Vocational education and training for the future of work: Hungary

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

The Government of Hungary recognised the impact of Industry 4.0 revolution on digitalisation, automation and robotization. All these technologies are challenging not only for corporate and labour market stakeholders, but also for the education and training system. The Hungarian Government's goal is to develop and implement strategies and initiatives that will successfully prepare citizens and economic actors for future digital and technological transformations.

The Hungarian Government's strategy for the technological challenges of Industry 4.0 Revolution and digitalisation is as follows:

- Building an adequate standard of digital infrastructure;
- Developing digital competences (writing and reading skills);
- Digitalisation of the economy;
- Digital transformation of public function;
- Creation of Industry 4.0 national technology platform.

In 2016, with the support of the Government, industry 4.0 national technology platform was established. It provides an opportunity for university/research and company actors for collaboration in order to prepare for the new technological era and accelerating changes in information technologies (IT) and industry mergers. The Ministry for National Economy has set up a working group 4.0 to develop a preparatory programme. As a part of the Government's digital workforce programme, Hungary's digital education strategy has been developed. The 2016 Government decision decided to launch programmes on developing digital education and pedagogy in school-based vocational training, whilst in adult education it aimed the adaptation of free digital literacy for citizens to improve the competitiveness of citizens on the labour market (1).

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CHAPTER 1.
VET and policy strategies for adaptation to digitalisation

Major efforts have been taken in Hungary during recent years to promote the introduction of digitalisation as extensively as possible and to meet challenges in the context of Industry 4.0.

This chapter presents the most important elements of the Hungarian Government’s strategy. In the course of the strategy development, the Government puts emphasis on professional consultation with advocacy organisations, market players, the non-governmental sector and academics.

One of the key factors necessitating strategic re-planning is the inadequate development of basic skills among school-age children. A further challenge is the extremely high rate of students performing poorly on PISA tests – meaning not reaching at least a satisfactory level. One of the EU targets for 2010 was to reduce the rate to below 10%, but according to the 2015 PISA survey, the Hungarian ratio is above 25% in all three areas (2). However, the data recorded in December 2019 reflects improvement (3). The performance of 15-year-old students improved in each of the relevant fields, including reading comprehension, maths and sciences. Hungarian students’ performance came closer to the average of OECD, the organisation of the world’s most advanced countries.

One of the EU-2020 goals is to reduce the rate of early school leavers below 10%. In Hungary, this ratio was 12.5% in 2017 and is showing an increasing trend. This question is negotiated by GINOP 6.2.2. project (decreasing the number of students living VET without any qualification) (4).

The rate of children at age 16 and at school dropped to 91.4% by 2016 (compulsory school attendance maximum age is 16) versus 99.7% result in 2010 (compulsory school attendance maximum age was 18), just as the rate of students at the age of 20 dropped to 46.7% versus 57.7% in 2011. Cohering to all the above, the rate of students with higher educational degree is consecutively dropping since 2015-17 rate was 32.3% - while the EU average is near 40%.

(2) http://www.oecd.org/pisa/
According to the previously mentioned PISA surveys, students' performance in Hungary is most strongly determined by the social status of their families. Teachers' salaries - despite the introduction of the career model and wage compensation - are now more distant from the national average of intellectuals than it was 10 years ago.

Digitisation is one of the most important drivers of sustainable growth, a major competitiveness factor, and has a clear positive impact on enterprise business efficiency. Based on the information system data of Economic development and innovation operation programmes (GINOP), every Hungarian Forint (HUF) invested in IT development brings a threefold increase in business profit for the concerned enterprise within two years.

Digitalisation of domestic small and medium-sized enterprises is among the top priorities for the Government of Hungary, promoting businesses’ endeavours with financial asset amounting to over HUF 100 billion (EUR 300 million). Data disclosed by the Ministry for Innovation and Technology—and confirmed by communication from the Sectoral Skills Councils as well—most domestic and international enterprises have already integrated and use up-to-date productive solutions collectively referred to as Industry 4.0, however, small and medium-sized enterprises doing business with them still need to change their attitude.

Immediate and radical digitalisation of the education system is indispensable if the competitiveness of the upcoming generation is to be ensured and young people are to be given a good chance in the labour market. The tasks faced by young Hungarians and the role played by the Hungarian national economy are equally regarded as outstanding. It is easy to understand how digitalisation is the best way for conscious participation in education and lifelong learning alike. Since no teaching and learning is possible in the 21st century with 20th century methods, one of the most important elements of the strategy is the elaboration of Hungary’s Digital Education Strategy.

The Hungarian Digital Education Strategy’s VET pillar is aimed at making sure that students completing vocational training acquire general and professional digital competences in the labour market.

Development goals:

- To strengthen institution managers’ commitment to digital education and its management and governance.
- To develop teachers’ and trainers’ digital competences in accordance so that they can meet the 21st century’s technical requirements and those of trade.
- Development of the VET institutions’ infrastructure required for digital education.
• Ensuring that institutions’ managers give their backing to the use of digital administration tools supporting education and training in all VET institutions.
• Promoting digital teaching and learning at the level of management in VET institutions.
• Making sure that teachers and trainers have the technological knowledge and skills, and the methodology competences required for digital teaching and training.
• Ensuring that VET institutions have all the necessary ICT tools and resources required for digital teaching and learning.

