
VOCATIONAL EDUCATION
AND TRAINING FOR THE
FUTURE OF WORK
CYPRUS



Vocational education and training for the future of work: Cyprus

Policy strategies and initiatives to prepare vocational education and training (VET) systems for digitalisation and future of work technologies



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Author: Aristos Theocharous, Human Resource Officer

Supervision: Constantina Kyriacou-Liveri, Senior Human Resource Officer

Contributors: Mr. Constantinos Karageorgis, Commerce and Industry Senior Officer at the Ministry of Energy, Commerce, Industry and Tourism;
Mr. Andronikos Kakkouras, Senior Electronic Communications Officer at the Department of Electronic Communications, Ministry of Transport, Communications and Works;
Members of the Cyprus ReferNet consortium.

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CHAPTER 1.

Introduction – Impact of digitalisation in Cyprus

According to the *digital economy and society index* (DESI) 2019 ⁽¹⁾, Cyprus's performance in the human capital dimension, which measures the skills needed to take advantage of the possibilities offered by digital developments, is below the EU average, although progress is being made. In 2018, 84% of the Cypriot population used the internet regularly (versus 79% in 2017), but only 50% of individuals between 16 and 74 possessed at least basic digital skills. The country also has a lower share of information and communication technologies (ICT) specialists in the workforce (2.3%) than the EU average (3.7%). Moreover, Cyprus has a low share of science, technology, engineering and mathematics (STEM) graduates (9.8%), ranking lowest among EU countries ⁽²⁾.

The Cyprus economy is mainly based on services, exhibiting their increasing dominance through time. The employment share of the tertiary sector is forecast to continue rising (more than 80%) at the expense of the primary and secondary sectors. Digitalisation is very important as a means to enhance competitiveness and modernise the economy. Towards this end, the objective of the National Digital Strategy is to achieve the digital transformation of the public sector (e-Government) and the promotion of the digital transformation of the private sector. At the time being, a number of projects are being implemented (IT system for the Town Planning and Housing Department and IT system for the National Health System) but there is further scope for similar projects in other public services. The sectors of Public administration and Financial services in Cyprus are being affected the most by digitalisation.

In Cyprus, as compared with industrial countries, there is delay in the introduction of state-of-the-art technologies, due to the sectoral mix of the economy and the prevailing small size of enterprises, with most of them having limited access to financial resources

(1) <https://ec.europa.eu/digital-single-market/en/scoreboard/cyprus>

(2) https://ec.europa.eu/education/resources-and-tools/document-library/education-and-training-monitor-2018-cyprus-report_en

In order to prepare and make the most of the AI revolution, Cyprus has recently (October 2019) drafted its National Strategy for AI, which is coherent with the European Coordinated Plan on AI.

In recognition of the importance and impact of research and innovation on economic growth and societal benefits, the Government of Cyprus has adopted a new research and innovation (R&I) [governance system](#) that reflects the necessity to draft and implement an ambitious national strategy for research and innovation. The decision was taken by the Council of Ministers in October 2018, followed by the appointment of the first Chief Scientist in January 2019. The Chief Scientist is appointed by the President of the Republic of Cyprus ⁽³⁾.

The Ministry of Energy, Commerce and Industry (MECI) launched a public consultation with industry and other stakeholders for the preparation of the new industrial policy. Through this public consultation, among other findings, the following problems have been identified:

- Lack of digital technology infrastructure in industry;
- Lack of cooperation between the industrial and academic/research sectors;
- Lack of mapping of the technology needs of industry and planning;
- Lack of a supportive culture among enterprises for creating business clusters / joint ventures for technological upgrades and digitalisation.

⁽³⁾ <https://chiefscientist.gov.cy/>

CHAPTER 2.

VET policy strategies to adapt to digitalisation

2.1. Government initiatives

A recent initiative of the President of the House of Representatives to organise a series of conferences on the *fourth industrial revolution* is indicative of the recognition of the significance of this issue for the economy and society of Cyprus. The latest such conference took place in October 2019, with the theme *fourth industrial revolution: Innovation, Artificial Intelligence and Inclusion*. The aim was to promote the creation of a network between the House of Representatives and the scientific and business world as well as providing feedback on the digital strategy and its implementation with the use of Blockchain, for which a national strategy is already in place.

This was the third conference organised. In June 2018, the theme of the conference was the *fourth industrial revolution: required actions* during which a welcoming address was delivered on video by the then Commissioner for Digital economy and society, Ms. Mariya Gabriel and there were three panel discussions: *digital economy and society, health and education and culture*. This conference was also in line with the one organised in 2017 under the theme *fourth industrial revolution: opportunities and threats*. The conferences were attended by current and former Members of Parliament, General Directors of Ministries, academics from state and private universities, representatives of employer organisations and trade unions, and other stakeholders.

In November 2018, the Cyprus chamber of commerce and industry (CCCI) and the Cyprus employers and industrialists federation (OEB) organised the digital Cyprus conference: driving digital transformation in Cyprus⁽⁴⁾. During the conference, the President of the Republic of Cyprus, announced that a Deputy Ministry for Digital Strategy will be created, aiming at a faster digital transformation of Cyprus.

In June 2019, the Council of Ministers, approved a National Strategy on Distributed Ledger Technology (DLT) - Blockchain, encouraging the use of these technologies in both the public and private sectors. The strategic objective of the

(4) <https://www.imhbusiness.com/en/the-digital-cyprus-conference-driving-digital-transformation-in-cyprus#information>

strategy is 'To enable the government to assess and seize the DLT opportunity, to drive the right level of awareness and clarity concerning the technology, in the context of fostering and utilising innovation for the benefit of the economy'. This strategic objective is in line with Cyprus's vision to be one of the leading international centres for innovation and growth, where innovators abiding to the regulatory framework can flourish. The strategy sets out Cyprus' vision for DLT and focuses on the creation of a regulatory framework that will accommodate and foster innovation, providing legal certainty and protection for consumers and investors.

