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CZECH REPUBLIC
TREXIMA, spol. s. r. o. (PP01)
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COUNTRY REPORT: HOW ARE INDUSTRY 4.0 REQUIREMENTS IMPLEMENTED IN THE VOCATIONAL EDUCATION AN TRAINING SYSTEM OF THE CZECH REPUBLIC?

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Country Report

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Enter your country (and/or region):

Czech Republic

1. Sectors relevant for Industry 4.0

An overview of the sectors in which changes related to Industry 4.0 have been recorded or investigated in the Czech Republic. The classification corresponds to the CZ-NACE nomenclature.

A – AGRICULTURE, FORESTRY AND FISHING
01 Crop and animal production, hunting and related service activities

C – MANUFACTURING:
10 - Manufacture of food products
11 - Manufacture of beverages
19 - Manufacture of coke and refined petroleum products
20 - Manufacture of chemicals and chemical products
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations
22 - Manufacture of rubber and plastic products
24 - Manufacture of basic metals
25 - Manufacture of fabricated metal products, except machinery and equipment
27 - Manufacture of electrical equipment
28 - Manufacture of machinery and equipment n.e.c.
29 - Manufacture of motor vehicles, trailers and semi-trailers
30 - Manufacture of other transport equipment
33 - Repair and installation of machinery and equipment

D - ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY:
35 - Electricity, gas, steam and air conditioning supply

F – CONSTRUCTION:
41 - Construction of buildings
42 - Civil engineering
43 - Specialised construction activities

G - **WHOLESALE AND RETAIL TRADE:**
46 - Wholesale trade, except of motor vehicles and motorcycles
47 - Retail trade, except of motor vehicles and motorcycles

H - TRANSPORTATION AND STORAGE:
49 – Land transport
52 - Warehousing and support activities for transportation

J - INFORMATION AND COMMUNICATION: 58.21 - Publishing of computer games 62 - Computer programming, consultancy and related activities 63 - Information service activities **M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES:** 73 - Advertising and market research

2. VET system in the Czech Republic

Key parameters of vocational education and training

The VET model that best defines the VET system in the Czech Republic:

dual system or very similar	
predominantly school-oriented VET system	✓
predominantly employer-oriented VET system	
varies significantly between sectors	
Other [specify here]	

Provide an estimate of the approximate ratio between work-based learning and school-based learning in the VET system in the Czech Republic:

	C
Practice (work-based learning)	27 %*
School-based learning	73 %*
	100%

**Notes:*

1) *The work-based learning may or may not take place at company workplaces. It may also be in school workshops, laboratories, etc.*
2) *The share of work experience varies according to the categories of VET fields.*
   Three-year courses: 45 %
   Four-year matriculation courses category L (with extended WBL): 27 %
   Four-year matriculation courses category M: 10 %

Types of schools for secondary vocational education and training in the Czech Republic:

Secondary vocational education school

Vocational training in the following sectors:	Different sectors according to the fields of study offered by a particular school: technical, economic, health, teaching and other professions.

Ratio between in-company and school education	10/90 or 27/73 (according to field category)*
Initial or continuing education:	Initial education, supplementary further education.
EQF exit qualification level:	4
Entry requirements:	1. successful completion of elementary education, 2. fulfillment of conditions for admission by proving suitable abilities, knowledge, interests and medical fitness. The school may or may not set a school entrance examination for the admission procedure.
Additional information:	It provides mainly secondary education ending with a high school diploma. The duration of studies is usually 4 years. Graduates then enter the labour market or can continue their education at higher vocational schools or universities.

