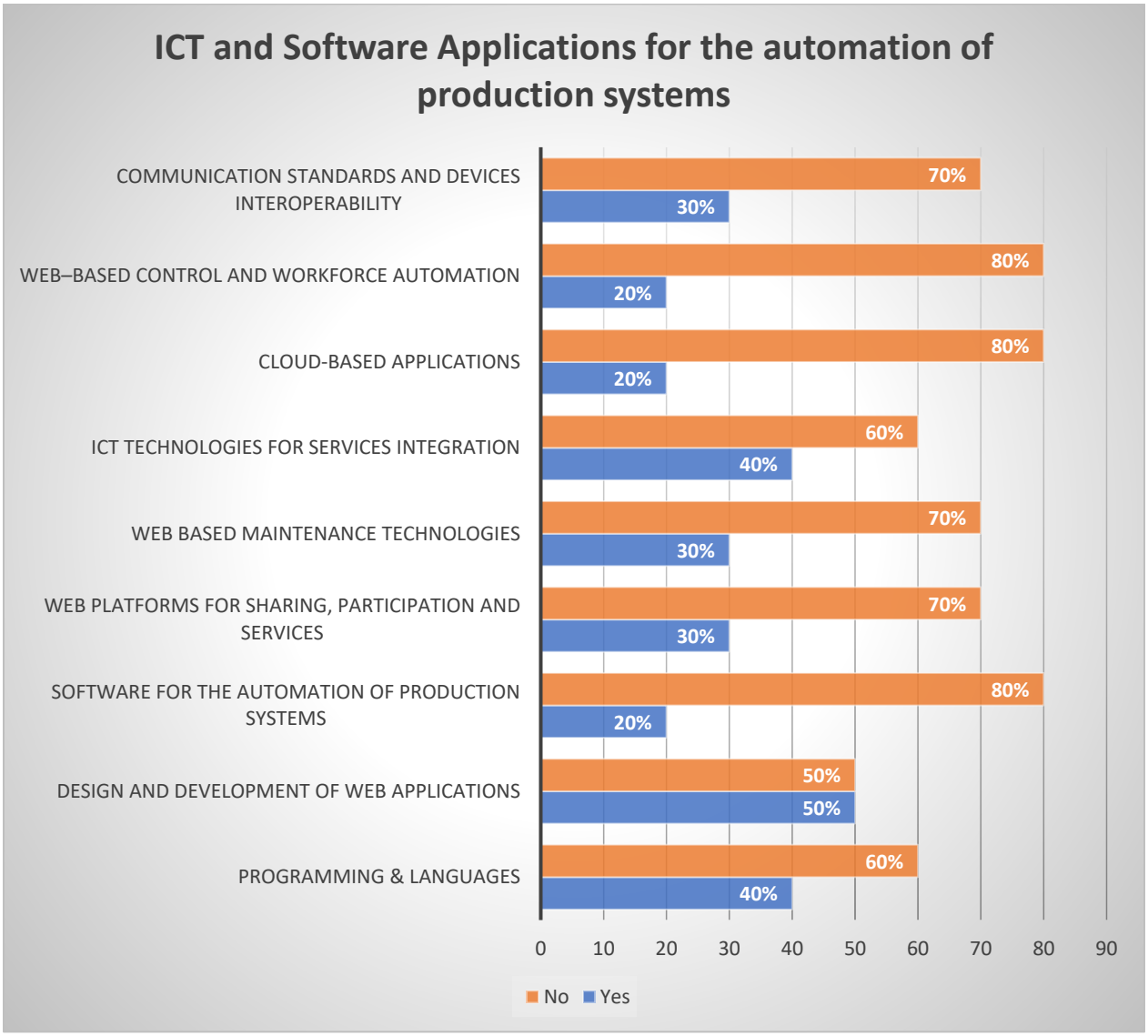
From the analysis it results that there are no training units that provide Robotics.



Graph 23: Advanced Production technologies

ICT and Software Applications for the automation of production systems are present only on 2-3 of the interviewed institutions with an average amount of dedicated hours lower than 25.

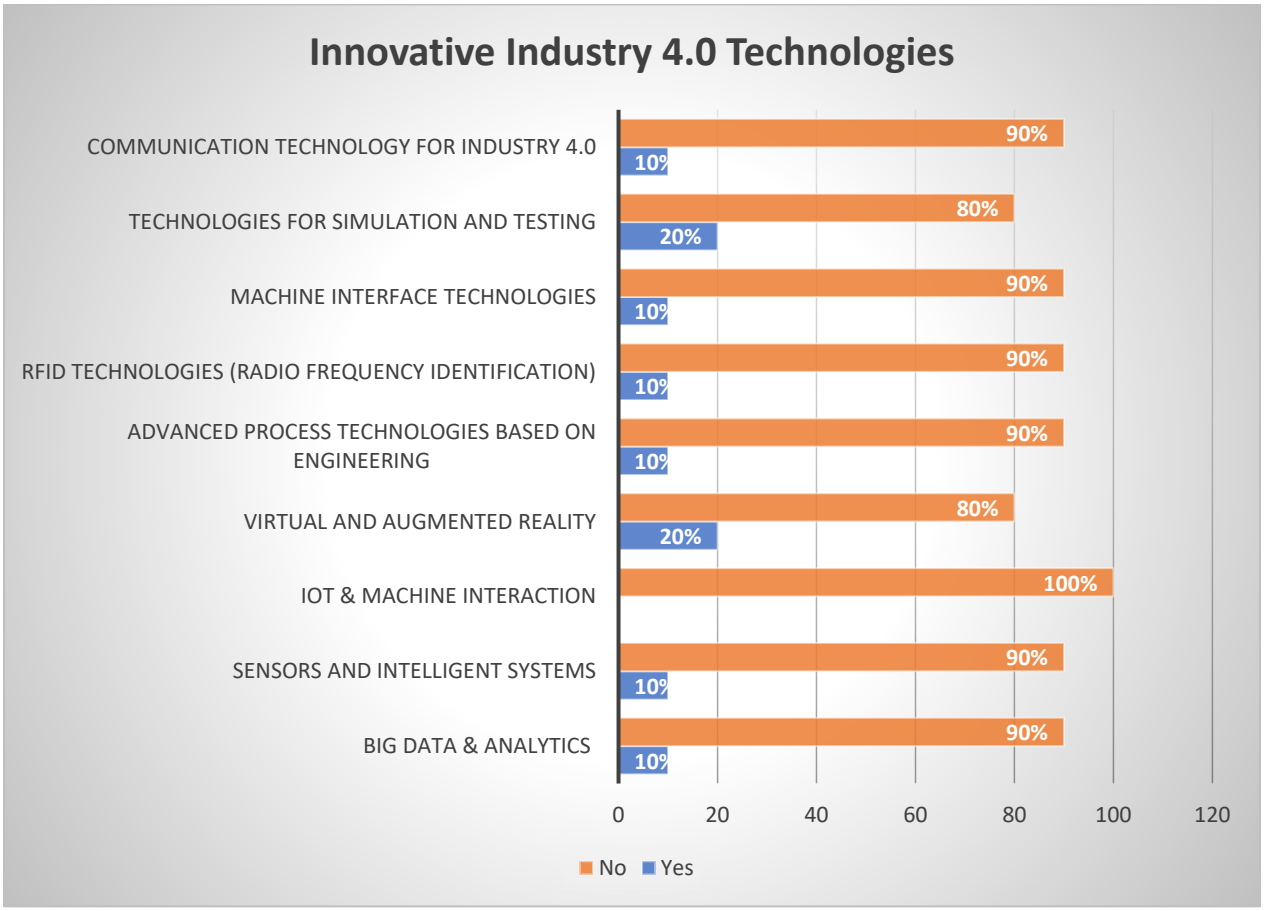
Only *Design and development of Web applications* are provided by 50% of the training units with average dedicated hours of lower than 50.



Graph 24: ICT and Software Applications for the automation of production systems

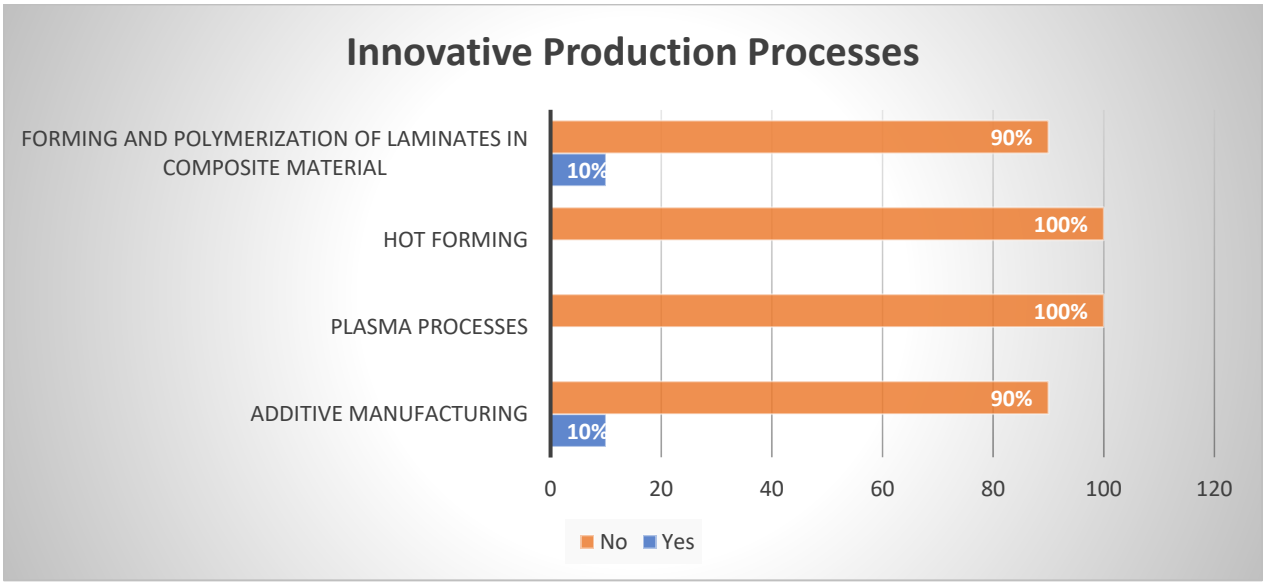
The Innovative Industry 4.0 Technologies are minimally provided in the interviewed training unit. Only one of them provides the most of the technical disciplines. *Virtual and augmented reality and Technologies for simulation and testing* are provided by two of the interviewed institutions with lower than 50 dedicated hours and over 50 dedicated hours respectively.