1.1. Hungary’s digital welfare program

On the basis of the results of the 2015 National internet and digital development consultation (InternetKon), the Government prepared the digital welfare program (DJP) (5) aiming at the digital development of Hungarian society and the Hungarian national economy.

1456/2017. (VII. 19.) Government Decree is about the extension of the digital welfare program, accepting its work plan for the year 2017-18, and further development of digital infrastructure, competences, economy and public administration (6).

The most important task of DJP is to support all citizens and businesses of Hungary, as well as the Hungarian national economy, to become winners of the digitalisation. The unprecedented change in information technology requires an exchange of knowledge that the Hungarian education and training system needs to be prepared for. The Hungarian government’s determined endeavour is to create more new jobs with high added value through digitalisation than the number of traditional jobs to be ceased due to technology change. Therefore, in the framework of the programme they worked out Hungary’s Digital Education Strategy (DES)—discussed in the previous chapter—and Digital Workforce Programme (DWP)

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(5) 2012/2015. (XII. 29.) Government Decree on the results of the National Consultation on Internet and Digital Development (InternetKon) on the Digital Welfare Program to be implemented by the Government

DJP defines the tasks of the smart city model. 80% of the world's population will live in cities by 2050, so liveable environment has to be created for them. In the smart city developments, former e-Hungary points are going to be transformed into Digital Welfare Points, where they coordinate smart spatial development locally. In an international comparison, Hungary has achieved a higher level than EU average in internet usage but is lagging behind in the digitalisation of companies and the public sector. Most things to do are in digital public services and the digitisation of health.

In the framework of the DJP, the artificial intelligence coalition (MI Coalition) has been established. The coalition aims to bring Hungary to the European forefront of artificial intelligence developments and applications. The task of the MI Coalition is not only to identify the competitive areas necessary for progress at European level, but to prepare everyone for the adoption of artificial intelligence-based solutions in Hungary. At end-2019—when this paper was written—the AI Coalition had more than 200 members, including businesses and non-profit organisations as well but the Coalition relies primarily on its tech company members, such as Magyar Telekom, Vodafone, Microsoft. Their innovative research activities include, for instance, IBM’s project converting human speech into written words. People can even test AI programs as part of the programme: for instance, they can chat with robots and test image recognition programs (7).

Hungary’s digital child protection strategy (DGYS) is also a part of the DJP programme. It aims to protect children from harmful content and methods on the Internet, and to prepare them and their parents and teachers for conscious and value-creating Internet use. It was an important aspect of creating DGYS not only to eliminate the risks to children from using the Internet, but also to help them use these opportunities as effective as possible. That is why the Strategy plays a fundamental role in the development of media culture and media awareness.

Within DGYS a contemporary assistant training system has been developed, in which the benefits and risks of using the Internet are presented by peers at the same age and they can also provide the necessary help. The nationwide digital welfare programme points (DJP Points) provide parents free media literacy training that prepares them for the risks of using the Internet and presents ways in which parents can more effectively help their children how to use the digital media in a safely way. Training of police, prosecution and court staff dealing with children is also ongoing. The goal is to include digital security related issues in the national core curriculum (Nemzeti Alaptanterv).

(7) For a more detailed discussion of this topic see Chapter 7.
Another part of the DJP is Hungary's digital start-up strategy, which will last until 2020. It aims to develop a regulatory system that adapts changes in new technologies in a flexible and open-minded way, recognising that rapid response is a competitive advantage in the global economy. The long-term strategy ensures a balanced development of the start-up ecosystem by strengthening the entrepreneurial spirit, the entrepreneurial competences and the culture of cooperation, the development of a supportive business environment and the targeted availability of funding sources. The strategy encourages the strengthening of entrepreneurship at all levels of education, improves the awareness of entrepreneurship and self-employment and also the social perception of entrepreneurship. In March 2017, the start-up Hungary coordination and methodology centre (SH) was established. Its main objective is to implement the digital start-up strategy of Hungary and the related monitoring system, also to coordinate programs aimed at developing the start-up ecosystem.

As part of the DJP, Hungary has developed the digital education strategy (DOS). The Strategy is based on the recognition that digital transformation is not a matter of choice: it is an inevitable phenomenon that everyone should be prepared for, as 20th century knowledge will not be competitive in the 21st century. Digital approach and devices need to be introduced in the classroom as they are deeply integrated into our everyday lives.

1.2. Industry 4.0 national technology platform

In May 2016, the Industry 4.0 national technology platform was established in the organisation of the Ministry for National Economy and the Computing and Automation Research Institute of the Hungarian Academy of Sciences, with the support and commitment of the Government and with the participation of around 40 companies with domestic premises. Today, the Alliance operates under the supervision of the Ministry for Innovation and Technology.

Behind the foundation of the National Technology Platform was the recognition that the Hungarian industry has also faced new technological challenges, in which the Internet economy is basically transforming production and related logistics systems. This process requires advanced and dynamic deployment of bridges between the physical and digital worlds, special innovation adaptation, responses faster than ever, and courageous innovation steps from all economical stakeholders – especially from the key companies involved in sectors
highlighted by Irinyi plan (8), the institutions concerned in innovation system and from governmental economic policies.

1.3. Modern cities programme

The modern cities program involves more than 250 development projects in the total value of 3 500 billion HUF. Realisation is funded partly from national and partly from EU sources. The development programme takes place until 2022 with the goal to enhance and promote the collaboration between industry and VET by the large-scale development of the Hungarian cities with county rights.

