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# RE-EDUCO Comparative Report



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# Introduction



The present report is part of the first intellectual output (IO1) **Needs analysis. Competence profiles update: perspective and impacts for the future digital society**, planned within the RE-EDUCO Project (*Rethinking EDUcation Competencies. Expertise, best practices and teaching in Digital Era*).

This comparative report has been elaborated based on the National Report furnished by each country partner focusing on:

- European policies and perspectives for digital culture
- New technologies and digital skills
- local labour markets trends and industry 4.0
- new digital profile
- new skills for digital society
- skills gaps in the digital field

# Introduction



The report compares national strategy of countries partner in order to:

- 1.the development of ICTs in the labour market
- 2.the financing Programs
- 3.the digital technologies in education
- 4.the trends of the labour market
- 5.the professional development and emerging profiles
- 6.the emerging competences

A SWOT analysis completes the comparative report to bring out possible development strategies to face the digital transition in a transnational perspective, looking at best practices.

The present report provides a comparative analysis of the most significant results of the national researches, trying to present them in terms of remarkable characteristics, common elements and notable differences

# 1. The development of ICTs in the labour market



The development of ICT in the labour market is supported by public institutions such as a ministry, which is a dedicated one in some countries. All the EU member states involved in the study promote the development of the country's digitalization in multiple sectors, from the financial and economic sector to the public administration and civil society, involving a multiplicity of social actors in this process, such as the enterprises, the financial market, but also citizens.

The five countries (Cyprus, Greece, Finland, Italy, Spain) started to implement the general development of digital era in different moment in time. They differ in the level of development, ranking differently in DESI index.

For this reason, each country shows a specific strategy to implement it according to its needs focusing on specific sectors (e.g., artificial intelligence, trade market, public administration) and enacting specific regulations, action plans, and projects financially supported at a national and European level.





# Cyprus

## The development of ICTs in the labour market laws, decrees, acts, contributions

In March 2020 the Cyprus Government announced the establishment of the Deputy Ministry of Research, Innovation and Digital Policy (DMRID). Previously these tasks were under the Department of Electronic Communications.

### 3 Strategic Pillars

1. Research and Innovation: Period 2019-2023, 9 Strategic Enablers
2. Artificial Intelligence: Released in January 2020, Identification of 3 priorities
3. Blockchain: Published in May 2019, Identification of 3 priorities

### 2 Actions or commitments

1. The Implementation of Regulation (EU) No. 910/2014, on Electronic Identification and Trust Services for Electronic Transactions in the Internal Market, Law of 2018
2. "Parallel Parliament" – May 2019: The parliament has identified key experts in various fields

### The Parallel Parliament consists of 7 thematic groups which are:

1. Research, Innovation and Digital Governance (37 members from academia and industry)
2. Environment, Ecology-Sustainability and Health
3. Culture
4. Civil Society
5. Entrepreneurship (specific committee on technology)
6. Youth representatives
7. Children's Parliament



# Finland

## The development of ICTs in the labour market laws, decrees, acts, contributions

The Finnish government started implementing the general development of digital era by the action plan 2016. The Program for the Promotion of Digitalization (2020) to support and encourage public authorities to make their services available to citizens and businesses in digital form by 2023.

## 2 Policy actions

1. Platform economy focused “Finland in platform economy”
2. An Artificial Intelligence focused “Finland a leader in the application of artificial intelligence”

## The new Finnish Government's program

The Finnish Government's program sets the goal that Finland will be on the top of digitalization and that technological development are developed and implemented across administrative and industry boundaries:

1. High-quality digital public services are available to citizens and businesses at least in accordance with the requirements of the Act on the Provision of Digital Services
2. Paperless office: The paper and business dealings of business people have decreased significantly, and a number of digital-only business services are available
3. Digital support is available throughout the country and is being developed to serve business people as well





# Greece

## The development of ICTs in the labour market laws, decrees, acts, contributions

The Greek Ministry of Digital Governance recently presented a Digital Transformation “bible” for the years 2020 – 2025 outlining a holistic digital strategy with 7 objectives.

### The 7 objectives of the Greek Ministry of Digital Governance

1. Safe, fast, and reliable access to the Internet for all
2. A digital state offering better digital services to the citizens for all life events
3. Development of digital skills for all citizens
4. Facilitate the transformation to digital enterprise
5. Support and strengthening of digital innovation
6. Making productive use of public administration data
7. Incorporating digital technologies to all economic sector

### Projects

Implementation of more than 400 projects in the sectors: Economy, Development & Innovation, Foreign Policy, Education, Culture, Sports, Employment & Social Affairs, Health



# Italy

## The development of ICTs in the labour market laws, decrees, acts, contributions

Every five years, Italy carries out a survey on professions (based on the O\*Net model) through which it detects and measures the tasks associated with each of the 800 Professional Units (UP) contained in the classification of professions (CP2011, the national equivalent of ISCO08). Based on CP2011, a set of initiatives were undertaken to define the professional needs of the professions associated with the ICT sector to which a set of specialist skills, defined through the e-CF model, were associated.

### The main structured sources at national level

1. The AGID guidelines for the harmonization of ICT professions
2. The Atlas of Labor and the national skills certification system (Legislative Decree 13/2013)
3. The Excelsior survey for the detection of professional needs
4. The Experimental survey on professions in the Public Administration conducted by the MEF

### Survey ISTAT INAPP

Italy carries out, every five years, a survey on professions (based on the O\*Net model) through which it detects and measures the tasks associated with each of the 800 Professional Units (UP) contained in the classification of professions (CP2011, the national equivalent of ISCO 08).

On the basis of CP2011, a set of initiatives were undertaken to define the professional needs of the professions associated with the ICT sector, to which a set of specialist skills defined through the e-CF model was associated.

### Survey ISTAT - AGID

ISTAT and AGID have identified some Professional Units (referring to the ISCO-08 standard) which, while maintaining a certain level of genericity, mainly describe the ICT sector. Each professional unit is fully described by the sample survey on professions. For example, regarding the System Analysts, the tasks performed within the profession are detected and measured on a double scale: frequency and importance.

These two models can be combined with the e-CF classification model (which became a European standard in 2016), which classifies 40 skills in 5 areas of ICT activity. Within the e-CF, skills are described from the point of view of observable behavior in the workplace and the measurable elements of a specific skill.



# Spain

## The development of ICTs in the labour market laws, decrees, acts, contributions

Based on the DESI Index, that covers 5 dimensions (connectivity, human capital, use of Internet services, integration of digital technology and digital public services), Spain ranks out 11th out of 27 EU Member States and the UK. Spain proves a great special performance on two main fields: connectivity and digital public services.