IoT & Machine Interaction is not provided by any of the interviewed institutions in their training units.



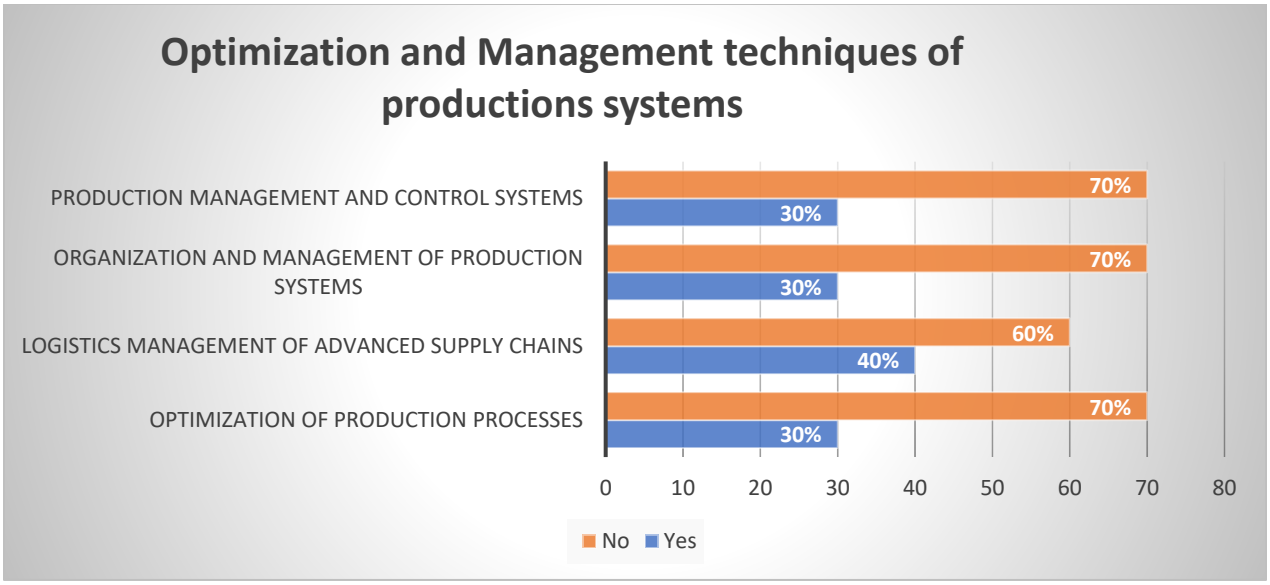
Graph 25: Innovative Industry 4.0 Technologies

There are no training units from the interviewed institutions that provide Hot Forming and Plasma Processes. Only one of the institutions (Stiliano Bandilli professional high school) provides Forming and polymerization of laminates in composite material and Additive manufacturing courses with over 50 dedicated hours and less than 25 dedicated hours respectively.



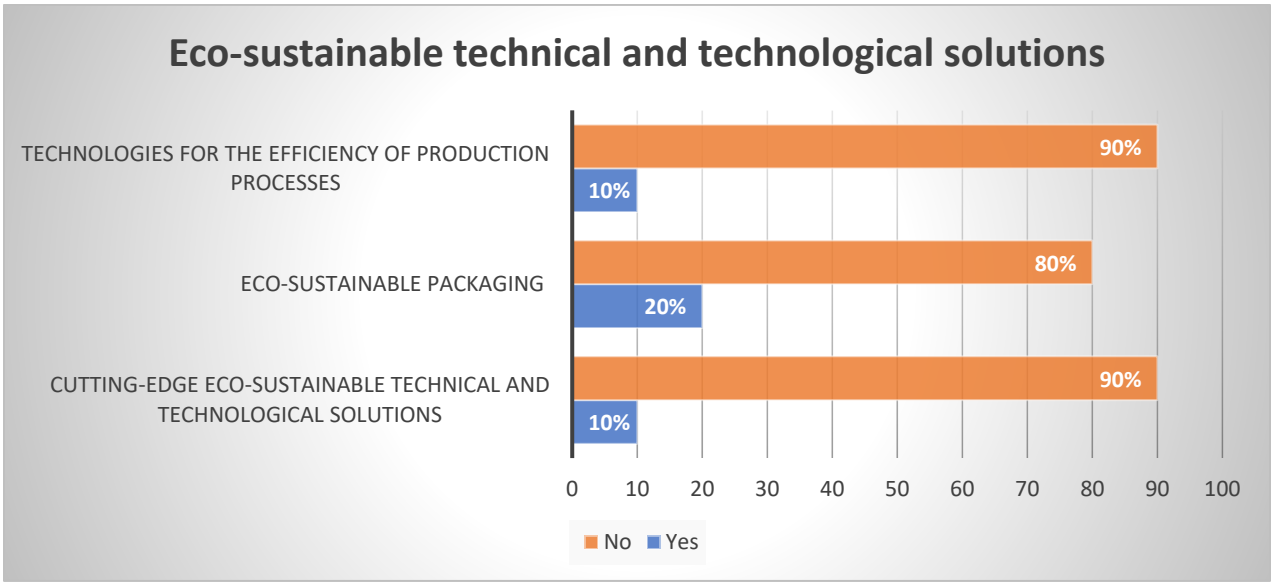
Graph 26: Innovative Production Processes

Optimization and Management Techniques of Production Systems are more provided in the training units, where 3 of the interviewed institutions provide them. The average of the hours dedicated to training these skills throughout the entire curriculum period varies from less than 25 hours in one of the interviewed institutions (Charles Telford Ericson) to over 50 dedicated hours to another interviewed institution (Stiliano Bandilli professional high school).



Graph 27: Optimization and Management techniques of productions systems

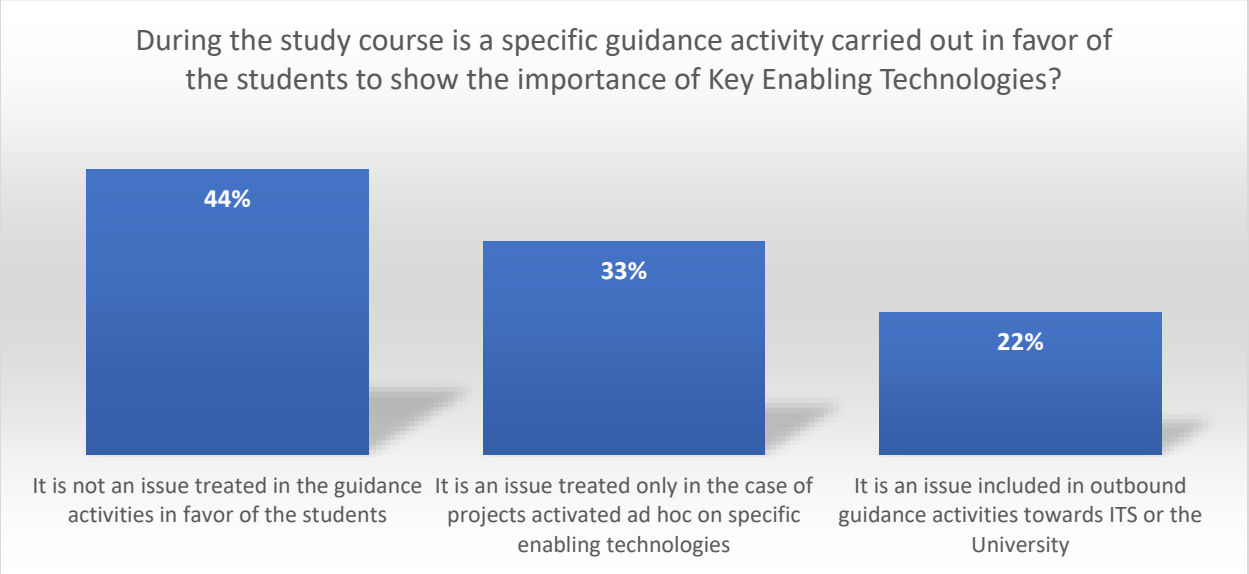
Lastly Eco-Sustainable Technical and Technological Solutions are provided mainly in one of the interviewed institutions. *Cutting-edge eco-sustainable technical and technological solutions* are provided on one of the institutions with over 50 dedicated hours. *Eco-sustainable Packaging* is provided on two of the interviewed institutions with less than 25 dedicated hours and *Technologies for the efficiency of production processes*are provided in only one of the interviewed institutions (Stiliano Bandilli professional high school) with less tha 50 dedicated hours to training these skills throughout the entire curriculum period.