In 2019, the modern cities project - with the total budget of 3 500 billion HUF - receives 135 billion HUF, and also the implementation of modern villages program began. The main goals of village development are better life quality and a more predictable future. In Hungary, more than the one quarter of the population lives in villages. The aim of the program is to increase the population retention capacity of-, and the employment ratio in villages, to improve transport, education, healthcare, culture and sport life (9).

The programme involves the construction of a test track near the town of Zalaegerszeg, in one of Hungary’s more advanced regions in terms of industry and infrastructure, where self-driving cars can be tested and ‘smart city’ solutions can be modelled. By completing the construction, it will also enable other vehicle manufacturers in the region to test their cars and systems. As one of the largest investments of this kind in Central Europe, this creates 350 new engineering jobs, which can be filled even by students who have completed their practical training here.

1.4. Hungary's digital export development strategy

Hungary’s digital export development strategy - accepted jointly with the 1491/2016 (IX. 15.) Government Decision – sets out a comprehensive government package of measures to improve the export capability of small- and medium-sized IT enterprises. The improvement of the export performance of the digital economy can make a significant contribution to the growth of the Hungarian economy,


(9) Although the programme is not primarily aimed at counteracting the trend of urbanisation in Hungary, it is expected to at least slow down the process to some extent.
creates numerous, high-value job opportunities attractive for the youth, stimulates domestic digital innovation and improves Hungary’s international perception by utilising Hungarian knowledge and innovation.
CHAPTER 2.
VET 4.0 initiatives and programmes

2.1. Directions of VET development

The strategy for the development of VET in Hungary is framed by the digital welfare programme. A part of the development was the creation of sectoral skills councils. In close cooperation with it, the vocational innovation was established. The most important objective of the overall strategy is the implementation of Industry 4.0 in Hungary.

While the digital workforce programme - developed by the Ministry for National Economy (10) - aims at employees, Hungary’s digital education strategy - in the framework of the digital welfare programme - aims at students at different levels of the education system. In the first phase of the digital workforce programme implementation, the Government focuses primarily on short-cycle, non-traditional IT training programmes. The goal is to train at least 20 000 additional IT professionals within three years, compared to the current training system. Parallel with this, capacity-building and content updating of traditional training systems are indispensable, just as the development of alternative training pathways to provide workforce with IT and digital competences for the digital economy (11).

2.2. Training developments aiming the management of technological changes of Digitalisation and Industry 4.0 revolution

The Government has outlined a vision for the VET system including the following elements of digitalisation and technological changes in the Industry 4.0 revolution:

• Up-to-date digital knowledge, skills and competences should be reflected in learning outcomes as well, therefore the upgrade of VET content is important - planned to be achieved by developing a curricula responding to technological change. The Vodafone Hungary Foundation’s digital school program also contributes to this. The Foundation has launched the digital school program three years ago; this year aims to extend the range of participants and to deepen the knowledge of students and teachers. Three partners are involved

(10) Ministry of Finance since 2018.
(11) https://digitalisjoletprogram.hu/hu/tartalom/dmp-digitalis-munkaero-program
('Tanoda' programme, national public education portal and Lego education programme) to achieve this goal. In cooperation with the national public education portal - which provides a collection of about 40 000 exercises and is used by more than 1 500 schools – they aim to make digital competence development part of everyday education. No precise statistics on participation are available, but the programme has already made some positive impacts.

- In terms of ICT usage, youth entering secondary educational level is already able to search, evaluate, store, create, present and to transmit multimedia-based information, also to be present in the online network. Relying on these competences, digital devices are also in the focus of the non-state-owned VET centres and institutions with educational activities, while enabling VET participants to enter the labour market with the possibility of independent self-study and self-training.

- During the theoretical and practical training of general and professional subjects, teachers and trainers use digital systems that support learning at the level of competence, relying on the students' own ICT tools. High-quality digital devices and teaching materials are already available in sufficient quantity; focus shall be on increasing availability to a wider audience:
  - mobile digital presentational device ('dinner wagon') and suitcase. The 'dinner wagon' includes one laptop, one projector, amplifier, speaker, microphone VHS, DVD, holding case. Digital suitcase includes laptop and projector;
  - Sulinet digital knowledge base. This platform includes the digitised teaching materials of general subjects for class 7-12, further examples, animations, demonstrational films, additional databases, background information, methodological tools and lesson plans for classroom subjects. It also provides chat, forum and other collaboration opportunities;
  - interactive blackboard. An IT tool that joins a computer, a projector and digital blackboard together via software. The blackboard can be used as a touch screen to control the computer with. It effectively supports differentiation, group work, and the usage of collaborative tools during lessons;
  - web 2.0 platform. Web 2.0 tools create a new platform for collaboration, also providing a virtual interface to establish common content. By using it for educational purposes, Web 2.0 platform offers a wide range of opportunities for teachers to renew their pedagogical tools;
  - e-learning. This is a form of teaching and learning, when digital media (for example, DVD, CD-ROM, Internet) is used for communication for processing and presenting the curriculum;
– hardware and software for theoretical and practical teaching of qualifications, and access to broadband internet in both educational and community areas;

• the development of digital competences is not an individual topic. It appears in every educational aspect, but of course teaching IT as a subject plays an important role;

• in this context, the common frame of reference for information communication (CFRIC) will be introduced, as being able to identify the level of digital competences of students, VET teachers and instructors and also to monitor their development;

• teachers and trainers to regularly develop their digital competences, supported by the state through free training programmes, horizontal learning opportunities and school networks. One of the most remarkable programmes is GINOP 6.1.2. (reducing the digital gap) training programme;

• vocational training designed with the help of a central electronic database (12) relying on labour market needs and providing up-to-date information on the indicators of a system monitoring digital education.