Notes:

**The work-based learning may or may not take place at company workplaces. It may also be in school workshops, laboratories, etc.*

The proportion of work experience varies by category of VET graduation:

4-year matriculation courses in category L (with extended work-based learning): ***27 %.***

Four-year matriculation courses in category M: ***10 %***

Secondary vocational training school

Vocational training in the following sectors:	Most often engineering and manufacturing, crafts of various orientations, gastronomy, hotel and tourism
Ratio between in-company and school education	45/55*
Initial or continuing education:	Initial education, supplementary further education.
EQF exit qualification level:	2 (for 2-year courses) 3 (for 3-year courses)
Entry requirements:	1. successful completion of elementary education, 2. fulfillment of conditions for admission by proving suitable abilities, knowledge, interests and medical fitness. The school may or may not set a school entrance examination for the admission procedure.
Additional information:	It mainly provides secondary education ending with a final examination (apprenticeship courses). The length of study is usually three years, less often two years. Graduates are awarded an apprenticeship or an apprenticeship certificate.

Notes:

**The work-based learning may or may not take place at company workplaces. It may also be in school workshops, laboratories, etc.*

Many schools include both vocational secondary schools and vocational secondary schools under one institution. Vocational secondary schools often provide a full range of courses: two-year, three-year and four-year. The distinction is rather based on tradition and educational institutions are not obliged to use them in their names.

Is vocational education and training regulated by law in your country?

Yes	✓
No	

If relevant, please provide details of the law(s) governing VET in your country. Which aspects of VET are regulated by legislation?

In the Czech Republic, there is no separate legal norm specifically for vocational education and training. Some aspects of VET are regulated by Act No. 561/2004 Coll. (the Education Act).

The Education Act provides:

- A two-stage system of VET programmes. VET Frameworks of different programmes are developed at the national level, defining the compulsory content, scope and conditions of education and training. They set the binding basis for the School Education Programmes, according to which specific vocational schools educate.
- Requirement that the VET Frameworks correspond to the latest knowledge of, inter alia, the scientific disciplines whose foundations and practical application education is supposed to convey (the method of fulfilling these requirements is not specified by law)
- The set of VET programmes must be discussed with the social partners, including employers and trade unions
- Obligation to discuss the Long-term Strategies for the Development of Education at national and regional level with the social partners
- Obligation of vocational schools to cooperate with employers in:
    - Designing the school curriculum
    - Designing a school development strategy
    - Providing practical training at employers' workplaces
    - Involvement of practitioners in teaching pupils
    - Participation of practitioners in matriculation examinations
    - Provision of adult education
    - Teacher internships in companies
    - Establishment of an Employer Advisory Council (not an obligation for the school, only an option)
- The possibility to carry out practical training with an employer if the company has signed an agreement with the school and if it carries out activities related to the field of education.
- Legal protection for pupils who have practical training with employers in terms of working hours, occupational safety and health and specific working conditions for women and adolescents.
- Rewards for so-called productive activities, paid by the school or employer if the productive activity is carried out by the pupils (30 % of the minimum wage)

Decree 13/2005 Coll. stipulates:

- Requirements of the contract between the school and the employer on the content, scope and conditions of practical training provided by the employer
- Number of pupils per company instructor

Competences needed for the Industry 4.0 work environment

Workers need specific competencies to succeed in an Industry 4.0 work environment. They can be divided into 4 basic groups: technical competences, data and IT competences, social and personal competences. In a comparative analysis of 26 studies and research reports, key competences relevant for Industry 4.0 were identified[1]. These are used in the following section as a basis for further questions. In the case of occupation-specific competences, the ESCO occupational classification can be used[2].

Technical competences are all skills that relate to basic and specialised knowledge in a particular discipline, sector or profession (e.g. process understanding, production system knowledge, process control, quality assurance).

Which specific technical competences related to your country have been identified as particularly relevant to Industry 4.0?