### Connectivity

Spain has promoted a vast digital infrastructure based on FTTP networks and on fixed VHCN.

This area raises Spain to the 5th place on the ranking.

The Government set a program for the extension of next-generation broadband networks: Programa de Extensión de la Banda ancha de Nueva Generación.

This program will help financially to supply better networks to the remaining white and grey areas all over the country.

### Digital Public Services

Digital Public Services: 2nd place on the ranking.

This principle has been embedded directly to the heart of the legal instruments that shape the relationship between citizens and public administrations: Administrative Procedure Law (Ley 39/2015) and Public Sector Law (Ley 40/2015).

### Field that need an effort

Other fields that need an effort: human capital training (16th position), integration of digital technology (13th position).





## 2. Financing Programs



ICT financing programs are generally based on three strategies: the allocation of a percentage of the total public expenditure, the allocation of funds to specific plan, and the allocation of funds to specific program. While the allocation of a percentage of the total public expenditure grants a constant financial support to digitalization allowing for a long-term development strategy, the allocation of funds to specific plan aims to foster the uptake and integration of digital technologies in national strategic areas, and the allocation of funds to specific program aims to foster innovation and competitiveness on specific target.

The financing methods therefore differ in their amount: programs' funding is lower than public expenditure and plan. Also the level of competitiveness count: it is greater in programs, that have a selection phase, than the public expenditure. Moreover, the pandemic has tested the robustness and adequacy of countries' ICT facilities and services. The shortcomings identified lead to the implementation of action plans or other sources of funding to fill the gaps. Finally, the founding strategies, not surprisingly, differs according to the level of ICT development of the country: the more the ICT is developed the more the project are targeted, while the less ICT is developed the more a multiplicity of founding strategies is adopted by the country.

# Financing programs of five EU member states

## Cyprus

- **Erasmus + Projects:** More than 300 projects dealing with ICT.
  - COVID-19 National Calls: Youth Board of Cyprus specific call “ReCOVer20” aiming to mobilize young people themselves to plan and implement actions
  - New instruments in 2021 by the European Commission  
**Horizon 2020 Digital Transformation Calls:** 7 calls but no participation from Cypriot partners
  - **Research and Innovation Foundation** opened a call during the pandemic aiming to collect innovative ideas in order to support the various public authorities
- 

## Finland

- The budget of the **Program for the Promotion of Digitalization** (2020 – 2023) is 7,6 million euros. In addition to the funding of the program, EUR 1.4 million has been allocated for the regional development of digital support for 2020 and EUR 1.6 million for 2021
- The Ministry of Transport and Communication has a plan for 2025, **The Digital infrastructure strategy**, which means that Finland wants to be among the top leaders in communications networks
- The budget of **the Academy used for 2020 to implement the ICT 2023 program was at least 10 million euros**. The aim of the ‘ICT Technologies for the Digital Transformation of Industry’ projects is to support the creation of new techniques and technologies to enhance the digital transformation of industry



# Financing programs of five EU member states

## Greece

- Two main funding streams, the **Operational Program “Competitiveness, Entrepreneurship & Innovation” (EPAnEK)** and **the Hellenic Development Bank (former ETEAN)**
- **EPAnEK** constitutes one of the seven sectoral Operational Programmes of the Partnership and Cooperation Agreement for the period 2014-2020 with total public expenditure set at €4,66 billion
- Strategic objectives of EPAnEK is to enhance the competitiveness and extroversion of enterprises and facilitate transition to quality entrepreneurship with innovation
- **The Hellenic Development Bank (HDB)** aims to support the design, implementation and management of specialised **financial actions**, delivered by financial institutions to **SMEs: programme “Business Innovation Greece”** and programme “4th Industrial Revolution”
- **Additional funding sources** that are used to support enterprises towards digital transformation: EquiFund, COSME, InnovFin, European Investment Bank and Tax incentives for investment

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## Italy

Italy has set up various incentives to finance **R&D and Innovation**, in an attempt to respond to the ongoing pandemic crisis:

- The **“Legislative Decree Relaunch”** in response to the Covid-19 emergency, converted into the law of 17 July 2020, n. 77
- **A Fund for technological innovation and digitization:** Its initial endowment is 50 million euros, entrusted to the **Ministry for Technological Innovation and Digitization**. They will serve to digitize public administration services for citizens and businesses, first of all to increase the type of practices that can be carried out electronically. The new Fund aims to increase the amount of services obtainable through the Digital Identity Service (Spid)
- Directorial Decree n.1628 of 16-10-2020 - **PRIN 2020 call**. The Ministry of University and Research launched **a new program of Projects of Relevant National Interest (PRIN)**, for financing of public research projects, with the aim of promoting the strengthening of national scientific bases, also in view of a more effective participation in European initiatives relating to the European Union Framework Programs and family offices)



# Financing programs of five EU member states

## Spain

Financing programs that foster the uptake and integration of digital technologies are:

- **Estrategia para la Digitalización del Sector Agroalimentario y Forestal y del Medio Rural** (Strategy for the Digitalization of the Agrifood and Forestry Sector and the Rural Environment)
  - **Estrategia Nacional Industria Conectada 4.0** (National Strategy Connected Industry 4.0)
  - **Estrategia de Internacionalización de la Economía Española 2017-2027** (Strategy for the Internationalization of the Spanish Economy 2017-2027)
  - **Plan Estratégico de ICEX España exportación e inversiones** (ICEX) (ICEX Spain Export and Investments Strategic Plan)
  - Taking into account the boost that **Covid-19** has caused, there are two main plans that gather different financial instruments, such as the AI National Plan or the Digital Toolkit Program:
    - **España Puede Plan** (Recovery, transformation, and resilience plan): Strategic Projects for recovering and economic transformation
    - “Agenda Digital 2025”
- 



# 3. Digital technologies in education



Education system starts digitalization from early childhood to improve overall digital skills in all the countries and it is proposed to all level of education in order to reduce differences in learning outcomes and increase citizens' digital skill in a near future.

All the country has a two-fold strategies: the implementation of educational program in school, that would produce a new “digital” generation, and the improvement of adults' digital skills. Programs aiming to improve workers' digital skills focused of the public administration, the industry, and the citizens.

Not surprisingly, the differences seem to emerge from the level and spread of digital skills in each country. During the pandemic activities such as tele-working, blended learning and teaching and the public administration digitalization were promoted and implemented changing the level of the country's digital development. Unfortunately, data on the digital transformation resulted from pandemic's interventions most often are still not available and it is not possible to evaluate the real outcome.