Graph 28: Eco-sustainable technical and technological solutions

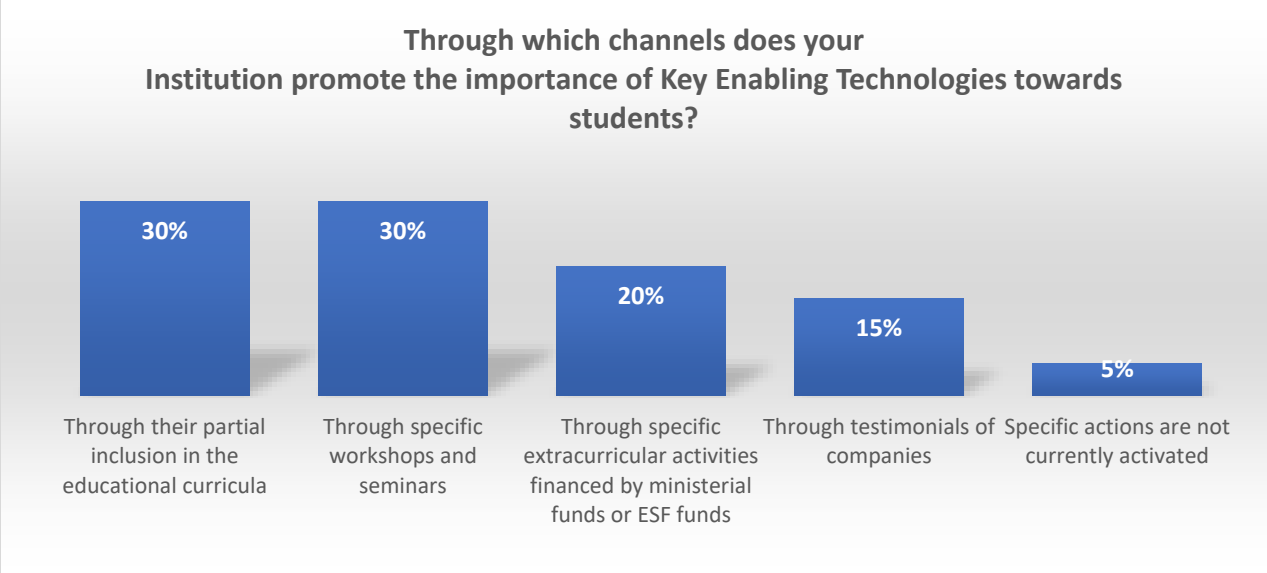
6.8.Guidance activities aimed at young people

Key Enabling Technologies (KETs) are not seen as an issue treated in the guidance activities in favor of the students for 44% of the interviewed institutions. 33% of them treat KETs only in the case of projects activated ad hoc on specific enabling technologies. On the other hand for 22% of the interviewed institutions KETs are included in outbound guidance activities towards ITS or the University.



Graph 29: During the study course is a specific guidance activity carried out in favor of the students to show the importance of Key Enabling Technologies?

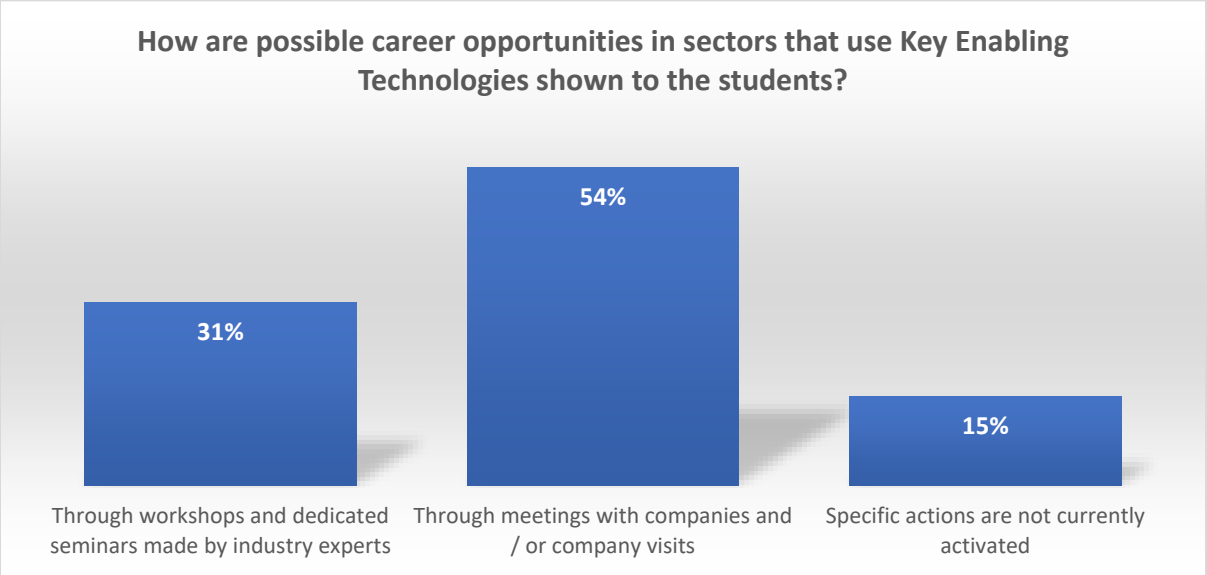
30% of the interviewed educational institutions promote the importance of Key Enabling Technologies towards students *through their partial inclusion in the educational curricula and specific workshops and seminars. Whereas 20% of them promote KETs through specific extracurricular activities financed by ministerial funds or ESF funds.*



Graph 30: Through which channels does your Institution promote the importance of Key Enabling Technologies towards students?

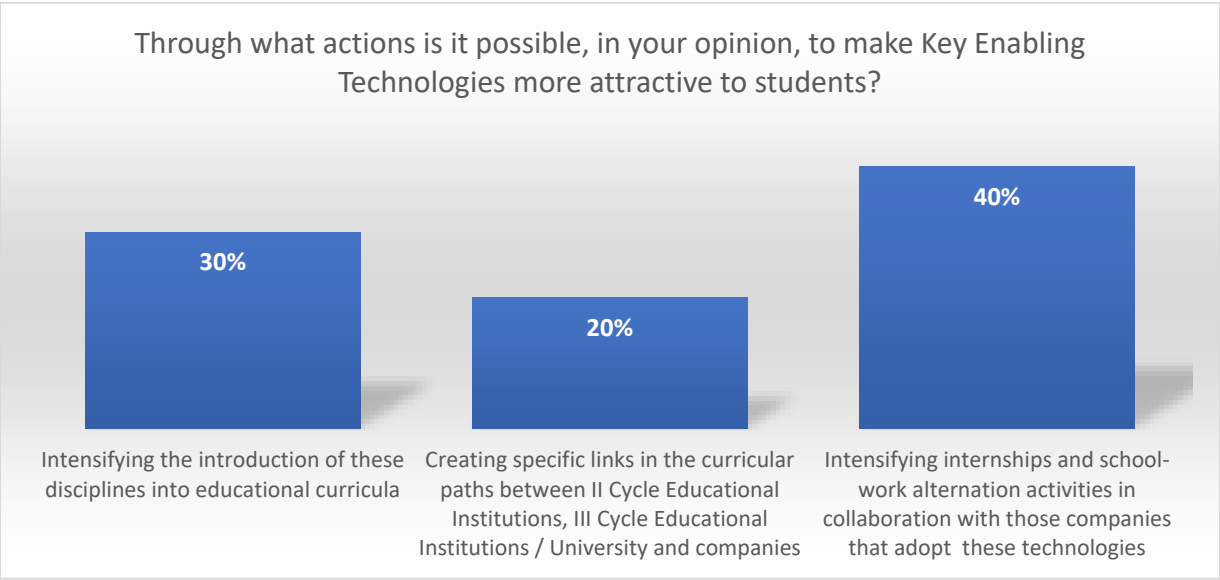
For 54% of the interviewed institutions, the best way to introduce possible career opportunities that use KETs to the students is through meeting with the companies that implement KETs or

visit their headquarters. Also another optimal option for 31% of the interviewed institution is the introduction of these career opportunities through workshops and dedicated seminars made by industry experts.



Graph 31: How are possible career opportunities in sectors that use Key Enabling Technologies shown to the students?

For 40% of the interviewed institutions the best way to make KETs more attractive to students is by *intensifying internships and school-work alternation activities in collaboration with those companies that adopt these technologies, following by intensifying the introduction of these disciplines into educational curricula* for 30% of the interviewees and by *creating specific links in the curricular paths between II Cycle Educational Institutions, III Cycle Educational Institutions/ University and companies for 20% of the interviewees*.



Graph 32: Through what actions is it possible, in your opinion, to make Key Enabling Technologies more attractive to students?

VII. Conclusions

This initiative aims to contribute to increasing the quality and creation of new curricula and to promote better cooperation between industry and education and training organizations in order to align education & training with the 21st century needs.

From the analysis of the questionnaires it is seen a lack of teachers specialized in communication standards and devices interoperability, web-based control and workforce automation and cloud based applications where only 25% of the interviewed institutions have teachers specialized in these fields.

It should be noted that in the interviewed institutions there are no teachers specialized in Robotics and as a result there are no training units that provide Robotics.

ICT and Software Applications for the automation of production systems are present only on 2-3 of the interviewed institutions with an average amount of dedicated hours lower than 25.

It is seen a lack of teachers specialized in Innovative Industry 4.0 Technologies where only one or two institutions have teachers specialized in its subcategories. Also there are no institutions with teachers specialized on IOT& Machine Interaction and as a result IoT & Machine Interaction is not provided by any of the interviewed institutions in their training units.