General technical competences (indicate the general technical competences relevant to all occupations).
Quality management Materials Professional documentation and records Planning and organisation Processes Machines and tools Technical, customer and user support Economics of the organisation
Occupation-specific technical competences
Checking parameter values of materials, intermediate products, final products and services Quality control of materials, intermediates, final products and services Measurement and subsequent evaluation of the obtained results Orientation in materials and their properties Assessment and selection of materials Reading and interpreting drawings and schematics Interpreting data in technical documentation Archiving and safe keeping of technical documentation Checking, identifying and correcting errors and inconsistencies in technical documentation Orientation in material and technical standards Compliance with technical imaging standards Receiving and transmitting technical documentation in accordance with organisational processes and standards Preparation of technical drawings and sketches Coordinating resources and planning Prioritising activities Process innovation Monitoring processes and systems

[1] Schmid (2017) What type of competencies will Industry 4.0 require?
[2] ESCO occupational classification.

Production chain management Preparation and operation of machines and tools Customer relationship analysis and management User documentation and individualisation User support

Data and IT competencies are all skills related to data collection, analysis and protection, as well as monitoring, use and maintenance of data systems (e.g. documentation, cloud computing, use of analytical and digital tools, programming, software development), artificial intelligence, 3D printing, IT support, UX design).

In relation to your country, which specific data and IT competencies have been identified as particularly relevant to Industry 4.0?

General data and IT competences (indicate general technical competences relevant to all professions).
Setup and maintenance of hardware and related equipment Using and interfacing specialized hardware Use of specialized programs, advanced databases and applications Evaluating data outputs Use of relevant computer, graphical and spreadsheet systems Recording data in technical documentation Graphic software Online communication and data presentation
Specific professional data and IT competences
Industrial robots and manipulators Industrial Internet of Things Modelling and simulation of manufacturing machines, processes and systems Remote device management Predictive analytics and maintenance Advanced Process Control (APC) Intelligent Networks Data management and analysis (Big data, Business Intelligence) Augmented Reality Virtual reality Digital twin Cybersecurity Artificial Intelligence Cloud computing UX analysis and design Building Information Management (BIM) Geographic Information Systems (GIS) 3D printing 3D scanning Automated storage

Autonomous warehouse vehicles (AGVs) Warehouse management system (WMS) Warehouse Control System (WCS) Autonomous driving and driving systems E-commerce On-line marketing

Social competences are all skills that relate to communication and collaboration activities (e.g. interdisciplinary and intercultural collaboration, translation and transfer competences, user-oriented engagement, motivation to innovate and perform).

In relation to your country, which specific social competences have been identified as particularly relevant to Industry 4.0?

General social competences (indicate the general social competences relevant to all occupations).
Effective communication Cooperation Planning and organisation of work Problem solving Customer orientation

Personal competencies are related to personal dispositions and abilities (e.g. willingness to continuously improve, lifelong learning; holistic, analytical and creative thinking; problem solving; self-learning, recognition of transferable skills; tolerance of ambiguity; flexibility).

In relation to your country, which specific personal competences have been identified as particularly relevant to Industry 4.0?

General personal competences (indicate the general personal competences relevant to all occupations).
Analytical thinking Conceptual thinking Lifelong learning Flexibility Creativity Stress and workload management Proactive approach Independence Performance

Labour market requirements

This section is dedicated to collecting content related to labour market requirements at country-specific level.

If relevant, what labour market requirements related to Industry 4.0 have been identified in **your country**?

Electromobility:
- Electric propulsion (traction batteries, fuel cells),
- Hybrid drives and accessories (e.g. heating).
- Infrastructure (distribution, charging stations, dynamic charging).
- Future mobility (digitalisation, connectivity, shared vehicles, autonomous driving).

Energy:
- Intelligent Measurement (AMM)
- Photovoltaics
- Digital sensors
- Digitisation of power grids
- Smart grids

Chemistry:
- Automation and robotics
- predictive analytics
- digitisation in the form of digital twins
- virtual reality
- 3D modelling
- Sensorics
- Nanotechnology
- new materials

Cybersecurity in ICT:
- Cybersecurity literacy
- Compliance in ICT
- Cybersecurity audit
- Risk analysis
- Business Impact Analysis

Gaming industry:
- PC game development technologies: software, virtual reality, artificial intelligence
- PC game animation, game design
- New business models.