# Cyprus

## Issues

- Cyprus ranks below the EU average on the take-up of fast broadband.
- Almost an eighth of Cypriots have never used the internet
- Half of Cypriots lack basic digital skills
- Despite growing demand in the labour market, the supply of ICT specialists is still below the EU average

## Actions

The current “**Digital Strategy for Cyprus**”, which started in 2012 and was updated in 2015 and in 2018, is in line with the objectives and measures proposed in the “Digital Agenda for Europe”. The new digital strategy plans to publish the strategy in the second half of 2020.

Cyprus has a cybersecurity strategy in place since 2012 and the Digital Security Authority has proposed a new cybersecurity strategy, which is pending final approval from the Ministry of Communication and the Council of Ministers.

The Council of Ministers adopted the new ‘**Cyprus Industrial Strategy Policy**’ for 2019-2030 in May 2019, and it is currently being implemented.

In January 2020, the government approved a **national strategy on Artificial Intelligence (AI)**.

Cyprus is also a member of the **EuroHPC Joint**. It has also signed the Declaration of European Blockchain Partnership, and the Declaration on Cooperation on Artificial Intelligence.

During the pandemic the following activities have been promoted and implemented:

- In the area of education, various online activities were developed to facilitate the provision of the best possible education to students of all levels at the same time, supportive educational materials have been uploaded to the “Ministry of Education, Culture Sports and Youth” and individual school webpages, for all students of all grades
- Digitization of the public administration is also being accelerated, enabling citizens to use their e-banking credentials to engage with e-government services
- Teleworking has also been promoted for civil servants through the use of services supporting remote access and teleconferencing

# Finland

## Issues & Actions

The level of education and competence among the population will rise at all levels of education, differences in learning outcomes will decrease, and educational equality will increase' (Government program).

Finnish education system starts digitalization from early childhood education. Finnish government has decided to raise the age of compulsory education to 18 years.

The new system intends to implement near-term measures to respond to the shortage of skills and to train adults with a low level of basic skills e.g., computer and digital skills.

The educational focus is also, on recognizing and acknowledging the skills gained in working life and/or prior studying in vocational school.

The research and development are focused on technology and higher education. The education system is renewed, and more and more young promising students continue their studies to the University of applied sciences or even University to be a researcher.

The aim of the '**ICT Technologies for the Digital Transformation of Industry**' projects is to support the creation of new techniques and technologies to enhance the digital transformation of industry.

## Supporting activities

There are different support activities on the society and organisational level, such like '**Digituki**' **digital support** persons in organisations and **Suomidigi** with providing the opportunity to share information, support, and tools to help digital service designers, creators, and decision makers build more streamlined and customer-centric services, thus none of the developers of digitalisation in the public sector would be left alone in their work.

Pedagogy and digital teachers as well digital tutor-students of Omnia form Omnia support for all departments, teachers and learners.

Omnia supports digital pedagogical themes by organizing teachers' training and uploading different materials on the pedagogical and digital learning landscape. There are many forms of support, donors and channels providing support for different situations: pedagogical, technical or administrative.



# Greece



## Issues & Actions

- Development and gradual implementation of distance learning
- Without intending to replace f2f the Greek Ministry of Education is activating digital platforms and tools in all education levels
- In primary and secondary education, distance learning is mainly available through registration to the National School Network
- Tertiary education uses free and commercial tools (e.g. Moodle-based LMSs, teleconference systems, etc.)
- The digital platforms “e-class” and “e-me” are used for e-learning courses, while students will have the opportunity to follow “Open Classes” posted in the platforms by their teachers without prior registration
- CISCO, Webex, Zoom, Google and Microsoft are the main tech providers to the Ministry of Education and the Greek Universities





# Italy

## Issues

The dramatic impact of the epidemic made even more evident how important the use of digital technology is for social and economic life, as well as for education.

- Only 42% of Italians aged between 16 and 74 years have basic digital skills (58% in the EU)
- The 17% of people between the ages of 16 and 74 who have never surfed the net (9% in the EU)
- Only 1% of Italian graduates have an ICT qualification (the worst position in the EU) and that the percentage of ICT specialists - although it has increased over time and reached 3.6% of total employment - is still way behind the EU average (4.2%) (Source: Eurostat 2019)
- Regarding the number of ICT graduates, the gap between supply and demand is growing, with a shortage of 5,100 graduates e.g. 35% of the total (Source: Digital Skills Observatory 2019)

## Actions

According to the **Digital Skills and Jobs Coalition** of the European Commission and through the **Strategy Italia 2025** and in particular with its main pillar **Repubblica Digitale**, and the **National Strategy for Digital Competencies**, Italy has established three areas of intervention and related objectives:

- **DIGITAL EDUCATION** - The empowerment of digital skill for citizenship, growth, competitiveness, creation of public value, and the well-being of the country
- **ETHICAL, HUMAN AND NON-DISCRIMINATORY DIGITAL** - Public and private should contribute to the removal of all social, economic, geographical, technological, and cultural obstacles that can foster inequality between citizens
- **DIGITAL CITIZENSHIP** - For a new form of citizenship based on quality information, participation in deliberations, civic engagement

# Spain



## Issues & Actions

The uptake of digital technologies in education is a priority for the Spanish Government.

Some measures that are included in the **Recovery Plan of Spain** reflect that:

- €3.59 billion to implement a digital skills national plan
- €1.64 billion to modernize and digitalize the education system
- In the “Agenda Digital 2025” there are €11 billion destined to the Digital Skills national plan, 2021-2025 SME’s digitalisation plan and the Public Administration digitalisation plan
- Digital Skills national plan: a 80 % of basic digital literacy all over the Spanish society
- On 2020 6th June, Spain launched the **“Educa en Digital” program** (€260 million)
- **500.000 devices distributed to the students**
- Assistance program facility through AI that will interconnect students, teachers and managing authorities
- 2020 November 22nd: Plan Estratégico de Formación Profesional del Sistema Educativo 2019-2022
- Updating the qualifications requirements demanded by the labor market
- Around **80 new certificates and specialization connected to digitisation**

# 4. Trends of labour market



An increase in the digitalization of the labour market is expected in the future. Investments have been made on the educational sector, the public administration and the commerce. Teleworking had a bust during pandemic, which modified the labour market. Countries had invested in artificial intelligence, e-commerce, e-services, cyber security, then, these sectors will develop in the future.