2.3. The 21st century VET school development programme

The 21st century VET school development programme is a mid-term development programme with national impact, aiming the renewal of state-operated VET schools. The programme is important to reach such a quality level of VET schools’ buildings as they become more attractive for young people, who are at the point of deciding on their future career, and their parents, also for tools development. The aforementioned programme was planned based on an integrated professional strategy for a 10 year period.

In Hungary, Miskolc and Győr - two cities with remarkable economic potential - have already begun the execution from 10 billion HUF, Debrecen and Kecskemét are in the preparatory phase. The quality of service in school buildings is also improving; almost half of the Vocational Training Centres have been renewed, and investments are ongoing throughout the country.

(12) One of these systems is the secondary admissions information system. Another such programme is called the educational registration and study system, which – though under development – has already provided many important data in 2018, including not only study outcomes but also institutional management data.
The Ministry for Innovation and Technology is working to modernise all VET institutions during the present governance cycle. The modernisation includes the joint development of practical workshops with companies. It is also important that students have digital competences. Focus from printed textbook development is moving to digital content development. The curiosity of today’s children can be raised more with an educational film, and by that, the efficiency of school education can also increase.

### 2.4. The vocational innovation council

The Council was created in 2018 by the proposal of László Palkovics, Minister for Innovation and Technology. ‘The fourth industrial revolution is a strategic challenge for VET as well, but if we use the potential of new technologies wisely, we will be able to meet the demands of the 21st century’s labour market’, said the minister in relation to the matter. The Council is a national body that assists the Minister for Innovation and Technology in fulfilling its tasks in the field of VET and adult education. It also has a decision-making, preparation, commenting and proposing role. Its purpose is to support the further development of the Hungarian vocational training system. The vocational innovation board with 38 professional held its inaugural meeting on the 7th of September 2018.

One of the major tasks of the vocational innovation council was to form proposals for the chancellery system to be introduced for vocational training centres and to elaborate the details of the regulation. The chancellor employed at Vocational Training Centres are in charge of ensuring that the Centres' development is driven by a management-oriented approach. Chancellors are responsible for the economic areas of the centres and for effective cooperation with companies. Dual training is attracting an increasing number of businesses in Hungary; the chancellors are also responsible of laying down the foundations for and of promoting such relationships.

### 2.5. Sectoral skills councils

Sectoral skills councils started their operation on the 1st of July 2018 based on the Act CLXXXVII/2011 on vocational training. Their task is to facilitate the match of labour market needs with the training system, to contribute to the operation and necessary transformation of the vocational and adult education system by their means of opinion and proposal function. Permanent membership varies between
7-19 persons, depending on the size and structure of a sector. Permanent members of sectoral skills councils come from companies committed to take on a cross-sectored, intermediary role, which have sufficient information on labour market needs and are able to formulate professional demands to promote the sector's training (vocational and adult education) conditions (13).

The more than one-year operation of the Sector Skills Councils (SSCs) has proven that the system of VET cannot be transformed without partnership with businesses. SSCs have made some very useful comments and proposals concerning the development of the new VET system, helping the alignment of policy concepts to challenges expected to be faced in the business sector. Dialogue between SSC members and the Ministry for Innovation and Technology has grown more intensive. The Hungarian Chamber of Commerce and Industry has played a major role in the intensification of the process through its unceasing support of the closest possible cooperation between policy makers and the profession, regarding this as the guarantee for the successful implementation of development programmes.

(13) https://mkik.hu/agazati-keszsegtanacsok
CHAPTER 3.
4.0 intelligence for VET

Several, currently running national programmes have as main objective the introduction of Industry 4.0 vision into vocational education. Vocational training centres are the most important building blocks of VET 4.0 (14). As the provider of vocational training centres, the National office for VET and adult learning seeks to collect and organise as much data as possible. The previously mentioned Public Educational Registration and Study System (KRÉTA) is one of the best examples of big data procedures. This is an IT system supporting the education related organising tasks of public education institutions. It cooperates with other systems of public education in an integrated and adaptive way and is one of the most remarkable digital developments of the Hungarian education system. Thanks to KRÉTA, the maintainer has up-to-date information on schools under its operations.

KRÉTA is a complete educational management system capable of fulfilling various institutional requirements. Thanks to its continuous development, specific needs of schools are also solved within the software package. The e-journal module of KRÉTA was launched in the academic year 2016-17. The progressive introduction and trial periods enabled state-run institutions to move from paper records to digital records. Since academic year 2018-19, institutions have been obliged to use KRÉTA, so the amount of incoming data has significantly increased.

The information technology system of public education (KIR) gives information on IT equipment supply of public education institutions – including VET institutes. The data of (eLEMÉR) 30 is also available. This is a monitoring system, providing an option for self-evaluation to public education institutes on a voluntary basis. It should also be noted, however, that Hungary is still facing challenges even after the establishment of strategic goals and the execution of a wide variety of operational tasks. One of these is the inadequacy of Big Data analyses previously detailed. Challenge is the proliferation of large amounts of data analysis methods and the fusion and harmonisation of large amount of data in VET. Although, due to large-scale developments, the amount of data to be processed has increased, it is difficult to implement and analyse these data. There have been and also are going to be a lot of researches that could help with strategy development if they could analyse their data.