Logistics:
- Automatic identification technologies
- Automation of production and warehouse logistics,
- Automation of transport and handling technology
- Technologies for worker and warehouse equipment
- Data, logistics IT support and IS
- Internet of Things in logistics

E-commerce and internet marketing:
- New ways of selling
- Digitalisation (price tags, 3D models)
- Marketing (personalisation, Big data and analytics, etc.)
- Automated communication with customers
- Technical solutions for e-shops

- Delivery logistics

Modern industrial/engineering production:
- Automation of production and non-production processes
- Robotics (robots and manipulators)
- Computer vision
- Digitalization, Big Data
- Internet of Things
- Virtual reality

Food processing:
- Digitization, automation, robotization of food production
- Special and new production processes
- Special foods for defined population groups
- New methods for the analysis of the composition of food raw materials
- Fully automated food warehouses (palletisation, product packaging)

Construction industry:
- Building Information Management (BIM)
- Additive manufacturing in the construction industry
- 3D scanning
- Geographical Information System (GIS)
- facility management
- digitisation of the construction management process

Agriculture
- GPS applications in agriculture
- Geographical Information System (GIS) applications
- Remote sensing
- Reflectivity measurement by sensors
- Drones and unmanned aerial vehicles

Equal opportunities

This section provides space for the issue of equal opportunities provision and the search for links between these topics and Industry 4.0.

If relevant, what types of programmes aimed at tackling inequalities in relation to Industry 4.0 have emerged in your country in the last 5-7 years? These are programmes addressing gender inequalities or addressing changing demographics (especially with regard to age).

Example No. 1	
Name of the programme:	Girl´s Day
Programme initiator/creator:	Gender Studies (in Czechia)
Which sector is the programme aimed at?	STEM

What kind of inequalities is the programme targeting?	Low representation of women in technical (STEM) fields.
How is the programme focused on Industry 4.0 or relevant competences?	Girls Day is an interactive open day for girls who have a unique chance to learn about a wide range of study fields and professions in areas such as IT, telecommunications and construction. Every year in April, the doors of technical universities, companies and research centres are opened to girls for one day. Girls Day takes place simultaneously in sixteen European countries with the aim of attracting girls to science and technology and inspiring them to choose promising fields that are still perceived as male-dominated. Girls Day can guide girls towards successful careers.
What are the results of the programme?	Girls Day in the Czech Republic encourages girls' interest in technical fields. Self-realization in promising fields is a guide to personal growth, information and digital literacy, motivation to study and a path to economic self-sufficiency. Girls Day breaks down stereotypes about unsuitable careers for girls and improves their prospects in a changing labour market. It also helps to address the current shortage of skilled labour. The event's partners in the Czech Republic are companies such as Škoda Auto and Vodafone. The 9th edition was organised in 2021 (this year in the form of an online event due to anti-epidemic restrictions).
Link to the website:	https://girlsday.cz/
Further information:	

Example No. 2	
Name of the programme:	IT is the future. Your future.
Programme initiator/creator:	Czechitas
Which sector is the programme aimed at?	ICT
What kind of inequalities is the programme targeting?	Low representation of women in ICT.
How is the programme focused on Industry 4.0 or relevant competences?	Czechitas is a Czech NGO that aims to educate and inspire women and children in IT and build a community interested in IT. By organizing various workshops and courses, the organization aims to increase gender diversity in the IT environment and offer an alternative to formal IT education in schools. The workshops teach interested women