A development that will impact not only on the business models, concerning companies, web shops and e-services, but also on the economy allowing for a green, competitive, and inclusive economy. Nonetheless, differences in the stage of development phase persist.

While countries, such as Cyprus, are more focused on the human resources training, fostering and improving the education sector to attain a consistent digital transformation, other countries, such as Finland, has already a high number of companies which had addressed digital transformation in their strategies.

# Trends of labour market of five EU member states

## Cyprus

### Promoting ICT

#### Initiatives implemented in Cyprus

- Cyprus National Reform Programme, Cypriot National Coalition for Digital Skills and Jobs
- Human Resource Development Authority: Youth Board of Cyprus: The STEAMers, Youth Makerspace
- Department of Labour Relations
- Cyprus Pedagogical Institute
- Cyprus Computer Society Activities and Competitions
  - Informatics Olympiad, Bebras challenge, Cyber Security Challenge, Robotex International, World Robotics Olympiad
  - Coding our Future, EU Code Week, European Robotics Week, Hour of Code, All Digital week
- Professional Associations (IET, ACM, IEEE, ETEK, ISACA, PMI, etc.)
- Advanced Training programmes (Universities, Hackathons, Entrepreneurs, etc.)
- Social Media Tech/ICT Groups

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## Finland

Digitalisation will change the business models of companies, web shops and e-services, and will be key to a climate-neutral, green, competitive and inclusive economy.

The Technology Industries of Finland published a roadmap to the zero-carbon industry (2020) about digital solutions need to address the entire lifecycle of the industry as follows: raw materials and energy; production and processing; usage, maintenance and logistics, recycling.

Mostly 86 % of companies had addressed digital transformation in their strategies. For best development in the future, the Finnish enterprises expect to invest in and prioritization within AI, IoT, robotics, AR/VR, blockchain and 3D printing. In the public sector, robotics has everyone's attention.



# Trends of labour market of five EU member states

## Greece

- Most sectors are expected to see increases in employment in both the short term (2018-2022) and the longer term (2022-2030)
- The strongest employment growth is expected in construction
- Non-marketed services are also expected to see strong growth
- Primary sector and utilities are expected to see a continued decline in employment
- Manufacturing is expected to see almost no employment growth in the short term, but strong growth of 2% pa in the long term

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## Italy

The change is widely believed that it can be considered in three phases or partially overlapping waves (Hawksworth et al., 2018):

1. **Algorithm wave**, concerns the tasks of a computational nature, i.e. those based on the use of basic software, mathematical calculations, telematic research and the like
2. **Augmentation wave**, concerns more dynamic tasks, for example, routine form filling activities
3. **Autonomy wave**, will be that of autonomy and will be characterized by AI and robotics, not just going to replace routine activities, but also going to carry out more complex tasks from the point of view of manual dexterity and also from the point of view of view of the required problem solving skills

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## Spain

The main technological trends that influence the labour market are:

- Teleworking: wider flexibility, higher productivity, digital disconnection, Covid-19 as an adoption catalyser in Spain
- Education methodology: online model, blended solutions, technological skills required, new private initiatives arise, inclusion of new competences such as AI, Big Data, IoT, robotics, 3D design, computer programming





# 5. Professional development and emerging profiles



Companies use computers, internet, and social media, and they have a website in all the countries. Nonetheless, differences lie in the development of the infrastructure, and the spread of digital skills in the population. For example, while in Cyprus the use of cloud computing is beginning, in Finland society and companies are going more digital reaching a widespread diffusion of digital skills.

The demand for ICT specialists is increasing but not all countries can meet the demand. Spain, Greece and Cyprus highlight a discrepancy between supply and demand, which imply the need to hire specialist outside the country determining an increase in the cost for the companies.

Education plays a key role in facing this change in the working skills' demand. Schools allow the up-skilling and continuous learning increasing the employment level and opportunities to enter in the job market. In digitalized countries, the larger use of digital opportunities as well as new and variegated users has involved the need to take in account for digital etiquette and security issues. For example, Finland made digital education equality and non-discrimination mandatory for all levels of education.



# Cyprus

## Key points

Steady **increase of big data analysis, IoT devices, 3D printing and Robotics**

The vast majority of large enterprises (81,5%) employ ICT specialists compared to just 19,8% of small enterprises.

The 10,7% of enterprises recruited or tried to recruit ICT specialists in 2019.

The 4,4% of enterprises faced difficulties to fill the vacancies during 2019.

Applicants' lack of relevant ICT related qualifications from education and/or training and applicants' lack of relevant work experience were the two of the main difficulties faced by enterprises during the ICT specialists' recruitment process.

**CEDEFOP Skills forecast 2020: Computer programming and information services is expected to exhibit strong growth**

because of the government's effort to promote the use of ICT technologies across the economy through the implementation of the National Digital Strategy.



# Finland

## Key points

Finland has been ranked as one of the leading countries in several digital transformation related assessments. Finland has the best availability of scientists and engineers in the world combined with one of the most digitally oriented population.

ICT specialists' share of the workforce (6.7%) is one the highest.

Digital services already are quite common in Finnish everyday life (e-government, banking, health care, education).

Finnish society and companies are going more digital. The changing demand of the working life demands up-skilling and continuous learning.

To increase employment level and opportunities the schools are in key role. Larger use of digital opportunities as well new and variegated users will highlight many questions of digital etiquette and security. Obligatory the equality and non-discrimination digital education to the all level of education.





# Greece

## Key points

Greece is rapidly increasing its share of higher qualified workers in the labour market - expected to increase to 40% by 2030.