The strategy seeks to build upon the efforts and aims initiated after the signature of the joint '*Declaration of the Southern Mediterranean Countries on Distributed Ledger Technologies*' on the 4th December 2018, by the Republic of Cyprus and six other European member states (Malta, France, Greece, Italy, Portugal, and Spain) with the aim to enhance cooperation in the digital sector and to promote Southern Europe as a leader in emerging technologies such as DLT. The Declaration can be utilised in order to absorb EU funding on DLT technologies. The national strategy also supports the efforts of the European Blockchain Partnership, which was created in 2018 by the 28 EU member states and Norway agreeing to cooperate in the establishment of a European Blockchain Service Infrastructure that will support the delivery of cross-border digital public services.

2.2. National Coalition for Digital Jobs

In support of the European Commission's action call for a grand coalition, seeking to address the shortage in new ICT skills and the future mismatch of unfilled ICT-related vacancies across Europe, Cyprus's digital champion ⁽⁵⁾, with the cooperation of the Department of Electronic Communications (DEC), proceeded to create a National Coalition for Digital Jobs in September 2014. The national coalition for digital jobs is a partnership between Cyprus's digital champion, the DEC and national public institutions, professional communities, private enterprises and non-profit organisations. The action plan aims to promote the diffusion and the improvement of digital skills to address the anticipated future mismatch between ICT professionals and workforce needs.

(5) http://www.cyprus-digitalchampion.gov.cy/DigitalChampion/Digitalc.nsf/index_en/index_en?opendocument

A memorandum of understanding was signed on April 28, 2015 between the digital champion, the DEC and 40 stakeholders involved in this process. The purpose of the memorandum is to develop cooperation in the promotion of digital jobs for the benefit of Cypriot enterprises and the country's economy in general. The vision of the Cyprus national coalition for digital jobs is to create an environment of trust and common values among the involved parties. They also aim to achieve synergies and partnerships for creating an attractive environment that uses ICT to increase employment, especially among young persons, and to ensure digital literacy for all citizens without exclusions. Actions were proposed by the stakeholders aiming to ensure the adequate and continuous supply of high-quality graduates according to labour market needs.

The priority actions for 2016 to 2019 include the introduction of the certification of European computer driving license (ECDL) on a voluntary basis to pupils of secondary education in public and private schools, the training and certification of ECDL to soldiers and unemployed persons, provision of training programmes to persons with disabilities and conducting a series of awareness activities in ICT in collaboration with the stakeholders of the Grand Coalition. As from the school year 2016-17, the ECDL exams are offered free of charge to all pupils. It is considered a breakthrough for the education system of Cyprus, because it is the first time ever that pupils of public schools are provided with certification on a certain theme. It is also noted that since February 2015, the ECDL certificates carry the logo of the CCCI, marking the strategic collaboration of the Cyprus computer society and CCCI on the certification of ICT skills in Cyprus.

In renewing the national coalition, which is valid until 2019, a priority is to include new actions which concentrate on new areas, such as the promotion of ICT skills among professionals, creating an ICT specialised educational centre, etc. Moreover, it is planned to renew the certification programme in ECDL in cooperation with the Ministry of Education, Culture, Sports and Youth (MECSY), which is one of the stakeholders.

In addition to the national coalition for digital jobs, the following initiatives are in progress:

- (a) since September 2017, the CPC of the Ministry of labour, welfare and social insurance (MLWSI), in cooperation with the DEC of the Ministry of transport, communications and works (MTCW), offer free of charge workshops to adults on e-government systems and training courses on basic digital skills,

- with emphasis on the use of internet and its basic applications ⁽⁶⁾. The objective was to offer at least 170 workshops on e-government systems and 90 training courses on digital competencies all over Cyprus until the end of 2018. By the end of 2018, a total of 181 workshops on e-government systems with 2 513 participants and 83 training courses on basic digital skills with 1 013 participants were completed. Furthermore, during the same period 14 training courses on Internet Safety were also organised with 215 participants. In addition, consultancy services were offered to municipalities, community councils and other bodies for improving their e-business level; by the end of 2018, 400 persons attended 29 presentations on this subject;
- (b) the Cyprus Pedagogical Institute (CPI) of the MECSY, in collaboration with the DEC, promotes the training of teaching staff to use ICT during the learning process;
 - (c) since 2017, the DEC, within the framework of the communication plan of the digital strategy, carries out an awareness campaign to inform society and to cultivate digital culture among citizens and enterprises;
 - (d) since the early 2000s, the Human Resource Development Authority of Cyprus (HRDA) included ICT topics as a priority thematic area for the approval and subsidisation of training programmes. Emphasis is given on upgrading the skills of ICT professionals and more recently also on the acquisition of basic digital knowledge and skills for persons aged 35 and over.

2.3. Digital strategy for Cyprus

In February 2012, the *digital strategy for Cyprus* ⁽⁷⁾ was approved by the Council of Ministers and announced by the MECI. The digital strategy for Cyprus is in line with the objectives and actions proposed in the *digital agenda for Europe*, one of the flagships of the strategy *Europe 2020*, and contributes substantially to economic growth, productivity increase and job creation. The strategy promotes the use of ICT in all sectors of the economy and society. The stated overall vision of the Digital Strategy for Cyprus is 'information and communication technologies to support the development and the competitiveness of the economy, and citizen

⁽⁶⁾ http://www.mlsi.gov.cy/mlsi/kepa/kepa_new.nsf/All/9F4D9A31402D607FC225819200374AAF

⁽⁷⁾ [http://www.mcw.gov.cy/mcw/dec/digital_cyprus/ict.nsf/3700071379D1C658C2257A6F00376A80/\\$file/Digital%20Strategy%20for%20Cyprus-Executive%20summary.pdf](http://www.mcw.gov.cy/mcw/dec/digital_cyprus/ict.nsf/3700071379D1C658C2257A6F00376A80/$file/Digital%20Strategy%20for%20Cyprus-Executive%20summary.pdf)

participation in the social, cultural and political domains'. The strategy includes six strategic objectives (Table 1), each comprising several measures and actions.