	the basics of web development, programming, graphics and data analysis. They also organise IT events for children aged 8 to 18. In 2016, their work with the community was recognised by the European Union with the European Citizen Prize. In the same year, Google.org entrusted Czechitas as the first organization in Central and Eastern Europe with a grant to produce the first retraining course for women: the Digital Academy.
What are the results of the programme?	Programming courses for adults, with a focus on women: ● Programming in Java, C#, JavaScript or Python ● Web development (HTML/CSS, PHP, Bootstrap, Web responsiveness, Game development) ● Testing ● Digital Marketing ● Online security Events for kids: ● One-day workshops, weekend events, summer camps, IT summer school ● Regular programming clubs ● Home tutorials ● Workshops for teachers Career development and job placement assistance: ● Career workshops ● Career coaching ● Job offers at partner companies (Avast, Google, T-Mobile, Škoda Auto DigiLab, etc.) ● Job Fair Czechitas ● Overview of typical IT positions (videos, infographics) Since 2014, Czechitas has helped to employ hundreds of women in IT and has created a community of more than 18,000 people who want to help.
Link to the website:	www.czechitas.cz
Further information:	Absolventkám kurzů Czechitas rozesílá e-mailem pravidelné newslettery, kde najdou nabídky práce, novinky o kurzech i o trhu IT.

In addition to the examples of good practice mentioned above, which were created as a classic grassroots initiative, many local projects to promote equal opportunities are being implemented in the Czech Republic with financial support of European Social Fund. This may be support from the operational programmes of the Ministry of Labour and Social Affairs (these are mainly focused on equal opportunities on the labour market) or the Ministry of Education (these projects are mainly oriented towards equal access to education).

3. Actors involved in VET reform processes

Decision-making bodies

Rank the following decision-making bodies according to their level of responsibility in the processes of transferring Industry 4.0 competences to VET? (1 = most involved, x = not involved at all)

Ministry of Education	1
Ministry of Industry and Trade	x
Ministry of [specify remit]	x
School Councils	x
Trade Unions	x
Association of Employers	4
Labour Office	x
The Advisory Commission for...	x
Teachers' Association	x
Representation of students and pupils	x
VET providers - schools	2
VET providers - employers	3
Industry/economy (representatives)	5
Other [specify here]	x

Cooperation between different actors

What general and specific **strengths or achievements have** you identified through desk-research and stakeholder consultation in terms of cooperation and/or communication between the different actors involved in VET reform processes?

- At the local level, there are many examples of high-quality and long-term cooperation between vocational schools and employers.
- There is a growing awareness among employers of the need to work with vocational schools and to invest in the training of pupils

- The requirement to develop cooperation with employers in specific areas (see above) has been reinforced in existing school legislation. Headteachers are now under legislative pressure to develop local collaboration with employers.
- Tax incentives have been introduced for employers who invest in collaboration with vocational schools and provide practical training at their workplaces. Tax deductible items relate to the costs of company instructors, pupils and the technical equipment needed for on-site training.
- The project "Kompetence 4.0", which is examining new labour market requirements in 10 pilot sectors, has succeeded in involving experts from the National Institute of Education, who are taking suggestions for adjusting the set of programmes and their content.
- Although there is a lack of legislative support for the involvement of different actors at regional level, voluntary cooperation between actors in the regions (regional employment pacts) has started to develop in recent years.

Based on desk-research and stakeholder consultations, what general and specific **challenges or obstacles have** you identified in terms of cooperation or communication between the different actors involved in VET reform processes?

- The VET system in the Czech Republic is strongly school-oriented and the position of employers and other social partners is weak, especially at the national and regional level.
- The current school legislation does not address the management of the VET system with an appropriate role for social partners in modernising the structure and content of VET programmes.
- Projects to strengthen the position of employers in the VET system and to modernise courses are one-off (usually with ESF support), which has also been criticised by the OECD. The results of such projects are often positive but fail to be used for systemic reform of VET.
- Although the Education Act sets out certain requirements for employer involvement in the system at national level, these are often only formal procedures with insufficient time limits for making suggestions and comments.
- Social partners are involved late and insufficiently in national education development strategies. For example, they are not approached at the initiation stages of the strategies, when key challenges need to be identified. Social partners are often only approached after the basic parameters of the strategies have been defined and their influence on the redrafting of the documents is limited.
- Employers have so far been only minimally involved in the modernisation of VET programmes, mostly through individual participation in working groups, often dominated by representatives of vocational schools. This may lead to insufficient reflection of new labour market needs.