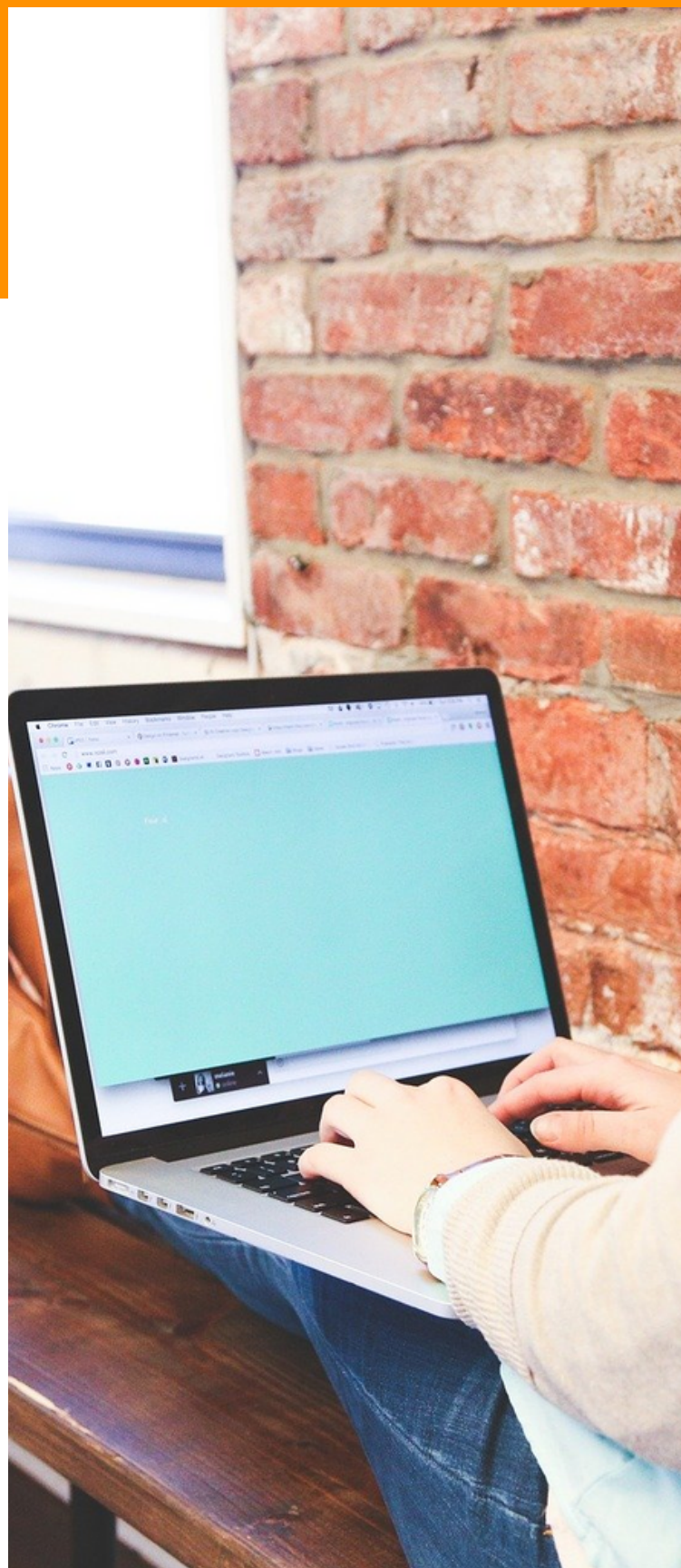
The share of medium qualified workers is expected to decrease from 41% in 2018 to 36% in 2030.

Clear trend of declining demand for people with few skills (high school graduates and below).

Demand for higher education graduates and postgraduate students will increase significantly.

Self-employment has increasing trends, while the demand for manual labor is projected to decline significantly.

Professions that are expected to show the greatest growth are those of salespeople and those related to the provision of services. A large number of positions in the field of new technologies and information technology remain vacant and employers report significant difficulty in finding skilled people to fill these positions.



# Italy

## Key points

Resuming the analysis of the report "Digital Skills Observatory 2019", it provides interesting quantitative and qualitative information on the trend of demand (job offers) in the ICT sector 2018.

The analysis also considers digital skill rates because they play an enabling role in the profession, allowing us to highlight the pervasiveness of digital skills, albeit with different sensitivities, depending on the profession.

Professions that are expected to show the greatest growth are:

- Developer
- Digital Consultant
- Digital Media Specialist
- Digit Analyst
- System Administrator
- Server Support

In the private sector, the change brought about by new technologies, globalization and the reorganization of production processes generate in companies the need for new professional with technological skills and soft skills depending on the job position required.





# Spain

## Key points

The emerging profiles that arise due to the digital revolution are:

- Artificial Intelligence Specialists
- Medical transcriptionists
- Data Scientists
- Customer Success Specialists
- Full Stack Engineers

Within a lower volume:

- Landfill Biogas Generation System Technicians
- Social Media Assistants
- Wind Turbine Service Technicians
- Green Marketers
- Growth Hackers

There is a mismatch, specially in countries such as Spain, between the professional offer and the skills of the professional demand.



# 6. Emerging competences



In the near future most of the works will need some digital skills. Then, even though there is a high demand for digital skills, soft skills (such as teamwork, creativity, critical thinking, communication, etc.) are becoming increasingly relevant for the choice of technical profiles, that have to work increasingly in multidisciplinary contexts.

It's interesting to note that, although countries present a different level of digitalization, professional skills' demand seems to be pretty similar and involve both soft and digital skills. This is probably due to the globalization of the digital skills market. In fact, the large companies producing hard and soft ICT services are multinationals that constantly produce goods and services that need personnel with specific skills to be used, and the constant rise in technology production create the company's demand for specific digital competences.

# Cyprus

## A focus on emerging competences

In 2015 the Cyprus Productivity Centre in collaboration with Human Asset Training Consulting Solutions, published a report on the evaluation of the ICT professionals gap. The report identified that around 7 out of 10 companies claim that the level of academic knowledge from the universities in Cyprus partially responds to their needs and around 8% mentioned that the academic knowledge does not respond at all to their needs.



### COMPANIES' NEEDS

- Training in system and technologies used by the industry
  - Experience through internships during their studies and not after graduation
  - Communication skills and knowledge of foreign languages
  - Project Management skills
  - Knowledge on application and web design
- 



### EMERGING COMPETENCIES

- IT problem solving
  - Be open to gain new skills and techniques which are considered are key skill within the company
  - Good communication skills with their colleagues
  - Organizational and self-discipline
  - Teamwork in all levels (within and other departments)
  - Communication skills with clients
-

# Finland

## A focus on emerging competences

In the near future, 90 % of the work will need some digital skills Finnish National Forum for Skills Anticipation and future 2035: digitalisation and technological development play a central role. New jobs will emerge especially in high-tech companies and in the processing and marketing of highly processed products from point of view the development of cost-efficiency and ecological sustainability.



### THREE LEVEL COMPANIES' NEEDS

1. Generic skills
2. Common working life skills
3. Skills specific to vocational fields.

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### EMERGING COMPETENCES



- Data protection, digital identity. Digital literacy skills, critical thinking
- Understanding of automatization and robots. STEM and SMAC skills, coding
- Creativity, enterprise and entrepreneurial skills, complex problem solving and mental flexibility, inter-disciplinary knowledge



# Greece

## A focus on emerging competences

Greece is rapidly increasing its share of higher qualified in the labour market. While the share was at 32% in 2018, it is expected to increase to 40% by 2030. The increase in the share of higher qualified is expected to come from the outflow of older workers, both low and medium qualified. The share of medium qualified workers is expected to decrease from 41% in 2018 to 36% in 2030, while the share of low qualified workers is expected to decrease only slightly, by 4 pp, over the same period. Relative to the EU-27 average qualification mix, Greece is expected to continue to have a lower share of medium qualified and a higher share of lower qualified.