Innovative production processes is another field where the interviewed educational institutions have a lack of specialized teachers. There is only one interviewed institution that has teachers specialized on Forming and Polymerization of laminates in composite material and Additive Manufacturing. There are no teachers specialized on Hot Forming and Plasma Processes so no training units from the interviewed institutions that provide Hot Forming and Plasma Processes. Only one of the institutions (Stiliano Bandilli professional high school) provides Forming and polymerization of laminates in composite material and Additive manufacturing courses with over 50 dedicated hours and less than 25 dedicated hours respectively.

It is seen a presence of teachers specialized on Eco-sustainable packaging and Cutting-edge eco-sustainable technical and technological solutions in only one of the interviewed institutions.

Key Enabling Technologies (KETs) are not seen as an issue treated in the guidance activities in favor of the students for 44% of the interviewed institutions. 33% of them treat KETs only in the case of projects activated ad hoc on specific enabling technologies. On the other hand for 22% of the interviewed institutions KETs are included in outbound guidance activities towards ITS or the University.

30% of the interviewed educational institutions promote the importance of Key Enabling Technologies towards students through their partial inclusion in the educational curricula and specific workshops and seminars

For 54% of the interviewed institutions, the best way to introduce possible career opportunities that use KETs to the students is through meeting with the companies that implement KETs or visit their headquarters. Also another optimal option for 31% of the interviewed institution is the introduction of these career opportunities through workshops and dedicated seminars made by industry experts

For 40% of the interviewed institutions the best way to make KETs more attractive to students is by intensifying internships and school-work alternation activities in collaboration with those companies that adopt these technologies, following by intensifying the introduction of these disciplines into educational curricula for 30% of the interviewees and by creating specific links in the curricular paths between II Cycle Educational Institutions, III Cycle Educational Institutions/ University and companies for 20% of the interviewees.

VIII. The list of the interviewed educational institutions

Nr	Institucionet	Vendi	Adrese Emaili	Personi pergjegjes	Shprehje interesi	Plotesim pyetesori
1	Shkolla Prof.”S Bandilli	Berat	kozetanushi@yahoo.com	Kozeta Nushi	Po	po
2	Shkolla Industriale “Pavarsia”	Vlore	Industriale11@yahoo.com	Gentian Boci	Po	Po
3	Shkolla Mesme Profesionale “Charles Telford Erickson”	Kavaje, Golem	shkollaemesmeagrobiznesgolem@yahoo.it	Matilda Çanaku	Po	Po
4	Shkolla Profesionale “Beqir Çela”	Shkozet Durres	fmerkuri@gmail.com	Fatmir Merkuri	Po	Po
5	Shkolla Teknike Profesionale “Demir Progri”	Korçe	Shkolla.dprogri@yahoo.com	Paskal Caca	Po	Po
6	FSP	Durres	elivyshka@gmail.com	Eli Vyshka	Po	PO
7	Shkolla Profesionale “Hysen Çela”	Shkozet Durres	dervishi_rina@yahoo.com	Blerina Dervishi	Po	Po
8	Drejtoria Rajonale e Formimit Profesional	Elbasan	indritabdiaj@gmail.com	Indrit Abdiaj	Po	Po
9	TIK Shkolle e Mesme Profesionale	Korce	shkollatikkorce@yahoo.com	Julita Bimbli	Po	Po
10	Drejtoria Rajonale e Formimit Profesional	Durres	d.durres@yahoo.com	Mihal Kallojeri	Po	Po

IX. Questionnaire on the offer of training for Key Enabling Technologies

EDUCATIONAL INSTITUTION DATA

Educational Institution name:	
Educational Institution address:	
Name of the Educational Institution Representative:	
Name of the person answering the questions:	
Data of the person answering the questions:	
Role in the organization:	
Email:	
Telephone number:	

A. Indicate which macro types of training courses are present in your Educational Institution:

Technical	**Professional**
☐	☐

B. Indicate the technical-technological pathways present in your Educational Institution:

1. _____

2. _____

3. _____

4. _____

CONTEXT

1. Material Resources

A. Number of locations of which your Institution is composed (including separate buildings) ☐

B. Number of classrooms devoted to normal teaching activities ☐

C. Number of classrooms with internet and PC connection ☐

D. Number of computers (fixed and portable) available to students ☐

E. Number of IT labs ☐

E.1 *Have investments been made on IT laboratories in the last 3 years?* **YES** ☐ **NO** ☐

E.2 *If yes, these investments have renewed:*

☐ **All the laboratories** ☐ **A good part of the laboratories** ☐ **A small part of the laboratories**

F. Number of classrooms used for linguistic laboratories ☐

G. Number of technological laboratories (both fixed and mobile) available ☐

G1*.Specify the types and number of technological laboratories available:*

1. …… ☐

2. …… ☐

3. …… ☐

4. …… ☐

5. …… ☐

G2*.Have investments been made on technological laboratories in the last 3 years?* **YES** ☐ **NO** ☐

***G3**.If yes, these investments have renewed:*

☐	☐	☐
All the laboratories	**A good part of the laboratories**	**A small part of the laboratories**

2. Professional resources

A. Presence of teachers with specialization in the following categories of disciplines:

A1. KNOWLEDGE AREA

A1.1	**MANAGEMENT AND ENTREPRENEURSHIP**	***Yes***	***No***
▪	Marketing	☐	☐
▪	Project Management	☐	☐
▪	Cost modelling skills (Cost control and budgeting)	☐	☐
▪	Fund raising	☐	☐
▪	Intellectual Property (IP) management	☐	☐
▪	Internationalization	☐	☐

A1.2	**QUALITY, RISK & SAFETY**	***Yes***	***No***
▪	Quality Management	☐	☐
▪	Risk Management	☐	☐
▪	Working conditions/ Health and safety	☐	☐

A1.3	**PRODUCTION TECHNOLOGIES AND AUTOMATION SYSTEMS**	***Yes***	***No***
▪	Robotics	☐	☐
▪	Systems for automation and industrial communication	☐	☐
▪	Innovative production technologies	☐	☐
▪	Flexible production systems	☐	☐

A1.4	**ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS**	***Yes***	***No***
▪	Programming languages	☐	☐
▪	Design and development of Web applications	☐	☐
▪	Software for the automation of production systems	☐	☐
▪	Web platforms for sharing, participation and services	☐	☐

▪ Web based maintenance technologies	☐	☐
▪ ICT technologies for services integration	☐	☐
▪ Cloud-based applications	☐	☐
▪ Web–Based Control and Workforce Automation	☐	☐
▪ Communication standards and devices interoperability	☐	☐

A1.5	**INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES**	***Yes***	***No***
▪ Big Data & Analytics		☐	☐
▪ Sensors and intelligent systems		☐	☐
▪ IoT& Machine Interaction		☐	☐
▪ Virtual and augmented reality		☐	☐
▪ Advanced process technologies based on engineering		☐	☐
▪ RFID Technologies (Radio Frequency IDentification)		☐	☐
▪ Machine Interface Technologies		☐	☐
▪ Technologies for simulation and testing		☐	☐
▪ Communication technology for Industry 4.0		☐	☐
▪ Other (Specify ….)		☐	☐

A1.6	**INNOVATIVE PRODUCTION PROCESSES**	***Yes***	***No***
▪ Additive manufacturing		☐	☐
▪ Plasma processes		☐	☐
▪ Hot forming		☐	☐
▪ Forming and polymerization of laminates in composite material		☐	☐
▪ Other (Specify ….)		☐	☐

A1.7	**OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS**	***Yes***	***No***
▪ Optimization of production processes		☐	☐
▪ Logistics management of advanced supply chains		☐	☐
▪ Organization and management of production systems		☐	☐
▪ Production management and control systems		☐	☐

▪ Other (Specify ….)	☐	☐

A1.8 ECO-SUSTAINABLE TECHNICAL AND TECHNOLOGICAL SOLUTIONS	*Yes*	*No*
▪ Cutting-edge eco-sustainable technical and technological solutions	☐	☐
▪ Eco-sustainable Packaging	☐	☐
▪ Technologies for the efficiency of production processes	☐	☐
▪ Other (Specify ….)	☐	☐

A2. AREA OF BEHAVIORAL SKILLS

A2.1 During the curricular and extra-curricular activities, are courses planned or teaching methods adopted for supporting the development of the following skills?

MANAGEMENT & ENTREPRENEURSHIP SKILLS	*Yes*	*No*
▪ Customer focus	☒	☐
▪ Team working	☐	☐
▪ Negotiation	☐	☐

If yes, briefly describe the teaching methods adopted:

……

……..

……

……..

COMMUNICATION SKILLS	*Yes*	*No*
▪ Interpersonal skills	☐	☐
▪ Verbal communication	☐	☐
▪ Written communication	☐	☐
▪ Presentation skills	☐	☐
▪ Public communication	☐	☐
▪ Virtual collaboration	☐	☐

If yes, briefly describe the teaching methods adopted:

……

……..

……

……..

INNOVATION SKILLS	*Yes*	*No*
▪ Integration skills	☐	☐
▪ Design mind-set	☐	☐
▪ Experimentation	☐	☐
▪ Problem solving	☐	☐
▪ Creativity	☐	☐
▪ Systems thinking	☐	☐

If yes, briefly describe the teaching methods adopted:

……

……..

……

……..

EMOTIONAL INTELLIGENCE SKILLS	*Yes*	*No*
▪ Stress tolerance	☐	☐
▪ Adaptability	☐	☐
▪ Ability to learn from failures	☐	☐
▪ Proactivity	☐	☐
▪ Continuous improvement orientation	☐	☐
▪ Decision making	☐	☐
▪ Leadership	☐	☐
▪ Cooperation	☐	☐
▪ Multi-cultural orientation	☐	☐

If yes, briefly describe the teaching methods adopted:

……

……..