Based on desk research and stakeholder consultations, what **suggestions and/or recommendations have** you identified to improve cooperation and/or communication between the different actors involved in VET reform processes?

- It is necessary to find a solution for social partnership management of VET in the Czech Republic that will be long-term, sustainable and stable.
- It is necessary to set up a process of continuous reforms of VET so that it is constantly in line with developments in the labour market. A suitable solution would be to anchor the management of the VET system in the Czech Republic legislatively, either by amending the Education Act or as part of a completely new standard (the Vocational Education and Training Act).
- The position of the social partners in the Czech VET environment needs to be strengthened through a properly set-up management of the VET system in the Czech Republic.
- The VET management system with the partnership status of the social partners needs to be resolved at the national but also at the regional level so that local labour market needs can be better addressed in a subsidiary way.
- It is necessary to establish operational rules for the modernisation of the national standards of individual VET programmes, for example in the form of regular revisions (e.g. over a period of several years).
- Rules should be laid down for adequate involvement of the social partners with a stronger involvement of employers. This will ensure that the current revision properly reflects the changing needs of the labour market.
- Processes for initiating new VET programmes should be established.

4. Processes

This section focuses on the different processes used in shaping and adapting VET in the Czechia.

Revision and reform processes

By revision and reform processes we mainly mean processes related to the revision of existing VET programmes and their modifications, as well as processes related to the creation of new VET programmes.

Which actors in your sector are generally **driving innovation** (e.g. stimulating change and proposing VET reforms)? Please assign approximate percentages indicating the levels of involvement of different actors.

Ministry of Education	10 %
Ministry of Industry and Trade	10 %
Ministry of Employment and Social Affairs	10 %
School Councils	____ %
Trade Unions	____ %
Association of Employers	30 %
Labour Office	____ %
The Advisory Commission for...	____ %
Teachers' Association	____ %
Representation of students and pupils	____ %
VET providers - schools	10 %

VET providers - employers	10 %
Industry/economy (representatives)	20 %
Other [specify here]	____ %
	100%

What mechanisms are in place in Czechia to ensure that **existing VET programmes** are reviewed**?** Are reviews carried out regularly and at set intervals?

The mechanisms are set out generally in the Education Act as follows:

- National Frameworks of VET Programmes (RVPs) can be changed in serious cases (however, the reasons for changes are not specified in the law and are not elaborated)
- According to the law, the curriculum must correspond to the latest findings of the scientific disciplines whose foundations and practical application are supposed to be mediated, pedagogy and psychology in terms of methods and organisation of education with regard to the age and development of pupils.
- The development and review of the RVPs is carried out by the relevant ministries through experts in science and practice, including pedagogy and psychology.

There are no set intervals for the review of VET programmes. Programmes are reviewed on an ad hoc basis.

Secondary schools must adhere to the basic requirements set by the national standard of the specific program, but they have a relatively large scope to specify the curriculum and to target it to the requirements formulated by the cooperating employers. This allows in many cases a better transfer of the requirements of Labour market into VET without changing the content of the national standards.

Briefly describe the process of reviewing and revising **existing VET programmes in** Czechia. How are revisions considered, submitted, and implemented? How long do these processes tentatively take? Are the conditions set by law or other rules?.

The process of control and review:

- An organisation established by the Ministry of Education called the National Pedagogical Institute of the Czech Republic (NPI CR) is responsible for the organisation and actual implementation of programme revisions.
- The designated NPI expert will set up a working group to check the relevance of the existing VET programme.
- Where a need is identified, adjustments to the relevant framework curriculum are proposed and determined by the working group.
- The requirements for the composition (representativeness) of the working group are not defined. As a rule, the working group is composed of teachers from secondary vocational schools offering the relevant field and, depending on availability, representatives of employers, usually the proposer of the relevant change to the standard.