Table 1. Digital strategy for Cyprus - strategic objectives

	Strategic targets
1	Connect Cyprus
2	Modernise public administration and provide public electronic services
3	Inclusion of all (including vulnerable groups) into digital Cyprus
4	Education and learning
5	Digital entrepreneurship
6	ICT for the environment

Source: Digital strategy for Cyprus, Ministry of Energy, Commerce and Industry

The fourth strategic target on education and learning included Measure 16 – eEducation, comprising thirteen actions, which among others includes:

- (a) increasing the number of personal computers in all schools (one computer per student);
- (b) introducing computers and multimedia labs in every school;
- (c) expanding the implementation of the *learning management system* (DIAS) in all secondary schools, both technical and general;
- (d) training teachers to further integrate ICT in the learning process.

One of the measures under the third strategic objective is the promotion of digital literacy which includes actions such as the implementation of the co-financed *e-skills for all* project, based on the seven sessions of the ECDL, coupled with ECDL Certification.

2.4. New industrial strategy 2019-30

New evidence emerging from the fourth industrial revolution points to the need for upgrading the education and training of the workforce in order to provide new skills. It is well known that skills shortages affect the ability of enterprises to respond to customer demand, their ability to maintain or increase their production levels and their ability to apply new technologies alongside the achievement of productivity goals. Low levels of production affect the growth and profitability of a business. Cyprus's *new industrial strategy 2019-30* ⁽⁸⁾ was announced by the MECI after it was approved by the Council of Ministers in May 2019. The new

⁽⁸⁾ <http://www.mcit.gov.cy/mcit/sit/sit.nsf/All/220B7D9555067150C225819C002A15CC?OpenDocument>

strategy will help tackle these challenges by embarking to transform its current industrial base into a robust, flexible, intelligent and technologically advanced industry with relevant services, focusing among others, on digitalisation and the development of relevant soft and digital skills.

The new industrial strategy 2019-30 will introduce a new framework and an action plan for its first phase of implementation covering the period 2019-22. Through the six strategic pillars of implementation (Table 2), the policy aims at upgrading Vocational Education and Training (VET) systems to respond to the skill gaps in the labour market.

Table 2. New industrial strategy 2019-30 - strategic pillars

Six strategic pillars of implementation	
1	Sustainable development and production
2	Improvement of industrial and business environment
3	Digitalisation of industry
4	Development of new and enhancement of existing skills for human resources
5	Enhancement of access to finance
6	Enhancement of access to markets

Source: New industrial strategy 2019-30, Ministry of Energy, Commerce and Industry

Cyprus also supports the *digital Europe programme* and invests a lot to enable the training of the workforce in advanced digital skills.

2.5. National Research and Innovation Strategy and National Chief Scientist

The adoption of a national R&I strategy aims at the technological, social and economic development of Cyprus, based on research and innovative entrepreneurship. This addresses the need to shift the existing model of national economic growth to a sustainable, innovation-driven model and requires significant increase of the national expenditure for research and development (R&D), an indicator relevant to the maturity and effectiveness of national R&I ecosystems.

In January 2019 the first National Chief Scientist for R&I was appointed by the President of the Republic Cyprus, with the political mission to lead and coordinate all efforts for Cyprus to become a dynamic and competitive economy, driven by research, scientific excellence, innovation, technological development and entrepreneurship, and a regional hub in these fundamental areas.

The Chief Scientist is the political and executive owner for Research and Innovation within the newly adopted Research & Innovation (R&I) Governance System and, in this capacity, holds a number of ex-officio roles such as Member of the [National Board of R&I](#) (NBRI), Chairman of the Board of Directors of the Research and Innovation Foundation (RIF) and Chairman of Ministry R&I Coordinators' Committee.

CHAPTER 3.

VET 4.0 initiatives and programmes

New specialisations related to digital skills have been introduced in secondary technical and vocational education (STVE), such as *computers, networks and communications, digital technology and programming, industrial design and 3D printing* in the theoretical direction, and *computer networks and communications technician* in the practical direction.

The post-secondary institutes of VET, which have been accredited as a public school of higher VET, offer two-year accredited programmes leading to the acquisition of a Diploma. The programmes of study, among others, include the following three, which aim at preparing students for respective labour market needs:

- (a) CNC technology – woodworking industry;
- (b) computer and communication networks;
- (c) industrial and residential automation.

As envisaged under Pillar 4 of the new industrial strategy, *development of new and enhancement of existing skills for human resources*, reforms in the existing VET system are under consideration through a series of relevant measures such as:

- (a) utilising labour market and employment forecasting studies to implement targeted measures in order to increase STEM and science, technology, engineering, production (STEP) skills. Also, to redesign and improve vocational education and training programmes, both initial and continuing (including improved internship and apprenticeship programmes);
- (b) adjusting and customising existing public sector training programmes to respond to the actual needs of industry and industry 4.0 technologies;
- (c) enriching secondary education programmes, both technical and general, higher education and Continuing Vocational Education and Training (CVET) curricula with certified programmes;
- (d) establishing a framework for industry, academia and research collaboration for the extensive use of university laboratories by industry;
- (e) refining the programmes of VET at secondary level (esp. for technical schools) according to industry needs;
- (f) creating a register of technical school graduates by specialisation.