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(14) Vocational training centre: regional vocational training centre, to which schools are affiliated. There are 44 centres across the country, grouping the 381 vocational training institutions. Their regional role is outstanding with a strong advocacy role and economic influence.
Examples:

- foreign language learning pathway research database (foreign language learning outside the school-based education, language selection, language learning goals, motivations);
- indicators of upper secondary level school work (higher education admission performance (recruitment ratio, average results of admissions writing, language skills of applicants), the effectiveness of upper secondary students’ work based on their rankings at approximately 70 national competitions, e.g. national study (OKTV), professional (OSZTV) competitions. School orders by type of settlements, counties, cities, school operators, type of schools;
- database of accredited school administration systems implementation experiences;
- educational school practice research database (database of empirical study on models for educating pupils with special educational needs; practical implementation of integration).

The exact information needed for the development of VET and adult education comes from PIAAC studies (programme for the international assessment of adult competencies). PIAAC is run by the national office for VET and adult earning (NSZFH) within the framework of GINOP-6.2.1-VEKOP-15-2015-00001 project. PIAAC is the most comprehensive international research on adults’ skills so far, examining the level of proficiency in the participating countries required for the information era. It also enables to receive comparable data of skills and basic competences used in everyday work and life.

PIAAC provides reliable and internationally comparable information on:

- partial skills level of low capability adults, whether they use a PC according to their own declaration or not;
- share of population according to the literacy skills;
- share of population according to the level of numeracy skills;
- adults’ problem-solving strategies used in IT environments;
- correlations between results in competence measurement, socio-cultural factors, other background variables and affective variables;
- correlations between data sourcing from background and JRA questionnaires (questionnaires on skills needs on workplaces) and measured competence levels.
CHAPTER 4.  
VET 4.0 learning practices

There are several, clearly visible changes in the field of digitalisation since 2018. There’s an abundance of progressive professional initiatives, such as for instance the application scheme called ‘Működj!’ (Operate! Let’s work!)\(^{(15)}\) or the Digital Community Creative Workshops (Digitális Közösségi Alkotóműhely [Hungarian abbreviation: DKA]) The establishment of the national network has begun; the first such workspace was realised in Nyíregyháza. By these creative rooms, new educational forms and spaces have been created, and it is expected to bring the overall renewal of vocational training. DKA laboratories had been opened in 19 VET Centres by November 2019. However, by the end of the next 6-month-period, each of the more than forty VET Centres in Hungary will have such a laboratory. In this special education space, modern technology and traditional professions merge, giving students the opportunity to develop their skills and carry out experiments. Besides students, digital community workspaces can also be used by the youth and adults, as well as nursery and primary school pupils during career orientation programs.

4.1. Digital community creative workshops

In digital community workspaces of vocational training centres, children can learn without noticing that they are studying, and teachers become more of a mentor – not only teaching but managing the process of creation. In the Digital Community Workspace in Nyíregyháza, in addition to robotics and programming, students can try several traditional professions, such as embroidery, sewing or turnery. The 300 square meter workspace represents modern technologies with drones, small and large programmable robots, computers and smart devices. In addition to lessons, workshops, talent and career guidance sessions, professional classes, and family days are also organised for those interested. Within the

\(^{(15)}\) All applicants implementing an idea and submitting a video within the deadline will be registered on a recommendation platform where company managers can monitor them with the recommendation of the Hungarian electro-technical association. Incoming projects are continuously monitored by the participating companies during the entire application period and they can also provide support to students with relatable ideas. This challenge is not only a good opportunity for students, but also for their teachers and for the schools of vocational training centres to present their capability.
framework of this project with the value of more than 512 million HUF, the
vocational training centre – to which a 10-member institution is affiliated - has also
realised machinery purchase, practical workshop, teachers' upskilling and
curriculum development programmes. This complex innovation will be spread
within the whole vocational training centre network.

Developments and specific programmes also offer several career paths to
young people and adults alike. The development of practical workshops is planned
by the Ministry for Innovation and Technology responsible for VET, in cooperation
with companies, to reach the goal that students by the time they enter into dual
training system will have the necessary basic knowledge of modern machines,
devices and technologies.

4.2. Steps of VET development

From practical reasons, VET development has basically three main pillars.

The first is the attractive environment, which means the development of VET
schools, the renewal of infrastructure and assets. (see: 21st century VET school
development programme)

The second main pillar is to ensure children that VET can be a career choice.
Vocational grammar schools provide practical technical trainings, which can be
sufficient for a middle management level at an enterprise; the best students can
even become engineers. The goal is to make it easier for students to enter
universities with professional qualifications and the ability of showing students and
their parents that the vocational grammar schools' qualification is an advantage.
Many companies can import new content into education, such as the curriculum of
electric cars.

The ministry is trying to make the system more flexible by implementing such
and similar initiatives. Having scholarship scheme is also important, so that
disadvantaged children are not left behind and can attend vocational grammar
schools or other vocational training programmes. The improved system offers
different career paths for different life situations and ambitions: one for those who
would study further with the will of becoming an engineer, another with the will to
become the master of a profession, and another in need of a chance for handhold
and catching up.