- The duration of the programme review itself is not specified. However, once the modernised programme is published, vocational schools have up to two years to incorporate the changes into their (school) curricula.
- The revised programme shall be discussed by the relevant ministries with the relevant central trade union bodies, the relevant employers' organisations with a national scope and the regions before being issued.
- The earliest the change will take effect is the start of the following school year (1st of September).
- Schools follow the Framework Curriculum from September the 1st, which is no later than 2 years after the date of its publication, with effect from the first year.

Briefly describe the process of introducing **new VET programmes** in your country. How long does this process (usually) take? Please list all relevant laws, regulations and stakeholders.

The process for initiating a new VET programme in the Czech Republic is not explicitly set out. It is not specified when and under what conditions the preparation and introduction of a new VET programme takes place.
The School Act specifies only the following parameters:

- Once every 4 years, a National Long-Term Plan for the Development of the Education System and Regional Long-Term Plans for the Development of the Education System are created
- The social partners, including trade unions and employers, are consulted on these documents
- The system of VET programmes shall be established by the Government by decree after consultation with trade unions, employers' organisations with national scope and regions.
- National Frameworks of VET programmes (RVPs) set out the specific objectives, forms, duration and compulsory content of general and vocational education according to the focus of a given field of education, its organisational structure, professional profile, conditions for the course and completion of education
- According to the law, the field of VET must correspond to the latest findings of the scientific disciplines whose foundations and practical application are to mediate education, pedagogy and psychology in terms of methods and organisation of education with regard to the age and development of pupils.
- An organisation established by the Ministry of Education, the National Pedagogical Institute of the Czech Republic (NPI CR), is responsible for the organisation and development of the programmes.
- The NPI expert in charge will set up a working group to develop the new Framework Curriculum.
- The requirements for the composition (representativeness) of the working group are not defined. As a rule, the working group is composed of teachers from secondary vocational schools offering the relevant field and, depending on availability, representatives of employers, usually the proposer of the relevant change to the standard.
- The relevant ministries will discuss the new programme with the relevant central trade union bodies, the relevant employers' organisations with a national scope and the regions before issuing them.
- There is no required timeline for the development of the new VET programme.
- The earliest the change will take effect is the start of the following school year (1 September).

- Schools follow the Framework Curriculum from 1 September, which is no later than 2 years after the date of its publication, with effect from the first year.

Responsibility of other ministries:

- National Frameworks of VET programmes (RVPs) are issued by the Ministry of Education in consultation with the relevant ministries. The RVPs for health field is issued in consultation with the Ministry of Health. RVPs aimed at preparing for the exercise of a regulated profession shall be issued after consultation with the relevant recognition body. RVPs for education in schools under the jurisdiction of the Ministry of Defence, the Ministry of the Interior and the Ministry of Justice shall be issued by these ministries in consultation with the Ministry of Education.

Which of the following aspects are taken **into account** in VET review and reform processes in general in Czechia?

Infrastructure	✓
Technology	✓
Availability of staff	✓
Competence of staff	✓
Job descriptions	✓
International classifications (e.g. ESCO, ISCO)	
Needs of VET providers	✓
Labour market needs	✓
Employee needs	
Pupils' needs	
Data exploration	✓
European trends	✓
International trends	
Local/regional/national policy	✓
Other [insert here]	

Which three of the above aspects are given **the most attention in the** processes of transferring the needs of the economy to VET in your country or sector?