### EMERGING COMPETENCES

- **IT skills**
  - Internet of Things, cloud computing, artificial Intelligence, big data analytics, mobile applications development, web programming, software development methodologies, IT security, wireless communications, embedded computing, etc.)
- **Transversal/soft skills**
  - Critical thinking, computational thinking, adaptability and flexibility, creativity, emotional intelligence, cultural intelligence and diversity, leadership skills, judgment and complex decision making, and working in teams



# Italy

## A focus on emerging competences

For the five-year period 2021-2025, the employment needs of the private and public sectors are expected to be between 3.5 and 3.9 million workers, of which 933 thousand-1.3 million units determined by the economic growth component (expansion demand), as far as turnover is concerned, it will concern the remaining 70% of the need for employees (Source: Unioncamere – ANPAL, Sistema Informativo Excelsior 2021)



### EMERGING COMPETENCES

- For the more managerial professional families the soft skills are more relevant, while for the more technical ones the main request is for digital and non-digital skills
- On the other hand, soft skills (such as teamwork, creativity, responsibility, etc.) are becoming increasingly relevant for the choice of technical profiles. In fact, these are called to contribute more and more in a multidisciplinary context
- At the same time, we are witnessing the growth in demand for new technical skills in particular related to the world of big data, artificial intelligence, IoT, robotics and cloud computing, to name the main ones





# Spain

## A focus on emerging competences

The 2025 Digital Agenda set the key priorities for the Spanish government on the digitalization transformation domain, within the “Recovery, transformation and resilience plan”. Launched on 2020 July 23rd, it has been defined as the “tool for the technological and digital transformation in Spain. (...) It will be also a driver of the ecological transition towards a new economic and social mode, grounded on sustainability”.

### EMERGING COMPETENCES



- Transversal competences:
  - Analytical thinking and innovation
  - Active learning
  - Solving complex problems
  - Critical thinking and analysis
  - Creativity
  - Leadership and social influence
  - Use, monitoring and control of technology
  - Technology design and programming
  - Resilience, stress tolerance and flexibility
  - Reasoning and problem solving
  - Emotional intelligence
  - Troubleshooting and user experience
  - Customer orientation
  - Negotiation and persuasion
- Digital skills:
  - Computer programming
  - 3D Design
  - Internet of Things (IoT)
  - Robotics
  - Biocomputing
  - Data Science and AI
  - Data Analytics
  - Digital media
  - Cybersecurity

# 7. The main challenges for the educational system



It emerges that educational system and the productive sector have to implement their cooperation to improve the educational curricula. All countries believe that it is necessary to implement digital skills in schools by basic education to company employees.

Cyprus, Italy, and Greece underline that the country still needs to improve and disseminate digital skills also in the adult people and not necessarily for specific professions. Spain stressed the need to overcome gender inequalities, while Cyprus highlights that is necessary to implement collaboration between the industry and educational system, increasing internship opportunities, updating of the academic curricula, and increasing the digital skills of teachers and students.

Undoubtedly, as Finland points out, meta skills, such as problem solving skills, self-regulation, the ability to learn, development and management of personal competence, and information evaluation skills, will be increasingly important in the future and, consequently, the school it must reorganize and rethink its curricula and staff skills.

# Cyprus



- Internship opportunities
- Real life industry focused projects/assignments
- Training in systems and technologies used by the industry
- Additional scientific directions
- Collaborations between the industry and academic institutions abroad
- Certification (CISCO, ORACLE, Microsoft)
- The lack of certification has financial impact on the companies that go ahead and pay for the training and the certification of their employees.
- The continues update of the academic curriculum since new technologies are implemented and used by the industry in a faster pace that in the past and graduates need to be trained in them as well (Social Media Applications, Gaming Applications, Cloud Services, 3D and AR, Robotics, Digital Image Processing and AI)
- The leading digital skills certification body ECDL (European Computer Driving License) was recently renamed to ICDL (International Computer Driving License)
- ECDL has been introduced in Cyprus since 2000
- Training and certification of secondary education teachers (5000 teachers)
- Seminars for the unemployed 2013-2014 (1500 participants)
- ECDL certification offered for free to secondary education students within their school curriculum since 2016