……

B. What is, in percentage, the use of interactive and / or laboratory methodologies in the teaching of technical-technological disciplines:

☐ **≤ 25 %** of the total hours ☐ **≤ 50 %** of the total hours ☐ **over 50 %** of the total hours

C. Indicate the average annual number of hours that teachers dedicate to updating in teaching subjects ☐

3. Relations with companies

	Yes	*No*
A. Presence of agreements with SMEs (small and medium-sized enterprises) to carry out school-work alternation activities and internships in the company	☐	☐

B. Presence of collaborations with SMEs operating in the following sectors:

	Yes	*No*
1. TRANSPORT (automotive, railway, naval, aeronautical sectors)	☐	☐
2. AGRO-FOOD - AGROINDUSTRY	☐	☐
3. ENVIRONMENT AND TERRITORY	☐	☐
4. CULTURAL HERITAGE	☐	☐
5. BIOMEDICAL	☐	☐
6. MANUFACTURING	☐	☐
7. MECHATRONIC	☐	☐
8. SOCIAL INNOVATION	☐	☐
9. ENERGY TECHNOLOGIES	☐	☐
10. PHARMACEUTICAL	☐	☐

C. Number of students who have carried out school-work alternation activities and internships in the last year (2018) ☐

D. Other projects carried out in cooperation with SME:

……

TRAINING OFFER

Please fill in the tables for each of the following categories of skills:

4. Transversal Skills Section

MANAGEMENT AND ENTREPRENEURSHIP					
Transversal skills	**In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?**		**If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?**		
Marketing	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
Project Management	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
Cost modelling skills	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
Fund raising	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
Intellectual Property (IP) management	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
International regulatory affairs	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**

QUALITY, RISK & SAFETY					
Transversal skills	**In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?**		**If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?**		
Quality Management	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
Risk Management	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
Working conditions/ Health and safety	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**

5. Technical Skills Section

ADVANCED PRODUCTION TECHNOLOGIES					
PRODUCTION TECHNOLOGIES AND AUTOMATION SYSTEMS	**In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?**		**If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?**		
Robotics	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
Systems for automation and industrial communication	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
Innovative production technologies	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**
Flexible production systems	☐ Yes	☐ No	☐ **≤ 25**	☐ **≤ 50**	☐ **over**

Other (Specify ….)	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over

ADVANCED PRODUCTION TECHNOLOGIES					
ICT AND SOFTWARE APPLICATIONS FOR THE AUTOMATION OF PRODUCTION SYSTEMS	**In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?**		**If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?**		
Programming & Languages	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Design and development of Web applications	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Software for the automation of production systems	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Web platforms for sharing, participation and services	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Web based maintenance technologies	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
ICT technologies for services integration	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Cloud-based applications	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Web–Based Control and Workforce Automation	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Communication standards and devices interoperability	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Other (Specify ….)	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
ADVANCED PRODUCTION TECHNOLOGIES					
INNOVATIVE INDUSTRY 4.0 TECHNOLOGIES	**In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?**		**If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?**		
Big Data & Analytics	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Sensors and intelligent systems	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
IoT& Machine Interaction	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Virtual and augmented reality	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Advanced process technologies based on engineering	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
RFID Technologies (Radio Frequency IDentification)	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Machine Interface Technologies	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Technologies for simulation and testing	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over

Communication technology for Industry 4.0	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Other (Specify ….)	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over

ADVANCED PRODUCTION TECHNOLOGIES					
INNOVATIVE PRODUCTION PROCESSES	**In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?**		**If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?**		
Additive manufacturing	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Plasma processes	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Hot forming	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Forming and polymerization of laminates in composite material	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Other (Specify ….)	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over

ADVANCED PRODUCTION TECHNOLOGIES					
OPTIMIZATION AND MANAGEMENT TECHNIQUES OF PRODUCTION SYSTEMS	**In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?**		**If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?**		
Optimization of production processes	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Logistics management of advanced supply chains	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Organization and management of production systems	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Production management and control systems	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Other (Specify ….)	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over

ADVANCED PRODUCTION TECHNOLOGIES					
ECO-SUSTAINABLE TECHNICAL AND TECHNOLOGICAL SOLUTIONS	**In the framework of the TECHNICAL-TECHNOLOGICAL pathways provided by your Institution, are there Training Units that provide the following skills?**		**If yes, what is the average of the hours dedicated to training these skills throughout the entire curriculum period?**		
Cutting-edge eco-sustainable technical and technological solutions	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over

Eco-sustainable Packaging	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Technologies for the efficiency of production processes	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over
Other (Specify ….)	☐ Yes	☐ No	☐ ≤ 25	☐ ≤ 50	☐ over

GUIDANCE ACTIVITIES

6. Guidance activities aimed at young people

Within the same question it is possible to select more answers

Q1.1	**During the study course is a specific guidance activity carried out in favor of the students to show the importance of Key Enabling Technologies?**	
A	It is not an issue treated in the guidance activities in favor of the students	☐
B	It is an issue treated only in the case of projects activated ad hoc on specific enabling technologies	☐
C	It is an issue included in outbound guidance activities towards ITS or the University	☐
D	Other (specify……)	☐
Q1.2	Through which channels does your Institution promote the importance of Key Enabling Technologies towards students?	
A	Through their partial inclusion in the educational curricula	☐
B	Through specific workshops and seminars	☐
C	Through specific extracurricular activities financed by ministerial funds or ESF funds	☐
D	Through testimonials of companies	☐
E	Specific actions are not currently activated	☐
F	Other (specify……)	☐
Q1.3	How are possible career opportunities in sectors that use Key Enabling Technologies shown to the students?	
A	Through workshops and dedicated seminars made by industry experts	☐
B	Through meetings with companies and / or company visits	☐
C	Specific actions are not currently activated	☐
D	Other (specify……)	☐
Q1.4	Through what actions is it possible, in your opinion, to make Key Enabling Technologies more attractive to students?	
A	Intensifying the introduction of these disciplines into educational curricula	☐
B	Creating specific links in the curricular paths between II Cycle Educational Institutions, III Cycle Educational Institutions / University and companies	☐
C	Intensifying internships and school-work alternation activities in collaboration with those companies that adopt these technologies	☐
D	Creating specific guidance actions in itinere and in outbound	☐
E	Other (specify……)	☐

X. Featured laws

- Law no. 15/2017 " On vocational education and training in the Republic of Albania"
- Law no. 23/2018 "For some changes and additions in law no. 10 247, dated 4.3.2010 "For Albanian Qualification Framework "
- Decision no. 514, dated 20 September 2017 "On the approval of the reviewed National Professions List"

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PROJECT: ***"HIGH SPECIALIZED TECHNICIANS IN KETs"***

ACRONYM: ***HISTEK***

Report

Analysis of the SMEs needs and Training offer related to KETs CCIT, ALBANIA

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Abbreviations and acronyms	
SAP	Systems Applications and Products
SME	Small and Medium-size Enterprise

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1.INTRODUCTION

The HISTEK project aims at strengthening the competitive capacity of **Italian, Albanian and Montenegrin SMEs**, through the creation of a **new Cluster** (made up of SMEs, Educational Institutions and Public Institutions), which will act as a "**connector**" between the world of education and the world of companies for empowering human capital, as a strategic lever to support growth and development.

The small and medium-sized enterprises of the three countries are today **engaged in considerable efforts to internationalise and innovate** their organisations. Many Italian companies already have, or are planning to open branches in Albania and Montenegro or vice versa.
To make these **processes more sustainable**, HISTEK proposes the cross-border definition of tools that can facilitate **training, transnational mobility and the inclusion in the SMEs of "high technicians / middle-skilled workers"** truly aligned with their current need for advanced technical skills, fundamental for supporting innovation processes.

First of all, the Cluster will define the architecture of a **new transnational short-cycle path (EQF Level 5)**, conceived according to the dual system, co-designed with the participating SMEs. Transnationality will imply the creation of **common and shared training standards between the 3 countries** and the prospect of the future joint delivery of the path, partly in Italy, partly in Montenegro and partly in Albania, with the cooperation of companies and training institutions of the 3 territories.

With the support of the **Chambers of Commerce, project partners,** in the design of the new training offer, a robust cross-sector preparation will be developed in line with the **main development and innovation trajectories indicated by SMEs** in the needs analysis phase.
To this end, particular attention will be given to the technical and transversal skills required for the use of **new enabling technologies (KETs)**, recognised by the European Commission as the indispensable background to support, today, product and process innovation.

In addition, **other services will be developed for SMEs** in line with the implementation of dual systems, (which foresee the realisation of at least 50% of training activities directly by company internal staff). In particular, **guidelines** will be produced to improve the ability of business referents to provide **on-the-job training** and to train young people during their **curricular internships**. A toolkit will also be created to support companies in **selecting future technicians.**
Lastly, the project foresees the signing of a **Consortium Agreement**, which will commit the partners to the implementation of the new training path immediately after the conclusion of the project, with a strong impact of the project results on SMEs at the CB level in the mid term.

Main Benefits / Expected Impacts for SMEs after the implementation of the new path:

- ***Improved acquisition of talents and skills*** through the inclusion of **young Italians, Albanians and Montenegrins** trained in the specific skills required, with standards common to the three countries;
- ***Reduction of indirect costs for lacking and fast integration in the corporate culture at CB level***, and to the transition from the training world to that of SMEs, with its peculiarities and characteristics;
- ***Reduction of indirect*** costs related to the **loss of business opportunities** deriving from the lack of skills in terms of innovation, knowledge of the markets, use of technologies, etc;

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- ***Higher internationalisation capacity*** aimed at expanding outlet markets.