The *development of new and enhancement of existing skills for human resources* task will be accomplished through strategic synergies between

relevant key stakeholders (e.g. the HRDA, the CPC, the MECSY, the RIF, academic and research institutions, industrial associations and businesses, and other policy makers from the public sector).

The *Cyprus digital champion*, in collaboration with the DEC, within the framework of the national coalition for digital jobs, prepared a relevant memorandum of collaboration, for the promotion and development of citizens' digital skills and the training of ICT professionals. The aim of the memorandum of collaboration is the development of mutual collaboration in the promotion of digital employment positions ⁽⁹⁾ to the benefit of Cypriot enterprises and the economy of the country in general.

Within the framework of the above coalition, a relevant action plan ⁽¹⁰⁾ was prepared, which provides a hierarchy and grouping of the actions in the following units:

- (a) training/education:
 - (i) enhance ICT in education;
 - (ii) identify ICT professional skills in accordance to market needs;
 - (iii) establish a more flexible education system where digital skills will be adapted according to European recommendations and policies;
 - (iv) provide training to unemployed, IT professionals and vulnerable groups;
 - (v) improve education, educational programmes and vocational training according to labour market needs.
- (b) Certification:
 - (i) promote and implement certification exams among ICT professionals by adopting European standards (e.g. the e-Competence framework);
 - (ii) promote certification exams in digital skills for Cypriots based on European standards (e.g. the ECDL);
 - (iii) conduct surveys indicating the level of digital literacy among workers;
 - (iv) promote certification exams to vulnerable groups (e.g. unemployed) for better employability;
 - (v) co-operate with public bodies for the promotion of the accreditation of digital skills and ICT knowledge.
- (c) Awareness:
 - (i) raise awareness of the public on the importance of digital skills and abilities;

⁽⁹⁾ <http://www.digitaljobs.cyprus-digitalchampion.gov.cy/el/page/home>

⁽¹⁰⁾ <http://www.digitaljobs.cyprus-digitalchampion.gov.cy/el/page/draseis>

- (ii) conduct campaigns, conferences and workshops on issues related to ICT;
- (iii) organise competitions in areas of ICT;
- (iv) contribute towards the provision of information especially to young girls about employment prospects in the ICT sector in order to attract more women to these professions.

Priority actions were approved by the Council of Ministers and the programme has started its implementation in January 2017.

As far as CVET is concerned, the HRDA approves and subsidises a variety of training activities, which are addressed both to employed and unemployed persons. The HRDA Schemes promoting CVET include:

- (a) single-enterprise training programmes in Cyprus which provide incentives to employers to design and organise in-enterprise training programmes, implemented by internal or external trainers, to meet the specific needs of the enterprise for the effective utilisation of its personnel;
- (b) single-enterprise training programmes abroad where incentives are provided to employers to participate with their personnel in training programmes abroad to transfer specialised knowledge and skills in areas related to the introduction of innovation, new technology and technical know-how;
- (c) multi-enterprise training programmes which provide continuing training for meeting the training needs of employed and unemployed persons through their participation in training programmes implemented by public or private training institutions and organisations. They cover a broad range of issues in all operations of the enterprise and in all occupations;
- (d) high-priority multi-enterprise training programmes which provide continuing training to meet the training needs of employed persons through their participation in training programmes in specific high-priority issues.

The thematic areas covered by the above-mentioned schemes are based on documents prepared by the HRDA every two years. The documents specify the themes which are considered as priorities of the economy and are prepared after consultation with stakeholders, taking also into consideration the results of research studies. The latest documents include themes such as:

- (a) ICT topics: Implementation and utilisation of new technologies and IT systems in various functions of business;
- (b) digital skills: acquiring basic digital knowledge and skills for persons aged 35 and over;
- (c) promoting research and innovation: designing and implementing effective management systems for research and innovation and implementing innovative practices in the operations of the business.

Also, the HRDA has developed the *system of vocational qualifications* (SVQ) which is an integral part of the *Cyprus qualification framework* (CyQF). The standards of vocational qualifications define the framework of the training and development of the candidates to reach the appropriate competence level. An indicative list of ICT related standards which are expected to be available by the end of the programming period 2014-20 are shown in Table 3.

Table 3. ICT related vocational qualifications standards

Job Group	Qualification	EQF/CyQF level
Construction	Technician for installing automated and electrical systems in buildings	5
Repairing vehicles and appliances	Craftsman for automated control systems for vehicle functions	4
ICT	Technician for supporting Information and communication technology users	5
	Craftsman for installation and repair of information and communication technology equipment	4
	Computer network and computer technician	5
	Craftsman for the installation and repair of network equipment	4
	Computer operator	3-5

Source: HRDA.