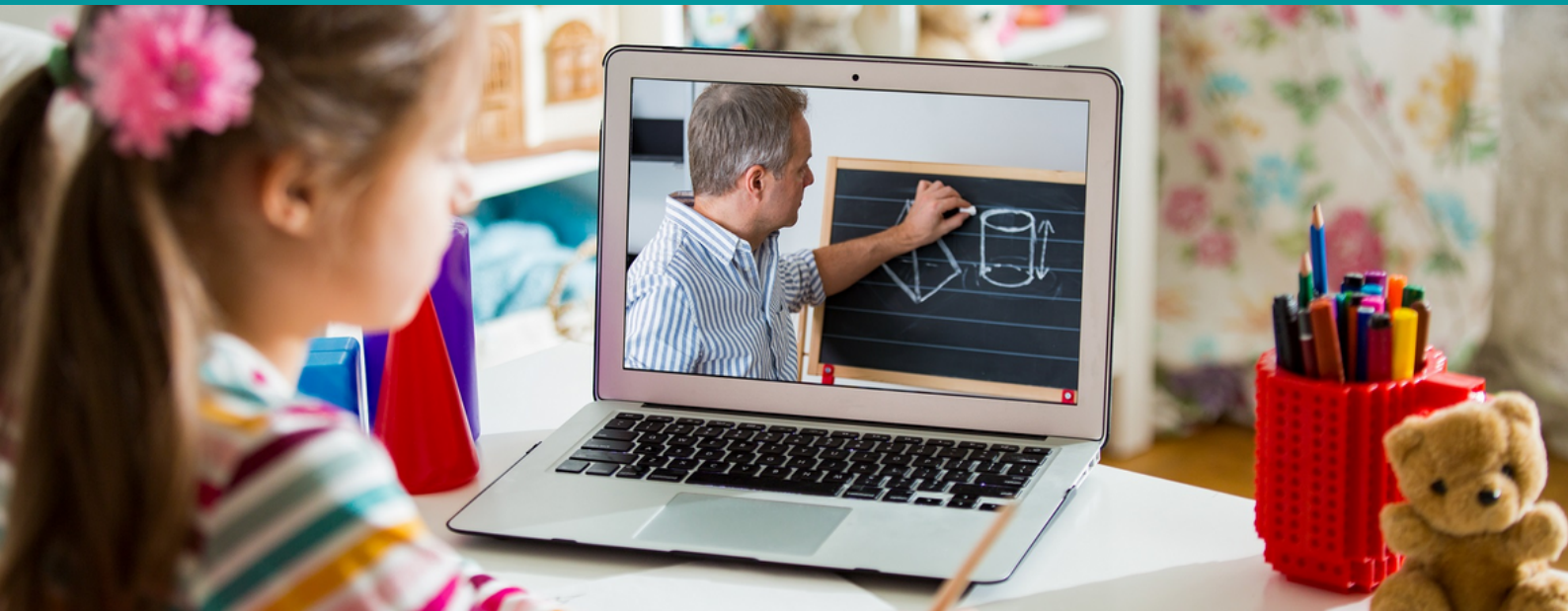
# Finland



- The digital skill creation is accelerated from basic education to company employees
- The share of mathematics and science in all education levels, from elementary school to universities is increased
- The digital professional and university education is boosted not only in technical sectors but also in application professions
- Use of Mass Open Online Courses (MooC) is encouraged
- Meta skills will be increasingly important in the future: problem solving skills, self-regulation, the ability to learn, development and management of personal competence, and information evaluation skills
- The importance of skills related to digitalisation, the ability to utilize digital solutions and platforms will increase
- Digital operating: skills in customer-oriented development of services and knowledge of sustainable development



# Greece



- Greece presents a fragmented labor market or a binary market (public vs private sector workers)
- The rapid technological changes combined with the low digital maturity of Greece demand urgent and immediate action on multiple axes through the implementation of a holistic digital approach
- Rapid decline in the share of total employment of people with average skills - phenomenon is usually called job polarization
- Need to reform educational curricula adding more ICTs-related courses
- Training in hard and soft skills is emerging as the most effective practice for implementing any digital transformation plan – need for well-organized VET courses
- Need to reform educational system integrating STE(A)M educational approaches and encouraging people to follow STEAM careers in primary and secondary education



# Italy



- In terms of digitization, Italy is confirmed among the bottom of Europe: according to the Desi 2020 index elaborated by the European Commission, Italy is at the twenty-fifth in Europe placing itself in a better position only than Romania, Greece and Bulgaria
- According to the data of the Desi 2020 index on digital skills and human capital, Italy is even last
- In 2019, four out of five (80%) young people aged 16 to 24 in the European Union (EU) had basic or higher digital skills. This was 24 percentage points (pp) higher than the share of individuals aged 16 to 74 (56%)
- the pandemic crisis has accelerated the digitalization processes of the Italian country with great efforts and resources for the implementation of the national strategic plan for digital skills

# Spain



- More focused institutional attention on teleworking and online education to optimize the profits and offset the threats that specific groups of people may encounter
- Carry out an inclusive and nationwide digital development and promote it in order to cover the mismatch between the offer and demand in the labour market
- Measures and policy must be implemented to make digitization an opportunity for all groups of people, tackling the gender and regional gap, as well as the skyrocketing number of jobless young people
- Development of new initiatives and educational plans that include the development of the digital skills and emerging competences required to succeed in the Digital Revolution

# 8. SWOT Analysis

## Strengths



There are three factors constituting **the strengths**, influencing the country's digital development. Their co-existence and level of development is based on the following key factors: the presence of political agency (e.g., ministry) and vision, which produces the strategic development lines and resources; the involvement of the private productive sector, setting strategies and investing on digital development; and the educational system involvement, promoting the training of human resources and the implementation of digital skills in the population.

As can be seen below, the strength of the countries is linked to the combined presence of those factors, starting from the basic one, i.e., the presence of a political vision and dedicated institutions, to follow with the coexistence of parallel but not integrated strategies of the public and private sectors, and the coordination and involvement of the educational sector at different levels to promote the digitization of citizens and, therefore, of the country.



# Strenght

## Cyprus

- Establishment of the Deputy ministry in 2020
- Strategies already set and are in the process of implementation
- New initiatives in education from the private and the public sector
- Experienced persons involved in the procedures

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## Finland

- Digital services already are quite common in Finnish everyday life (in banking, health care, education, shopping, health care, meetings etc.)
- Covid 19 situation rapidly increased use of different online services: work, education and free time activities
- Quick transfer to the remote studying and virtual teaching based on the ability to utilize digital solutions and platforms, on increasing digital skills
- Encourage and readiness to use different platforms and virtual learning methods
- Cooperation between different education levels
- Pedagogy and digital teachers as well digital tutor-students
- ICT is integrated in the curriculum on different educational levels in Finland

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## Greece

- Greek industry plays an important role in the Greek economy
- Share of population with tertiary education, that exceeds the EU average
- Greek enterprises appear to already invest in specific Industry 4.0 technologies, i.e. cloud, cybersecurity, etc
- Greek government launched key initiatives for the digital up-skilling and re-skilling of the Greek human capital

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## Italy

- Flexibility
- People (teachers, students, staff)

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## Spain

- Well positioned at connectivity deploy and public services digitization
- Ambitious initiatives definition, such as the Recovery Plan and the “Agenda Digital 2025”
- New initiatives in education that answer digitization and new skills needs

# SWOT Analysis

## Weaknesses



One of the most common **weaknesses** identified in the five countries is the lack of human resources with digital skills, which is determined by the misalignment between the educational sector and the productive one. This unbalance between supply and demand of digital skills results from the lack of coordination between the educational sector and productive one.

In some cases, the lack of digital skills is limited to a specific subpopulation (e.g., adult immigrants in Finland), who need a specific training to acquire suitable digital skills to get in the job market and participate actively to the social community. In some countries, the weaknesses also involve the lack of regulation, such as in Cyprus, or the lack of digital culture, such as in Italy. Nonetheless, in the last case, the solution could be offered again by the education sector.