Project partners:

Ministry of Education of Montenegro – LP (Montenegro)
Chamber of Economy of Montenegro – P2 (Montenegro)
Fondazione ITS "Antonio Cuccovillo" – P3 (Italy)
Chamber of Commerce of Bari – P4 (Italy)
Faculty of Business, "Aleksandër Moisiu" University, Durrës – P5 (Albania)
Chamber of Commerce and Industry of Tirana – P6 (Albania)

Survey description

Interviewing Method

The selected method is a CAWI (Computer Assisted Web Interviewing) questionnaire, through Google's free online form for the collection of responses. The questionnaire is about the Albanian situation, since the activity has been originally conceived as diversified among Italy, Albania and Montenegro, to respect the entrepreneurial and societal differences. For instance, Italy is treated first as a technology producer, while Albania and Montenegro are to be considered as ICT "demand" and market. That's why the questions in the Albanian questions regarding the mechatronic focus section's are turned from a purchaser's point of view.

Detection Technique

The Questionnaire has been detected through a qualitative and quantitative method.

Technical Assessments (Activity T1.4)

The analysis and elaboration of the results have been carried out by the HISTEK's partners (one for each Country) and the result is going to be showcased in this document via graphs and comment (discursive).

Detection Period

The period in which questionnaire has been available is end of December 2018.

Code of conduct

The survey has been designed and spread in compliance with the provisions of EU General Data Protection Regulation (GDPR) of May 25th 2016. The answers to the questionnaire are used in aggregate form and only for statistical purposes.

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2.ACTIVITY 1.3: OBJECTIVES

The main objectives, which the activity 1.3 tends to achieve through the survey of the participating Albanian SMEs, are:

1. The creation of a snapshot of the existing situation in enabling technologies (technologies used, collaborations activated)

2. The identification of:
   a. The export priority (to verify opportunities for activation of cross-border collaborations)
      2. The methods of financing any technological supplies sold
      3. Professional and training needs related to innovation
3. Identification of a first company backbone interested in KETS for a subsequent target

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3.SMEs NEEDS IN THE FIELD OF KETs

3.1 QUESTIONNAIRES

The Questionnaire proposed is articulated in three sections, in two languages (Albanian and English) as per follow:

Data	Variable	Sec.
Personal Data	Name and Surname	**1**
	Company E-mail	
	Website	
	Telephone	
	City	
	Region	
Company General Data	Company Name	**2**
	Company Role	
	What is the number of employees (regardless of the contractual form) of the company?	
	Market	
Company Techincal Data	Does the company collaborate with other subjects (research centers, universities, ITS, high schools) in the design, research and development of new products / services?	
	In your company, in a range from 0 to 10, what's the value of foreign market turnover over the total?	
	What are the 3 most important foreign countries for your turnover?	
	Does your company work with the following countries? (tick only if the answer is yes)	
	Does the company sell \ buy machinery or technology?	
	Which technologies do the company buy \ sell?	
	How does the assistance work?	
Company Educational and Human Resources Needs	What is the professional figure related to innovation that the company needs most?	**3**
	Which products, processes or technologies should he be able to manage?	
	What kind of training should the worker have? [Università / University]	
	What kind of training should the worker have? Is necessary university, ITS or just upper secondary training? [ITS / Professional School Institute]	
	What kind of training should the worker should have? Is necessary university, ITS or just upper secondary training? [Secondary School]	

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	What kind of training should the worker should have? Is necessary university, ITS or just upper secondary training? [Intermediary School]	
	Which subjects should be taught or which soft skills?	

3.1.1

Screenshot of the Albanian Questionnaire.

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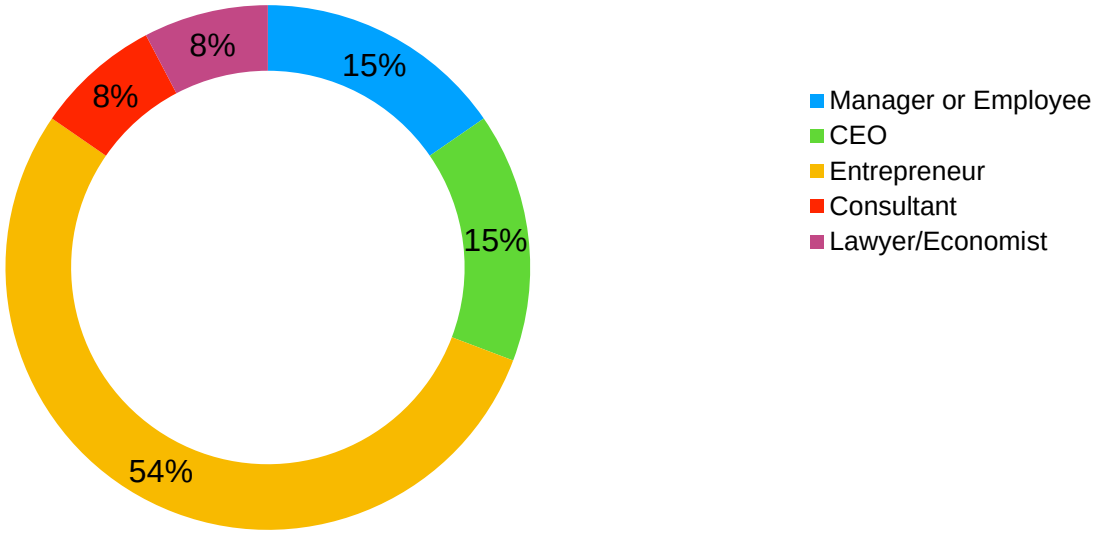
3.2 THE SAMPLES

Cluster sampling by dividing the SMEs in Groups of sectors. The survey sample is composed, of 15 SMEs, (in the field of; Food industry (processing of agricultural products), agriculture and fishing, services for companies, Tourism, Wholesaled retail etc.).

The SMEs were selected through a public invitation via email to express interest in participating in the survey, taking into account not only the technical-technological orientation but also the location in different areas of Albania and different sectors.

The representatives involved were; CEO, Entrepreneurs, Managers etc, who are entrusted to bring out quantitative and qualitative data on research.



Covered role of the interviewed within the company

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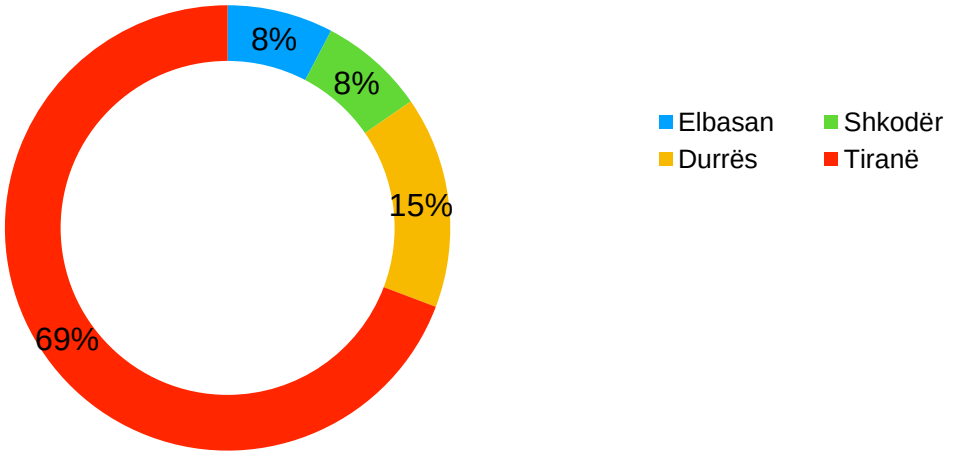
3.3 LIST OF SELECTED SMEs

LIST OF SELECTED SMEs

SMEs	Official Website
Natyral ATC	www.natyral-atc.com
Uka Farm	
Mjalte MORAVA	www-mjalte.morava.com
Albanian Trip Sh.P.K.	http://www.albaniantrip.com
Albania Textile F 15 shpk	
PortAlbania Sh.p.k	www.portalbania.com
Klinika Gliozheni	Www.klinikagliozheni.com
Smartwork	www.smartworknet.eu
A G S	www.ags.al
Kantina ARBERI	www.arberi.al
Easydrive Albania	www.easydrivealbania.com
EuroBicaku shpk	http://www.eurobicaku.com/
Prius Solution Shpk	www.priussolution.com
Zepa Natural	www.zepanatyral.al
Artisanal	



Geographical distribution of SMEs

3.4 SURVEY RESEARCH METHODOLOGY

The survey research is made by questionaries including two types of design; The online survey research is made by questionaries including two types of design; Closed - Ended Questions and Opened - Ended Questions. It aims to gather information from a sample of SMEs through the compilation of a questionnaire (as per suggestions given in project) and the subsequent analysis of the collected data.

The survey use as research instrument, a structured, multiple choice questionnaire, that consists of a series of questions with several option answers and also in open ended questions for collecting the needed information from respondents. So, The questionnaire was sent by e-mail and is therefore completed by the respective representatives; The questionnaire has both closed-ended questions (to count the frequency of each response) and open ended questions (to express themselves in their own words), this method was chosen to allow compilers to gather the various data to answer the questions of the various sections with their words and with a list of responses.

The questionnaire is structured in four sections: 1.SMEs Representative, 2.General SMEs Data, 3.SME Technical Data, 4. SMEs Educational and Human Resources Data. This structure is aimed to organise the data collection following a logical flow.

The target respondents are the representatives of SMEs of the Albania. The SMEs are representative of different sectors and region, in which 9 SMEs are located in the Region of Tirana, 2 SMEs are located in the Region of Durres, 1 in the region of Shkodra and 1 in the region of Elbasan. The geographical distribution of the sample allows to have a more representative indication of all the various realities of the Region and sectors, see fig of Stratification above.