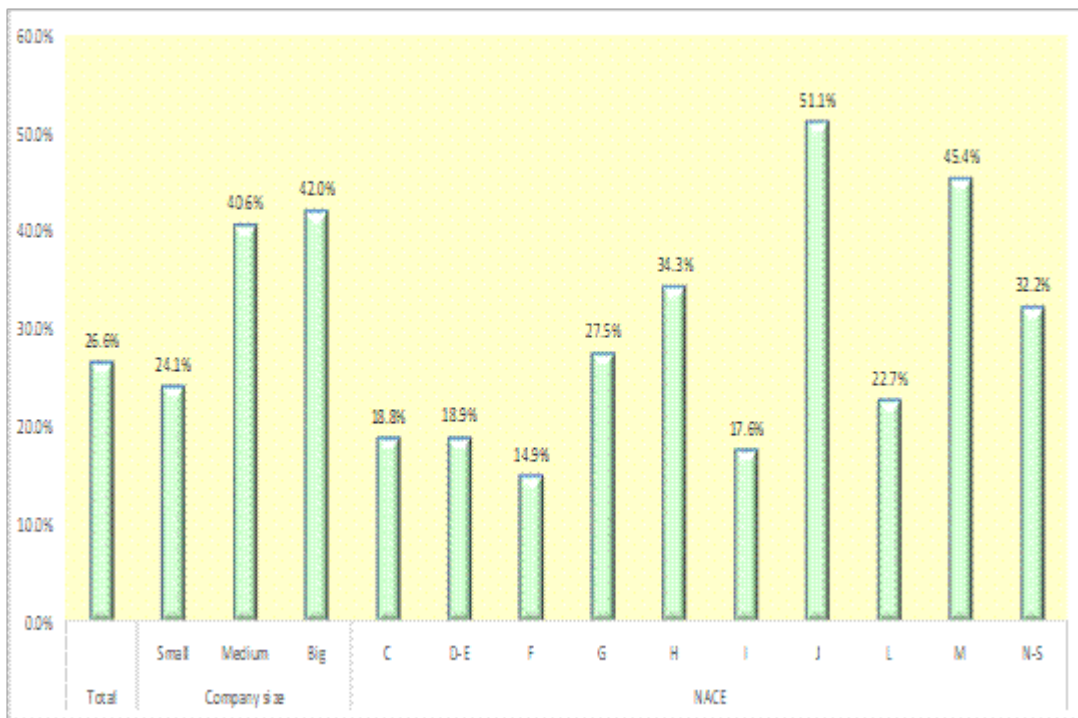
CHAPTER 4.

Using 4.0 intelligence for VET

4.0 intelligence is still at a very early stage in Cyprus. Big data analytics and any forms of AI are scarcely being used, by a small number of enterprises.

According to the latest data published by the Statistical Service of Cyprus (CYSTAT) ⁽¹¹⁾, in 2018 26.6% of the enterprises in Cyprus used cloud computing services in comparison to 10.2% in 2014. This percentage is higher in medium and large enterprises and in enterprises of the Information and communication industry (NACE rev. 2 J). As far as robotics is concerned, only 1.2% of the enterprises in Cyprus used industrial robot or robot service of any kind.

Figure 1. Use of cloud computing services by enterprises in 2018

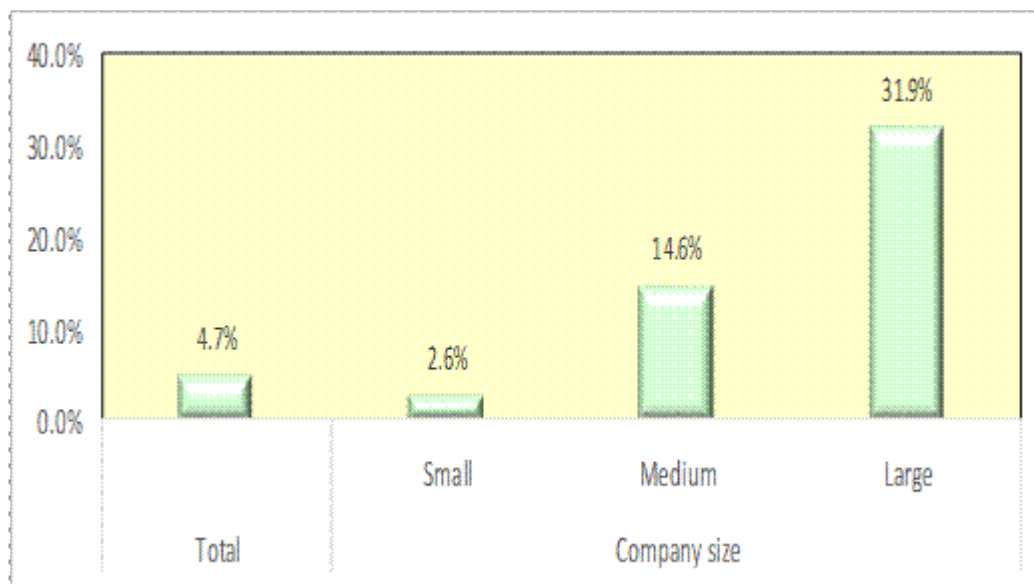


Source: CYSTAT

(11) http://www.cystat.gov.cy/mof/cystat/statistics.nsf/science_technology_93main_puparchive_gr/science_technology_93main_puparchive_gr?OpenForm&yr=2018

Also, in 2017 only 4.7% of the enterprises used big data analytics, most of them being large enterprises (Figure 2).

Figure 2. Use of big data analytics by enterprises



Source: CYSTAT

In December 2019, a new report was published by CYSTAT ⁽¹²⁾ based on research for the use of ICT and e-commerce by businesses in Cyprus. Among other findings, 82.0% of large enterprises, almost half (47.1%) of medium sized enterprises and 18.2% of small enterprises employ specialised ICT persons. The proportion for all enterprises is 23.1%.

Under the third pillar of the new industrial strategy *digitalisation of industry*, it is proposed that a technical review should be conducted with regards to the existing situation of industry, enterprises, and academia, to identify current capabilities of research, development and innovation on industry 4.0. technologies and applications, including potential expansion and development. The aim of the review will be to create an advanced database or interface, using Industry 4.0 technologies (big data and big data analytics, cloud, etc.) for the collection and analysis of relevant statistical data from various sources and databases (public and private) plus additional raw material. Data analytics will be used by relevant stakeholders for the better understanding of changing skill sets/professions and jobs and adapting VET systems to provide preparedness of

(12) [http://www.cystat.gov.cy/mof/cystat/statistics.nsf/All/75F4B5A804731B22C22584C8003C9BB7/\\$file/Summary_Report-ICT_ENT-2018-EL-101219.pdf?OpenElement](http://www.cystat.gov.cy/mof/cystat/statistics.nsf/All/75F4B5A804731B22C22584C8003C9BB7/$file/Summary_Report-ICT_ENT-2018-EL-101219.pdf?OpenElement)

human capital. Furthermore, this new database will help to create specialised advisory guidance and funding programmes targeted to businesses to improve their level of digitalisation and to change the culture towards adopting new technologies.