The third pillar of strengthening professional training will be the teacher and
instructor with up-to-date knowledge. An important principle of professional
methodology is the increased involvement of engineers in education, as well as
the in-company upskilling of the teachers. All these steps are necessary to achieve a systemic improvement of VET.

Several pilot programmes were launched in 2018 to achieve the goals. One is the corporate model. Based on the practical training basis of Siemens Zrt., a complex VET development programme is implemented. This programme is very complex: career guidance, development of dual training, development of digital curricula and quality assurance of training are parts of this programme.

The other programme element is the pilot introduction of the guidance grade. Although this is not closely related to digitalisation, it is important to see systemic building blocks. In Göd - a small town in Hungary - the Piarist Order launched the guidance zero year on an experimental basis in the 2017-18 academic year. Here they are waiting for children who do not know where to go, or who are struggling with some disadvantage or lag. They assess the strengths and weaknesses of children and then develop individual competences. Students who have no idea where to continue their further studies are also awaited here.

The third pilot programme is the launch of workshop schools. This is how the Ministry for Innovation and Technology wishes to minimise school drop-out rates. The EDIOP-6.2.3. EU project is one of the measures taken to reduce the number of students leaving school before finishing their studies. The essence of the training form in Kazincbarcika, together with the Salesian Order, is the master-apprentice relationship; the teacher appears here as a mentor. It is not the repetition of the primary school curriculum, but the strengthening of the knowledge related to the profession. For example, if you are studying to become a tiler, beside the mastering professional courses, you will learn how to calculate how much tiles and floor tiles you need. The professionals want to create a highly flexible, tailor-made training in the workshop schools, providing a safety net for students drifting near dropouts.

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(16) Several EU projects focus on early school leaving and drop outs, including GINOP 6.2.3 project running under the supervision of the National Office for VET and AL. School failures and dropouts are the frequent consequences of school leaving without qualification, or with a low level qualification. This results in a risk of exclusion from the labour market and society. In order to increase employment, the quantified goals of the Europe 2020 strategy include the reduction of early school leavers’ ratio below 10%. The long-term goal of the programme is to develop students’ skills and abilities. A further objective is the comprehensive development of the entire institutional system, including the development of teacher training and institutional infrastructure.
CHAPTER 5.
Adapting to AI and automation

5.1. Adaptation and continuous renewal

The adoption of the VET 4.0 Strategy in vocational education and training – described earlier on – was only the beginning. The strategy involves the renewal of the entire VET system, as provided for, since November 2019, in the updated VET Act (17). Based on the provisions laid down in the Act the ongoing transformation can safely refer to as a historic process. The need for transforming the VET system is indisputable: it has been induced and brought about by changes in the needs and requirements of businesses in the industry in particular and in the business sector in general. Although the Act does not specifically call for adaptation to artificial intelligence and automation, yet its underlying motives and endeavours strongly support this process and thus definite progress is expected during the coming years in this field as well.

The adoption of the Act laying down new foundations for VET in Hungary was preceded by extensive consultations with economic participants. The establishment of the VET Innovation Council in 2018 has been followed by the launch of the sector skills councils that have made valuable contribution to the drafting of legislation with consultancy and by channelling proposals from their members representing the business sector. The organised input from companies through skills councils, for example to the drafting of the new Act is a clear indication of the Hungarian Government’s commitment to developing a demand-driven VET system. The regulator, VET staff and, not least, businesses, have had to recognise that VET needs to be profoundly transformed in the face of the new challenges. The underlying concept involves output regulation and data-based decision making, similarly to the system in place in a manufacturing company.

5.2. New structure in VET

Output regulation has brought about profound changes in the practices applied in the Hungarian VET system. The structure of training programmes has been updated and adapted to employers’ interests as closely as possible. The previous

(17) https://net.jogtar.hu/jogszabaly?docid=a1100187.tv
forms of training (3+2 years, 4+1 years) have been replaced by training paths much more elaborately structured, yet at the same time, more thoroughly harmonised and standardised. Students attend vocational schools for three years (previously: 3+2). In the first year they are provided with sectoral basic education and training at the member institutions of the VET centres. After the first year, students take a sectoral basic examination and during the next two years they acquire the necessary technical knowledge and skills in the framework of the dual training delivered with the involvement of the VET centre’s partners. In the case of Technicums (previously: 4+1) students undergo two years of sectoral basic education and training, followed by three years in the dual education and training system. Upon completing their studies, they obtain a certificate secondary education and vocational qualification as well.

The Government and the profession also expect that the renewal of the vocational education and training system will result in an increased number of students starting their studies in the VET. This process was encouraged by policy makers through the latest amendment to the relevant legislation providing that all VET students are paid a scholarship, i.e. children start their studies at the age of 14 being paid a certain amount each month for conducting studies and participating in training for some vocational qualification. There is no doubt about how encouraging such a scholarship scheme is. And, of course, this is not the only incentive element comprised in the renewed VET system. In the new VET system, the technicum will be the venue of the development of skills relating to artificial intelligence and automation, as the highest level form of education in the VET system, a last step before entering higher education for prospective engineers, as a result of various legal regulations (18)

Changes in legislation on VET have resulted in a substantial extension in the role of dual training. The applicable regulations are geared to encourage vocational training centres and businesses to cooperate with each other. After the completion of sectoral basic education and training students actually spend more time at the premises of the dual partners than at school. This change will bring about an improvement in the skills relating to artificial intelligence since it is crucial

(18) In terms of its modular system, training at technical schools is easy to coordinate with various forms of training in the higher education system, and based on the relevant legislation, the five-year training is also open towards continued training at colleges and universities by enabling participants to acquire extra points for the entrance exams. Such high degree of interoperability between the two systems requires continuous consultations and close cooperation with higher education institutions in Hungary.
for the prospective employers that the students they provide with training have cutting-edge knowledge and skills (19).