3.5 REFERENCE FOR SKILLS ON KEY ENABLING TECHNOLOGIES

For the identification of the skills connected with the Key Enabling Technologies, reference documents are the following:

For the identification of the skills connected with the Key Enabling Technologies, reference documents are the following:

- Year 2009 document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - Preparing our future: developing a common strategy for key enabling technologies in the EU

- Year 2012 document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - A European Strategy for Enabling Technologies - A Bridge to Growth and Jobs

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- Year 2014 document on methodology, work plan and roadmap for crosscutting KETs activities in Horizon 2020 (RO-cKETs)

- Year 2014 document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

- Year 2016 Skills for Key Enabling Technologies in Europe document

http://listakombetareprofesioneve.al/category_1.php?id=2#category_1

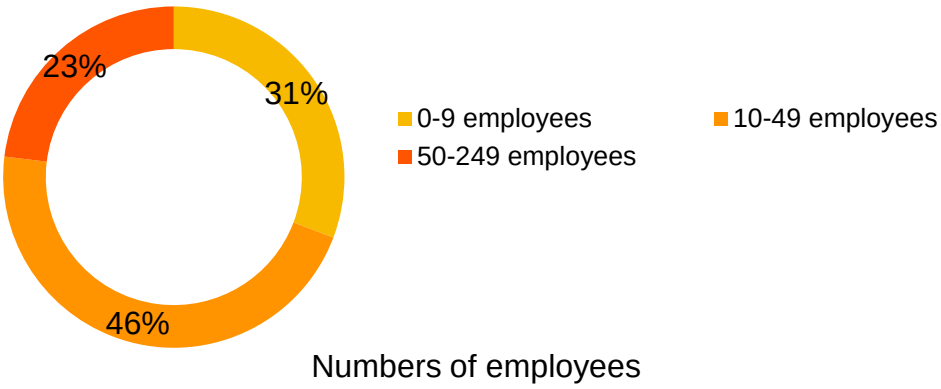
http://www.akafp.gov.al/rreth-nesh/baza-ligjore/

4. DATA ANALYSIS AND RESULTS

4.1 SMEs GENERAL DATA

This section is about General data of the companies such as; Names Surnames, Webs, email and telephone number, Cities and Region (see Annex 1 for detailed data).

4.1.1 The number of employees (regardless of the contractual form) of the companies.



As shown in the figure above, 31% of the SMEs that answered the questionnaire have 0-9 employees in their companies, 46% have 10-49 employees and 23% have 50-249 employees.

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4.1.2 Market

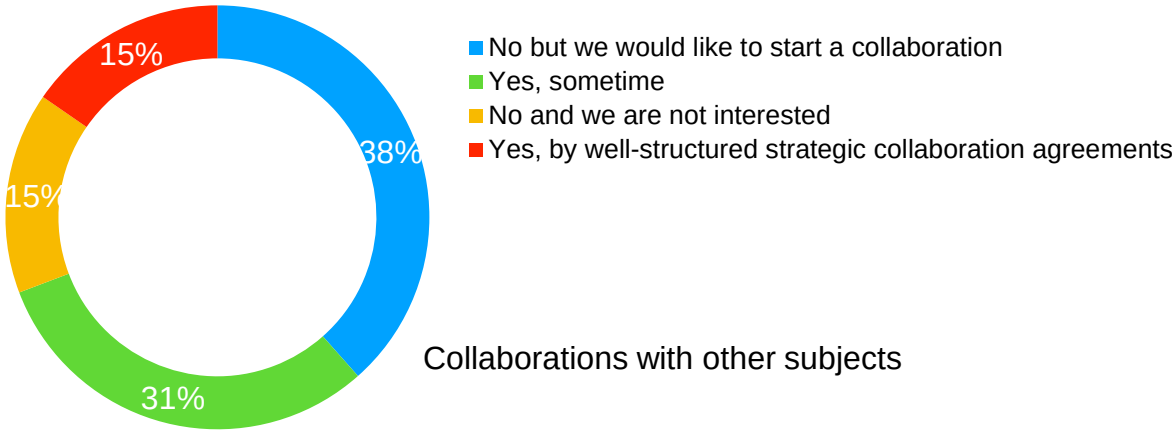
The SMEs operate in different sectors such as tourism, manufacturing, wholesale and retail, services, communications, transport & logistics, Agriculture, Food Industry. Generally, they are both focused on the local market as well as international export, as there are companies who focus solely on export or local market. Most of the interviewed SMEs operate in Agro Food Industries (31% of them), and another 15 % in services for companies. Details in percentage are shown in the figure below:

Stratification by Sector

4.2 SMEs TECHNICAL DATA

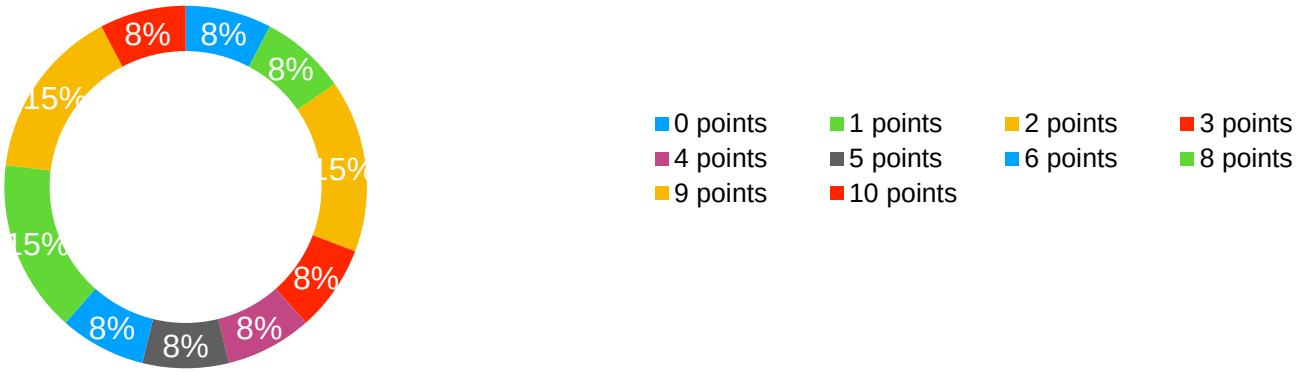
4.2.1 Collaborations with other subjects (research centres, universities, ITS, high schools) in the design, research and development of new products / services.

According to the data supplied by the SMEs, 46% of them have collaborations and 53% of them have answered they don't have a collaboration. Furthermore, 38% of them would like to have cooperation and only 15 % of the SMEs aren't interested to collaborate with other subjects.



4.2.2 The value of foreign market turnover over the total Turnover of the companies

In the figure below we see the amount of points (or percentage) given by the SMEs to the weight of the foreign market turnover. 15% of them answered 8 points, another 15% 9 points, and another 15% 2 points. The rest share 8% each in value of points given to foreign market turnover



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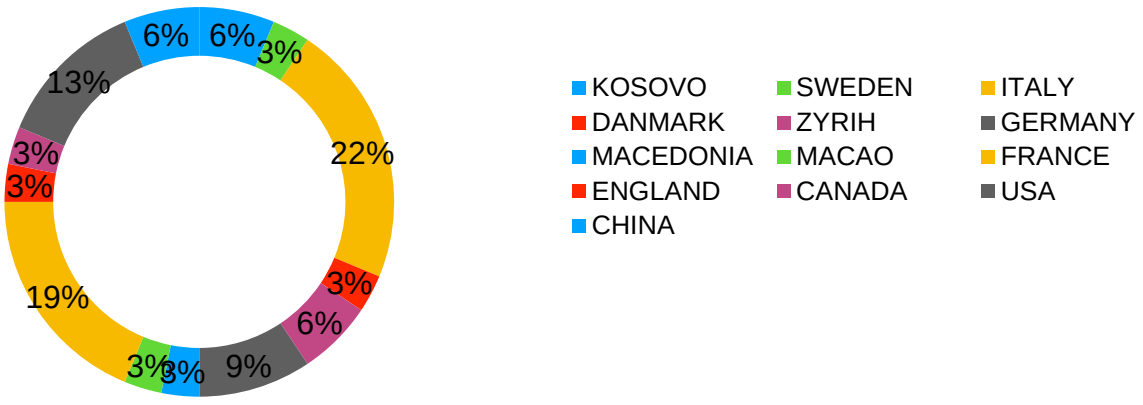
4.2.3 The 3 most important foreign countries for SMEs turnover.

Italy is the country that the SMEs think most important one to make business, passing in France, USA, Germany and so on.

4.2.4 Does the SMEs work with the following countries?

Yes, Indeed most of the SMEs work with Italy, Greece and Montenegro.



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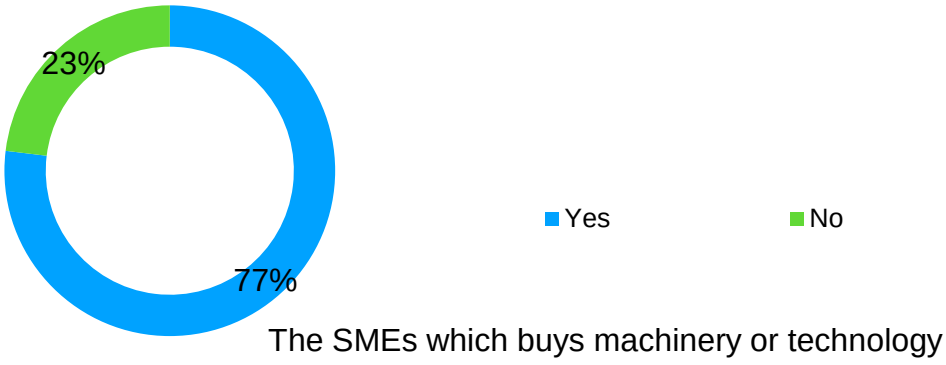
4.2.5 The SMEs which sell \ buy machinery or technology.