Since December 2019, the Service of Industry and Technology of the MECI is implementing a scheme ⁽¹³⁾ for the digital upgrade of enterprises. The aims of the scheme are to enhance the digital identity of the enterprises, increase the number of small and medium enterprises using ICT, including the area of e-commerce and promote digital entrepreneurship.

Currently systematic employment forecasting and the identification of skills gaps is conducted by the HRDA through the following research studies.

Long term employment trends and forecasting in Cyprus: The HRDA provides 10-year employment forecasts on a regular basis every two to three years. The latest study covers the period 2017-2027;

Annual investigations for the identification of employment and training needs with the involvement of the social partners: Provides annual estimates for the number of persons needed for specific occupations and the needs for specific skills;

Identification of Blue Skill Needs in the Cyprus Economy 2016-2026 (HRDA, 2016): Examines and analyses the blue economy and blue occupations, maps out the blue economy of Cyprus and identifies blue skill needs in the Cyprus economy for the period 2016-2026;

Identification of Green Skill Needs in the Cyprus Economy 2017-2027 (HRDA, 2018): Examines and analyses the green economy and green occupations, mapping out the green economy of Cyprus and identifying green skill needs in the economy for the period 2017-2027.

The results of the HRDA's studies on anticipation of skill needs are used by policy makers for the development of strategies and policies in education, training and lifelong learning. Furthermore, they are used at operational level for the development of programmes of study in education, including the programmes of study of technical schools and the post-secondary institutes of vocational education and training of the MECSY. They are also used by persons involved in

(13) <http://www.mcit.gov.cy/mcit/sit/sit.nsf/dab57a092c36651fc225816f001d2b7f/d01840125d87a50dc2258409001bb768?OpenDocument>

counselling, such as secondary education vocational guidance teachers and employment counsellors and by the public. For this purpose, all research studies, upon completion are disseminated to a wide audience of prominent stakeholders. Presentations are organised for secondary school guidance counsellors and employment counsellors, students and parents.

Box 1. Erasmus+ project *jobs for work 4.0*

Jobs for work 4.0 is an Erasmus+ project consortium interested in the impact of digital transformation on professions. In Cyprus it was developed by the Centre for the advancement of research & development in educational technology (CARDET) which is an independent, non-profit, non-governmental, research and development organisation.

The electronic platform developed by the consortium of six partners, is based on seminal work of Frey and Osborn and the International Labour Organisation's ISCO-08. It comprises 50 indicative professions where it examines the technological trends and provides concrete examples for the maturity of those technologies in the global market place. The platform has two different categorisations to make it as functional as possible to professionals in the labour market and is available in 6 different languages. The platform is intended for awareness purposes and the projections are not localised but drawn from reputable global media organisations and while fully sourced, it should be read as an indication rather than a conclusion.

The overall objective of the project is to raise awareness about these developments, first and foremost among those professionals who are working in the employment services. The aim is to inform persons working in labour market services and those in vocational orientation and education about the challenges they will face, to understand the pace at which digitisation and the 'Internet of Things' will lead to changes and create entirely new job families while others will become obsolete, and to support them in planning suitable qualification pathways for their clients.

Source: Jobs for work 4.0 (<http://work4-0.eu/>)

CHAPTER 5.

VET 4.0 learning practices

The 2014-20 lifelong learning strategy promotes the acquisition of digital competences, through the development of new curricula. An introductory ICT course (two 45-minute lessons per week) is compulsory in the first year of upper secondary VET. In the second and third years, ICT courses are optional for all specialisations. The theoretical VET direction also offers the specialisation of computer engineering. The CISCO Certified Network Associate (CCNA) optional subject was introduced in VET in 2003-04. It offers network technician and CCNA qualifications. Technical schools use ICT in technology and workshop practice. For example, computers and specialised design software are an integral part of the teaching process in electrical and automobile engineering, architecture and design programmes (interior design, furniture design and production, and fashion design). Computers support teaching of specialisation subjects. For example, electronically controlled tool machines (CNC machines, CAD/CAM Systems) are used in the fields of mechanical engineering, woodcraft and furniture making.

The MECSY implements programmes of continuing professional development for teachers in ICT. It also provides pedagogical and technical support for the effective use of ICT, including seminars and workshops on the use and integration of ICT in teaching and learning.

Two seminars were organised by the *Euroguidance Cyprus* and the *National forum of lifelong guidance* in October and November 2018. The aim of the seminars was to raise awareness among employment and educational guidance counsellors about the new categories of jobs that will appear due to the significant labour market effects in all sectors caused by the fourth industrial revolution, and the skills required in both old and new professions, as these will change in most industries and will transform how and where persons work. The development of specific modern theoretical and practical approaches to counselling guidance was also pursued. The relevant training and briefing of counsellors was necessary to adequately support individuals who will face difficult and complex future labour market transitions. These seminars aimed to provide information on new expected developments and their impact on work functions, employment levels and skills. The seminars were attended by guidance and employment counsellors and other relevant professionals.

CHAPTER 6.

Adapting to artificial intelligence and automation

The effort for developing and adopting an AI strategy is in progress. In September 2019, the Director of the DEC announced the launch of a public consultation for the development of a national AI strategy. On 31/10/2019, the DEC published on the department's website the results of the public consultation with the updated national AI strategy document ⁽¹⁴⁾. Currently the DEC is working on the final corrections of the document. The next step will be the approval of the national AI strategy by the Council of Ministers.