Of course, such profound changes in VET requires adaptation on the part of trainers teaching students at the schools concerned. Dual partners provide trainers as well with continued training, whereby they familiarise themselves with artificial intelligence and the possibilities lying in automation.

5.3. Digital renewal

The process of Hungary’s digital renewal is based on the above changes in the VET system. The institution system of vocational education and training can provide future employees with the digital competences they will need and in cooperation with its dual training partners the system is capable of providing them with the necessary practical skills in artificial intelligence as well. However, the need for developing similar skills in the adult population also poses an immense challenge. The Artificial Intelligence (AI) Coalition plays a major role in tackling this challenge, aiming at enabling Hungary to join Europe’s leading countries in AI development and applications and become an important member of the international AI community. The AI Coalition participates in working out Hungary’s artificial intelligence strategy and in analysing societal and economic impacts relating to the spreading of artificial intelligence. The membership of the AI Coalition has increased from the initial 70 to about 200 members by now, showing how an increasing number of economic participants are actually interested in the spreading of artificial intelligence.

5.4. Research supporting VET and the business sector

The ICT Association of Hungary is another key player of this particular sector besides the AI Coalition. The Association promotes the development and spreading of artificial intelligence and digitalisation in Hungary by way of scientific research as well. One of their most recent research projects probed the weight of the digital economy (20). Their research has revealed that the digital economy has

(19) Even at present vocational training centres are working together with a number of dual training businesses—including some international entities—with state-of-the-art automation processes where artificial intelligence is indispensable.

(20) http://ivsz.hu/a-digitalis-gazdasag-sulya-2019/
far outgrown the scope of the activities of the ICT sector in its narrow sense; digital services and products represent value added at multiple points of the value chain therefore their impacts are reflected by other sectors as well. The research method worked out with the involvement of macro-economic factors in such multiplier effects as well, i.e. the digital economy equals the ICT sector’s weight increased by multipliers plus the digital output of other sectors and state administration.

One of the key conclusions of the research is that adequate system-level measures can launch the domestic economy on a technology-driven path that would generate extra GDP of an amount of about HUF 4,000 billion by 2023 with an additional HUF 1,800 billion tax revenue increase. Experts say that consistent interventions, decisions made consistently with a view to digital considerations, as well as focused resources are indispensable and can also trigger a positive shift in Hungary’s DESI index (21) as well. Hungary’s position in the index shows that one obstacle to growth and development is the shortage of workforce with digital competence, as well as that in many cases business employ highly qualified IT experts even for functions that could even be performed by employees with a general level of digital competence.

5.5. **Projects promoting digitalisation**

One of the most important findings of the research is that in many cases there are major digital gaps between large international enterprises. The reason for this lies—in addition to scarcity of funds—in the fact that small and medium-sized enterprises are not sufficiently ambitious as regards digitalisation (22). The EU has launched a variety of programmes with the aim of helping such businesses and individuals improve their digital practices and skills and become more suitable for integrating automation processes. One of the most well-known such programme is the project identified as VEKOP-8.5.4-17-2017-00001, whereby 35-hour training courses are provided on the basis of the standardised training programmes entitled ‘First steps into the digital world’ (IKER, level 1) and ‘I use my IT device independently’ (IKER, level 2), developed by the Governmental Information Technology Development Agency (KIFÜ), with the involvement of adult training institutions.

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(22) This is a major issue because, for the most part, these are the very businesses where students spend their practical training periods after vocational education.
The easy-to-complete, practice-oriented training programme enables even participants with low schooling attainment to use web-based functions. The training programme provides participants with solid foundations of user skills and the participants must pass a closing test upon completing the course. Knowledge acquired at the training programmes helps in maintaining contacts, in managing administrative tasks, and in enhancing knowledge through the use of computers, tablets or smartphones, i.e. it may improve the quality of life and increases the chances of employability. At least 13,000 private individuals are planned to be enabled to benefit from more than a thousand ICT competence development training programmes in the context of the project to be organised by adult training institutions. The project will be closed on 31 October 2020. Closely associated with this programme is the project identified as GINOP 6.1.2.-15, whose key objective is to reduce the digital gap among Hungary’s adult population. At least 260,000 people will be enabled to participate in training programmes of two different levels, by end-2021.

Quite a number of initiatives, of outstanding significance even by international standards, have of course been launched in Hungary, in areas of both the economy and education. It was in recognition of his remarkable individual performance that Zoltán Sisák was appointed digital ambassador in September 2019. Mr. Sisák is one of the most important figures of IT training in Hungary, who has made crucial efforts to promote the digitalisation of both formal and other forms of education and training. The Cisco Networking Academy (23) he has been developing, leading and managing, provides some 15 thousand students with possibilities to develop their skills, and he is also founder of Infotanár Mentor Program, providing some 1500 teachers with online training.