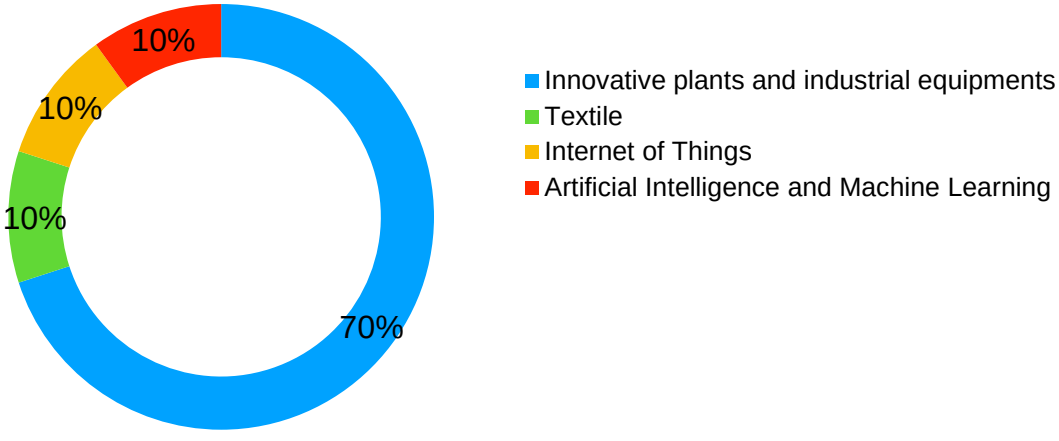
About 77% of the SMEs buy machinery or technology outside Albania.



The SMEs which buys machinery or technology

4.2.6 Which technologies do the companies buy \ sell?

The lion share of technologies that the surveyed SMSs buy, is innovative and industrial equipment.



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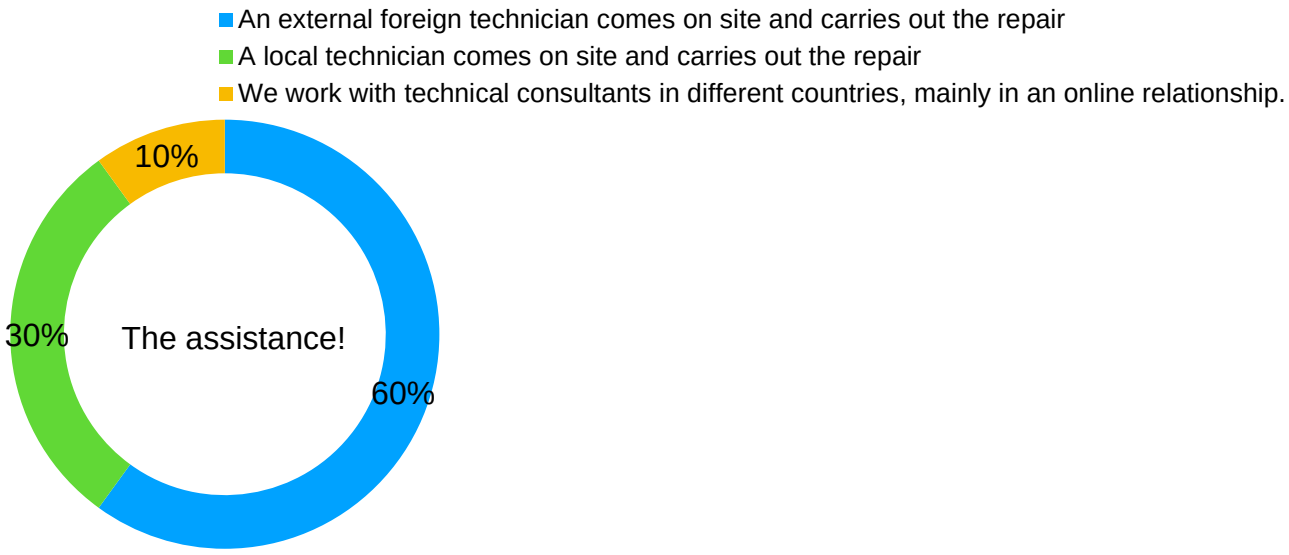
4.2.7 How does the assistance work?

The SMEs mainly works with external foreign technicians, which in general go to their companies and carry out the repair, as well as they have an external local technician who carries out the repair of machinery on site. Only 10% of the companies work with online technicians. .



4.3 SMEs EDUCATIONAL AND HUMAN RESOURCES NEEDS

4.3.1 The professional figures related to innovation that the companies needs most.

According to data from open ended questions the companies needs more in this field of:

Seller
Professional in the field of culinary
Webmaster, marketing & sales specialist, networking tools, media partnerships.
Technical Worker
Digital PR Specialist and Communication
Specialized technicians
Business Analyst
Production Technology Workers
Enologist, Technology and IT Engineering
Customer Care Manager
Wood Engineer
Program Developer

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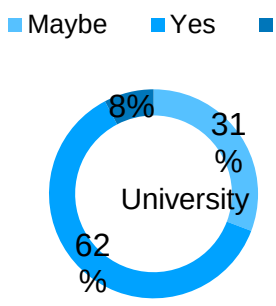
4.3.2 The products, processes or technologies the SMESs professional figures should be able to manage.

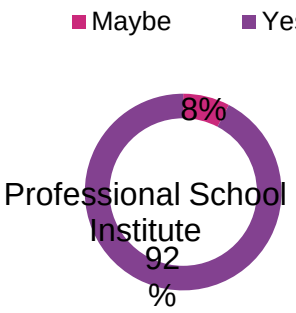
As we see above the professionals figures related to innovation that the companies needs most should be able to mange their products/processes or technologies as below:

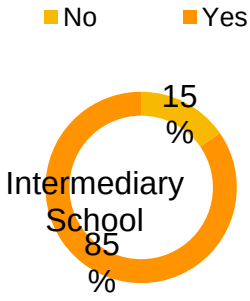
Tea and herbs
Restaurant MENU's
Sales management, product image, company image.
Everything
Social Media and PR in HORECA
Laboratory equipment
SAP
The employee must be able to manage the production of UHT Products and aseptic product packaging technology as well as ongoing food safety monitoring processes.
The first crop of grapes
customer care
Numerical / Autocad machines
Applications, Web, Platforms

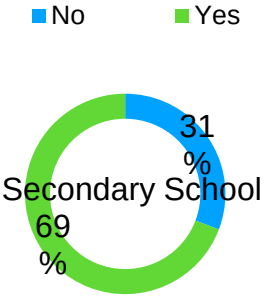
4.3.3 The kind of training that workers should have in SMEs. The necessaries for university, ITS or just upper secondary training of the workers. [ITS / Professional School Institute, Intermediary School, Secondary School]

Professional Schools are the kind of training workers need according to the data. About 92% of them has checked the 'yes' box for this kind of training.
In general, all SMEs need educated workers, about 62% of them agree that they need workers that have finished University and 85% of them said that the workers should have an intermediary school, and for about 69% of the SMEs is enough only one level of schooling.









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4.3.4 The subjects that should be taught or soft skills in SMEs.

Tourism
Marketing & Tourism, Sales management, Multimedia
Mechanics
Office Management. Burial and basic fiscal culture
Informatics, Physics, Biology, Chemistry
Programming
The employee should be trained and possess computer skills / to have the right professional training in the field of microbiology, chemistry and food technology and have coordinating skills in the work of production departments.
Chemistry and Biology (Baseline Information)
Service, customer care, flexibility
Mathematics, primarily Physical and Physical

The kind of training the worker in SMEs.

SMEs	University	Professional School Institute	Intermediary School	Secondary School
Natyral ATC	Maybe	Yes	No	No
Uka Farm	Maybe	Yes	Yes	No
Mjalte MORAVA	Maybe	Yes	Yes	Yes
Albanian Trip Sh.P.K.	Yes	Maybe	No	No
Albania Textile F 15 shpk	No	Yes	Yes	Yes
PortAlbania Sh.p.k	Maybe	Yes	Yes	Yes
Klinika Gliozheni	Yes	Yes	Yes	Yes
Smartwork	Yes	Yes	Yes	No
A G S	Yes	Yes	Yes	Yes
Kantina ARBERI	Yes	Yes	Yes	Yes
Easydrive Albania	Yes	Yes	Yes	Yes
EuroBicaku shpk	Yes	Yes	Yes	Yes
Prius Solution Shpk	Yes	Yes	Yes	Yes
Zepa Natural	Yes	Yes	Yes	Yes
Artisanal	Maybe	Maybe	Yes	Yes

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5. CONCLUSIONS

Regarding **SMEs in field of KETs**, below are a number of highlights stemming out of the data analysis we believe are potentially interesting to further investigate and take note of:

- As expected, most of the surveyed SMEs reside along Tirana and Durres, also called Durrana.
- 46% of the SMEs have 10-49 employees
- Most of the companies realize their cooperation and turnover with Italy
- Most of SMEs in equal parts either already cooperate with training institutions, or do not but are looking forward to work with them
- More than three quarters of the SMEs buy machinery or technology
- The lion share of technologies that the surveyed SMSs buy, 70%, is innovative and industrial equipment
- Interestingly, 60% of the SMEs rely on technical expertise from abroad

An interesting finding is the more than 90% of the SMEs need workers trained in Professional

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