The national AI Strategy will set out the focus areas that will underpin the strategic objectives and considerations that will drive Cyprus's vision concerning AI. According to the draft version of the document for the national AI strategy, the strategic objectives are to:

- (a) create programmes to promote and develop AI in all organisations (academic, public, local authorities, individuals and enterprises);
- (b) enrich and exchange available Cyprus data;
- (c) upgrade the education system;
- (d) expand the skills of AI experts and of human capital of organisations and enterprises;
- (e) develop a moral and reliable AI, and
- (f) build an international collaboration through Cyprus' participation in initiatives and programmes organised by EU and other countries.

Through this strategy, Cyprus is planning to utilise more the potential of AI in 'Human health activities', 'Transport', 'Tourism', 'Energy' and 'Cybersecurity'. Other economic sectors that are expected also to be affected, but to a lesser extent, are 'Computer programming and information service activities', 'Telecommunications', 'Research and development', 'Public administration', 'Education' and 'Weather forecasting'.

To this day, no national training programmes have been developed with a specific focus on enabling adults to understand the implications of AI or to learn AI methods or to assist those who may have been displaced by their jobs because of automation.

(14) <http://www.mcw.gov.cy/mcw/DEC/DEC.nsf/All/373791098D66FAA6C22584A400439E84?OpenDocument>

One of the workshops of the last conference organised by the President of the House of Representatives in October 2019 focused on differentiation and inclusion in the AI era (see section 1.1). The conclusions of the workshop centred on:

1. Benefits of and dangers for enterprises and society;
2. Differentiation and inclusion in the workplace;
3. Collaboration of researchers with the business world and society;
4. Awareness on research results;
5. Role of Human Sciences.

CHAPTER 7.

Conclusions – main challenges and outlook

Capitalising on the opportunities provided by the fourth industrial revolution, the new industrial strategy 2019-30, will attempt to create an integrated policy framework, achieve a common target for its development, through the safeguarding of the role of the state, in cooperation with its strategic partners, to create appropriate mechanisms, infrastructures and appropriate financial and other tools for overcoming the challenges of digitalisation and i.4.0 technologies. Improvements in production processes, training and specialisation of human resources through an improved VET system, and incorporation of appropriate technologies and equipment, will help create innovation conditions, reduce costs, modernise the workplace, increase productivity and boost exports. In addition, they will increase the added value and competitiveness of products and services, while creating new jobs, and achieving sustainable and adaptable levels of production.

The restructuring of STVE is underway within the context of the education reform (MECSY, 2004) with the direct involvement and cooperation of VET stakeholders. The quality and efficiency of VET has been improved through the further development of the infrastructure of technical schools and the introduction of modern technology in VET curricula. The *Strategic plan for the system of technical and vocational education and training 2015-20* (MECSY, 2015), approved by the Council of Ministers in April 2015 and the *proposal for the upgrading of secondary technical and vocational education*, approved in December 2015, include measures aiming at further improvement of the quality of STVE and the acquisition by students of the (digital) skills and competences needed by the labour market.

In general, MECSY places emphasis on the development of actions that can contribute to the acquisition of the necessary digital skills. More specifically, the actions promoted which relate to VET are:

- (a) offer of IT courses by the MECSY adult education centres;
- (b) new specialisations related to ICT offered in secondary technical and vocational education (theoretical direction: computers, networks and communications, digital technology and programming; practical direction: computers, networks and communications technician);
- (c) offer of seminars and workshops for teachers, parents and pupils from the CPI. The seminars are related to the following thematic areas:
 - (i) implementation of ICT in teaching and learning;
 - (ii) specialised seminars on ICT;

- (iii) robotics and programming;
- (iv) safe use of the Internet.
- (d) organisation of conferences and workshops on the integration of ICT in the learning process;
- (e) coordination of programmes for the integration of ICT in the learning process:
 - (i) programme *innovative schools and teacher coaches for ICT in teaching and learning*;
 - (ii) programme *safe school for the Internet*;
 - (iii) programme *young coaches for the internet*;
 - (iv) European project *CYberSafety*;
 - (v) European project *NEStOR*;
 - (vi) European project *EduWeb*;
 - (vii) European project *ATS2020-assessment of transversal skills 2020*;
 - (viii) European project *MENTEP: Mentoring technology enhanced pedagogy*.
- (f) participation of the MECSY in the European programme for adult learning in Europe (EPALE). One of the themes of the programme is *digital and e-learning*;
- (g) ensuring and maintaining modern and adequate ICT infrastructure in all school classrooms;
- (h) completion of the first phase of the ICT teacher training programme, which concerned mainly the acquisition of basic ICT skills. The second phase of the programme, which will involve more specialised skills on ICT use, is under development and planning.

The development of a national monitoring system of Initial Vocational Education and Training (IVET) and CVET graduates remains a priority. This will be achieved by the development of a platform for data collection which IVET and CVET students will be encouraged to use while they are still attending VET programmes to become familiar with it. In this way, and through incentives such as notifications regarding job vacancies, events and other relevant information, as well as communication with employers' associations, IVET and CVET graduates will continue to use the platform and can be provided with useful information for their progress and career. The platform will also be used by employers, enabling them to find the appropriate personnel for their job vacancies and it will be a useful tool in identifying the appropriate VET programmes for the labour market needs.

The establishment of a national monitoring system of IVET and CVET graduates is mentioned in the strategic plan as an objective which will contribute

towards the upgrading of the system of technical and vocational education and training in Cyprus.

The HRDA will continue and strengthen its support and contribution to both employers and employed and unemployed persons, through a variety of training activities under its policy schemes which provide incentives for both in-house and institutional training as well as through the research and the studies it conducts. Emphasis will continue to be given to ICT professionals for their training in ICT topics and new developments in the field as well as to persons aged 35 and over for the acquisition of basic digital skills.