# Weaknesses

## Cyprus

- Low position in the DESI report that needs boosting
- Not enough graduates in the ICT sector
- Not enough legislations voted although there are EU directives.
- Education not in line with the Industrial demands on graduate skills

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## Finland

- The tools of remote working (computer, telephone) and the quality of the internet connection
- The students' lack of ICT skills and equipment, weak language skills and study motivation
- The lack of proper network connection and computer, especially immigrant backgrounded adults, didn't have computer at home or any skills to start remote studying
- The lack of digital skills needed to keep up with the society's digitalization and to promote digital citizenship
- Different digital platforms, needs to register in different platforms
- People, different age groups need more personal support
- Importance of meta skills: problem solving skills, self-regulation, the ability to learn, development and management of personal competence, and information evaluation skills

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## Greece

- Greece's suboptimal position with regards to its digital infrastructure and the provision of digital public services
- On connectivity Greece performs below the EU average
- Greek enterprises lag across the adoption of Industry 4.0 and digital technologies and applications
- R&D appears disassociated with applied research & industry implementation
- Human capital

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## Italy

- Poor digital skills and digital culture
- Outdated learning model

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## Spain

- Needs a boost in human capital training and integration of digital technology
- High unemployment rate
- Spain needs a sufficient number of medium to high-skilled technicians to increase its innovation capacity



# SWOT Analysis

## Opportunities



**Opportunities** are related to the changes brought by pandemic, the European Union belonging, the global changes in goods and services distribution, and the central role of education. Covid-19 has pushed the various procedures for the digital transformation of the country while the belonging to the EU will help to the implementation of all the actions.

In particular, Pact for Skills from the European Commission promotes a joint action to maximize the impact of investing in improving existing skills and new ones.

The globalization of the distribution is an opportunity for Greece that considers the changes in the production sector as the driver for a national improvement. Finally, it emerges the central role of the educational system because it offers the opportunity to promote the learning of digital skills in the future generations but also to update the previous ones.



# Opportunities

## Cyprus

- Covid-19 has pushed the various procedures for the digital transformation of the country
- The digital transformation starts in 2021 and with the correct implementation these can upgrade the position of Cyprus among the EU countries
- Belonging to the EU will help to the implementation of all the actions

## Finland

- The political programmes, budget and development supported the digital transformation
- Different supportive activities, for example 'digituki' digital support persons in organisations and Suomidigi; YLE offers training and testing of digital skills on their platform
- Trust is a pivotal factor for successful digital government. Opportunity to remote work
- Digitalisation as a key element of the future operation and competitiveness. Importance of metaskills in the future
- Finnish education system offers training in digital skills on every level
- Reform in Finnish education: raising the age of education to 18 years, to provide computers to all the students 16 to 18 years
- VET has a more agile education system and individual support, personal study pathway

## Greece

- Global changes in distribution and nodes of power enable Greece to become part of wider global ecosystems
- The "smartification" of products can enable Greek enterprises to produce products of higher added value
- 5G and the "IoT-isation" economy can become game changers for "unlocking" innovation and growth
- Industry 4.0 can significantly benefit Greece in increasing its economy's circularity

## Italy

- Technical infrastructures and regulatory instruments
- Growing demand for ICT professionals

## Spain

- Covid-19 has been a catalyzer for the digital revolution
- Pact for Skills from the European Commission that promotes joint action to maximize the impact of investing in improving existing skills and new ones
- Belonging to the EU will help to the implementation of all the actions



# SWOT Analysis

## Threats



The pandemic has not had an equal impact on all European citizens.

Inequalities such as gender inequalities have increased, putting the weakest groups at greater risk. An inherent threat in the digitization of the country are the new risks arising from the new technological trends that should be addressed.

The increase in activities in which ICT is used implies some issues that necessarily must be considered, such as netiquette and security. Moreover, the change in social relations, remote working and using digital tools do not support creating 'old-fashion' relationships among people.

# Threats

## Cyprus

- Cyprus needs faster procedures since the world is also moving fast implementing actions
- The pandemic did not have an even impact to all European citizens
- Gender inequalities
- New risks arise from the new technological trends that should be tackled

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## Finland

- The lack of digital skills needed to keep up with the society's digitalization and to promote digital citizenship
- Larger use of digital opportunities as well new and variegated users will highlight many questions of digital etiquette and security
- Cyberbullism and problems with data protection
- Personal attitude: low self-confidence in using ICT or learning new things of ICT, fear, prejudices
- Change in social relations, remote working and using digital tools do not support creating 'old-fashion' relationships among people
- People need also social contacts

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## Greece

- Industry 4.0 disrupts the traditional linear value chains & redefine the Greek industries
- Significant brain-drain during the economic crisis period
- EU counterparts' rapidly progress with regards to their digitalization both at a national and at an industry level
- EU counterparts' progress regarding targeted measures to support and enhance digital innovation and R&D

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## Italy

- Loss of competitiveness
- School dropout

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## Spain

- The pandemic had not an equal impact to all European citizens
- Gender inequalities have to be faced
- New risks arise from the new technological trends that should be tackled





# Conclusion

Although Cyprus ranks lower than the EU average, a great effort is being put by both Public and Private organizations. It is expected that in the coming years the digital skills of students and the workforce will rise but it is crucial for everyone to identify and acknowledge that digital transformation all around the world is happening at a fast pace. The public authorities mainly need to speed up their policies and implement their strategies in order not to be left further behind.

In Italy, some factors that may not favor the digital change such as criticality in the interaction between ICT and non-ICT managers in a specific company, the lack of professionals to support the digital transformation and uneasy interactions between ICT functions and business functions, and the need for the development of soft and digital skills in non-ICT professionals of all ages. This involves the need or supply of a lifelong learning activities and new training avoiding the exclusion from the labour market of specific subpopulation. To this aim, two interventions seem necessary aiming both to spread digital culture at all levels and to promote a new training model allowing the continuous updating of human capital preserving from job market drop out. This will induce also the need for a change in education, both in terms of teaching models and learning activities and in staff skills, to adapt to the change in the market demand reorganizing ICT and non-ICT professionals training.

As stated by the literature, the "skill gap" is a phenomenon determined by the unbalance between the supply and demand of professionals with digital skills determined by the lack of coordination between education and the labour market. This mismatch produces: the lack of graduates with required skills; the unbalanced supply in terms of graduates and high school graduates required by the market; the low enrollment in the faculties related to information technology; the inadequate training for the required skills updating; the lack of coordination between companies, families and educational institutions.

Then, it would be necessary to:

- strength the teaching staff's training and updating
- raise the awareness of the change in the labour market, in which more skilled jobs will increase and less skilled jobs will be replaced by smart machines
- realign the educational curricula, directing students who drop out of ICT courses towards ITS ones
- teach new technologies, methodologies and "soft" skills implementation
- promote of the spread of an entrepreneurial culture among ICT professionals
- increase of opportunities for internship experiences and of graduates' ICT entrepreneurship
- build ICT "supply chain" degree (e.g. Cloud, Cognitive Computing)



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