Lidl Magyarország’s Artificial Intelligence-based development earned the ‘digitalisation project of the year’ award this year. The project enables very substantial reductions in the store-chain’s ecological footprint. The goal of the project is to enable full automation of decisions that used to be based on human consideration, in the process whereby fresh goods are managed and distributed, making it possible to massively reduce Lidl’s losses resulting from scrapping goods with expired shelf lives. Developments of such innovative companies are going to be accessible for an increasing number of VET students, thanks to the dual training model.

(23) A considerable number of VET centres participate in the programme.
5.6. Implementation of the Digital Education Strategy

The spreading of digitalisation and at the same time its prompt integration in day-to-day life is facilitated by a variety of now indisputably justified initiatives. The Centre for Digital Pedagogy and Methodology (CDPM) is an organisation supporting the technical implementation of Hungary’s Digital Education Strategy (Hungarian acronym: DES). It is tasked with providing methodology support to the digital transformation of public education, providing it with a technical/professional background and an expert basis, as well as providing technical/professional support for tenders and priority projects relating to the implementation of the DES.

Regarding the implementation of the Digital Education Strategy the Centre supports infrastructure, organisation and content developments read for the digital transition of the education and training institution system, it determines expectations and requirements relating to digital competence development for education and training institutions, it implements and coordinates various digital pedagogy and methodology developments as well as supports their introduction.

The CDPM provides technical/professional support for the development of various content regulations and requirements of certain branches of education and training. It participates in the elaboration of the framework, and the system of measurement and evaluation, of the key competence area of digital literacy and it regularly monitors digital pedagogy processes at an institutional level. The DCPM provides input to the elaboration of a framework system that will be suitable for measuring teachers’ digital competences and provides for its integration in what is known as teacher promotion system. It helps experts and consultants prepare for tasks relating to the above area.

In relation to the dissemination of scientific and technical/professional achievements and the associated knowledge management activities the Centre discloses domestic and international news, updates, issues and good practices relating to the world of digital pedagogy, through its own website and other communication channels. It maintains relations and develops institutionalised cooperation with domestic and international technical/professional organisations and organises technical/professional events and forums in areas and topics relating to digital pedagogy (24).

Tempus Public Foundation also plays a major role in digital dissemination and extension, enabling the development of multiple digital competences, while greatly benefiting teachers as well, helping their work with a catalogue of ideas relating to methodology and a digital repository of methodologies, all aimed at

(24) For more detail, click: https://dpmk.hu/
providing teachers with up-to-date ICT skills and knowledge. Such methodology aids are particularly important in VET, because many trainers have no qualifications in pedagogy (25), so for them the main challenges stem not from keeping up with progress in their own specific fields of expertise but finding the most efficient and effective ways of transferring their knowledge.

(25) Qualifications in pedagogy is a mandatory requirement in Hungary only for teachers of general subject.
CHAPTER 6.
Conclusion – main challenges and a future outlook

VET in Hungary is about to undergo historic changes. In line with the objectives set forth in the VET 4.0 Strategy the Government made a number of amendments to the VET Act in November 2019, creating thereby the regulatory background for the necessary changes. Effective communication of the benefits of the restructured VET system will be among the most important tasks for the coming months and the school year starting in September 2020.

Teachers working in the VET system will definitely face some radical changes. Now public employees, in the future they will be covered rules laid down in the Labour Code which may result in major increases in their earnings but will change the foundations of part of their work. An important change regarding VET as a whole is that the previous input regulation will be replaced with a system focusing more on the satisfaction of output requirements. This change will pose challenges to future trainers as well, because competitiveness will be a key consideration in VET.

The updated VET Act – together with its implementing decrees – spares no effort to promote cooperation between vocational training institutions and economic actors. All recent strategic and operational measures and actions have been geared towards this end. A significant upswing has been observed in dual training connections after the establishment of the VET Innovation Council and the Sector Skills Councils. VET Centres today regard the development of their dual relationships as a strategic goal, while more and more of the partner companies are planning and putting training shops in place so as to meet the Industry 4.0 challenges together with the students of their training partners.

Despite the challenges it is safe to conclude that vocational education and training is developing steadily in Hungary; it is capable of the desired renewal and successfully implements various elements of digitalisation in its operation.
## Abbreviations

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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CFRIC</td>
<td>common frame of reference for information communication</td>
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<td>DGYS</td>
<td>digital child protection strategy</td>
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<td>DJP</td>
<td>digital welfare program</td>
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<td>DOS</td>
<td>digital education strategy</td>
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<td>GINOP</td>
<td>Economic development and innovation operation programmes</td>
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<td>HUF</td>
<td>Hungarian Forint</td>
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<td>IT</td>
<td>Information technology</td>
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<td>KIR</td>
<td>information technology system of public education</td>
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<td>KRÉTA</td>
<td>Public Educational Registration and Study System</td>
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<td>MI Coalition</td>
<td>artificial intelligence coalition</td>
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<td>NIS</td>
<td>National Infocommunication Strategy</td>
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<td>NSZFH</td>
<td>national office for VET and adult earning</td>
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<td>PIAAC</td>
<td>Programme for the International Assessment of Adult Competencies</td>
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<td>SH</td>
<td>Hungary coordination and methodology center</td>
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<td>VET</td>
<td>vocational education and training</td>
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