A recent government consultation with industrialists and other stakeholders, revealed key challenges with regards to the lack of skills and the slow progress of integration of digital technologies by businesses, pointing at the same time towards future appropriate measures. These mainly focus on the following challenges:

- (a) the skills mismatch between secondary and tertiary education graduates and the actual skill set required by industry;
- (b) the high cost of human resource development, especially with regards to the recruitment of specialised personnel from abroad;
- (c) the closing down of a former higher technological institute (HTI), resulting in the lack of specialised, technical graduates characterised by strong hands-on experience, technical, technological and practical skills;
- (d) the lack of skilled workers in digital and advanced technologies and relevant high training costs in the field, mainly due to the lack of digital infrastructure technologies, the lack of industry/academia/research collaboration to develop applied solutions for industry, the lack of a comprehensive inventory of industry's technological needs and proper planning for the introduction of suitable machinery, the lack of holistic knowledge about the range of new technologies and how they can offer holistic solutions to industry and businesses, and the lack of a positive culture to create clusters for technological upgrading and digitisation;
- (e) slow technology absorption and application by businesses and industry, due to a lack of culture (resistance to change, security of data processing, etc.) and knowledge. Because of this, there is a reduced possibility of integrating digital technology at all stages of the supply chain;
- (f) high internet costs, especially in terms of broadband connection for businesses;
- (g) the lack and difficulty of importing high-calibre, field-experienced specialists with a combo of digital and soft set of skills.

A VET system encompassing all the necessary knowledge, skills and abilities of human capital at all levels in the new digital era is crucial. This will mainstream the development of new academic and industry qualifications and assessments, training curriculum, and vocational education and training, at all levels, to produce highly-skilled, ready-to-work employees. Such a VET system will serve as an all-time incentive for all stakeholders to support and participate in.

Abbreviations and acronyms

CAD	Computer-aided drawing
CAM	Computer-aided manufacturing
CARDET	Centre for the advancement of research & development in educational technology
CCCI	Cyprus Chamber of Commerce and Industry
CCNA	CISCO certified network associate
CNC	Computer numerical control
CPC	Cyprus Productivity Centre
CPI	Cyprus Pedagogical Institute
CVET	Continuous Vocational Education and Training
CYSTAT	Statistical Service of Cyprus
CyQF	Cyprus Qualification Framework
DEC	Department of Electronic Communications
DESI	Digital Economy and Society Index
DIAS	Learning management system
DLT	Distributed Ledger Technology
ECDL	European computer driving licence
EPALE	European programme for adult learning in Europe
EQF	European Qualifications Framework
EU	European Union
HRDA	Human Resource Development Authority of Cyprus
HTI	Higher Technological Institute
ICT	Information and communication technologies
IT	Information technology
IVET	Initial vocational education and training
MECSY	Ministry of Education, Culture, Sports and Youth
MLWSI	Ministry of Labour, Welfare and Social Insurance
MECI	Ministry of Energy, Commerce and Industry
MTCW	Ministry of Transport, Communications and Works
NBRI	National Board of Research and Innovation
OEB	Cyprus Employers and Industrialists Federation
RIF	Research and Innovation Foundation
STEM	Science, Technology, Engineering and Mathematics
STEP	Science, Technology, Engineering, Production
STEV	Secondary technical and vocational education
SVQ	System of Vocational Qualifications
VET	Vocational education and training

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Annex. Members of the ReferNet Cyprus consortium

1. National coordinator
 - 1.1. Human Resource Development Authority of Cyprus
www.anad.org.cy
2. Ministries/Government departments
 - 2.1. Directorate General for European Programmes, Coordination and Development www.dgepcd.gov.cy/dgepcd/dgepcd.nsf
 - 2.2. Ministry of Labour, Welfare and Social Insurance/Department of Labour www.mlsi.gov.cy/dl
 - 2.3. Ministry of Education, Culture, Sport and Youth www.moec.gov.cy
 - 2.4. Statistical Service of Cyprus
www.cystat.gov.cy/mof/cystat/statistics.nsf/index_gr/index_gr?OpenDocument
 - 2.5. Cyprus Academy of Public Administration
www.mof.gov.cy/mof/capa/cyacademy.nsf/index_en/index_en
 - 2.6. Pedagogical Institute www.pi.ac.cy
 - 2.7. Cyprus Productivity Centre www.mlsi.gov.cy/kepa
3. Social partners: employer and trade union organisations
 - 3.1. Cyprus Employers and Industrialists Federation www.oeb.org.cy/
 - 3.2. Cyprus Chamber of Commerce and Industry www.ccci.org.cy
 - 3.3. Cyprus Confederation of Professional Craftsmen and Shopkeepers
www.povek.com
 - 3.4. Cyprus Workers' Confederation www.sek.org.cy
 - 3.5. Pancyprrian Federation of Labour www.peo.org.cy
 - 3.6. Democratic Labour Federation of Cyprus www.deok.org.cy
 - 3.7. Cyprus Union of Bank Employees www.etyk.org.cy
4. Other organisations/non-profit making organisations
 - 4.1. University of Cyprus www.ucy.ac.cy
 - 4.2. Research Promotion Foundation www.research.org.cy
 - 4.3. Open University of Cyprus www.ouc.ac.cy
 - 4.4. Cyprus University of Technology www.cut.ac.cy/
 - 4.5. Youth Board of Cyprus onek.org.cy/en/
5. National agencies/units for managing European programmes/initiatives
 - 5.1. Foundation for the Management of European Lifelong Learning Programmes www.erasmusplus.cy
 - 5.2. National Eurydice Unit www.moec.gov.cy/eurydice