Labour market needs
Competence of staff
Technology

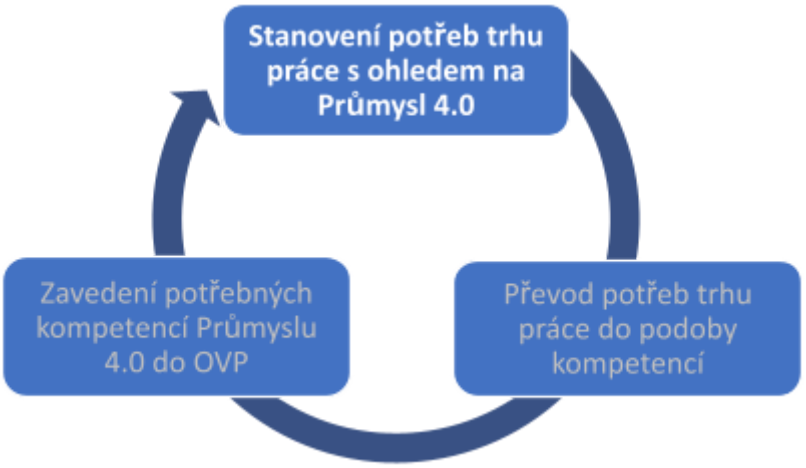
Which three of the above aspects are given **the least attention in** the processes of transferring the needs of the economy to VET in your country or sector?

International classifications (e.g. ESCO, ISCO)
Employee needs
International trends

What mechanisms are available to meet the **needs of VET providers, teachers and learners** and to listen to their demands? How are their perspectives translated into policy?

The Czech Republic has a school-based VET system. It follows that (vocational) schools are the most important link in the VET system in the Czech Republic. Secondary schools in the Czech Republic have a high degree of autonomy within which they can apply national Frameworks of VET programmes standards in the form of their own school standards.
Mechanisms for meeting the needs of VET providers, teachers and pupils and for listening to their demands are not directly enshrined in the Education Act (a key legislative norm). The main mechanisms are therefore the activities of the various associations and dialogue with them, for example in the design of education strategies.
Associations are an important element in meeting the needs of vocational schools. For example, the Czesha Union is an umbrella organisation for associations of different types of education providers (Association of Secondary Industrial Schools of the Czech Republic, Association of Business Academies, Association of Apprenticeship Institutions, etc.) and formulates the needs and requirements of VET providers, teachers and students in the form of opinions on draft laws or national strategies of the Czech Republic in the field of education, financing of education, etc.
Teachers' needs are mainly reflected by associations of teachers and education trade unions.
The needs of pupils are referred to in the Education Act. It states that secondary education develops knowledge, skills, abilities, attitudes and values acquired in primary education that are important for the personal development of the individual. It provides pupils with a broader general education or vocational education related to general education and strengthens their value orientation. Secondary education also creates the conditions for a full personal and civic life, independent acquisition of information and lifelong learning, continuation of further education and preparation for a profession or employment.

Mechanisms for identifying labour market needs with regard to Industry 4.0



Which of the following actors is mainly responsible for the mechanisms put in place to determine labour market needs in your country?

Ministry of Education	
Ministry of Industry and Trade	
Ministry of Labour and Social Affairs	✓
School Council	
Trade Unions	
Association of Employers	
Labour Office	
The Advisory Commission for...	
Teachers' Association	
Representation of students and pupils	
VET providers - schools	
VET providers - employers	
Industry/economy (representatives)	

What **general mechanisms** exist in your country to identify labour market needs?

Monitoring and evaluating the situation on the Czech labour market is part of the state employment policy as defined by Act 435/2004 Coll. (Employment Act).
This Act requires the Ministry of Labour and Social Affairs (MLSA) to prepare analyses and forecasts of labour market developments and to take measures to create balance between the resources and needs of the labour force in the Czech Republic.

The MLSA publishes an annual **analysis of the labour market situation in the Czech Republic**. The analysis is mainly quantitative. It maps the employment and unemployment situation in a given year according to various parameters (e.g. the structure of the unemployed, the structure of offered jobs, the situation in the regions, etc.). A deeper, qualitative analysis of supply and demand on the Czech labour market was carried out in 2016. It notes that one of the causes of the mismatch is the low or outdated qualifications of the unemployed, which do not match the requirements for the performance of the offered job. It also states that this mismatch is not being addressed due to the inflexible system of providing retraining through the Czech Employment Office. The report also notes that it is difficult to prepare candidates for technical jobs in particular with the help of retraining, which is often short-term. According to the report, the initial VET system provides better conditions for preparation for technical occupations.

The MSPV also maintains the National **Occupational Catalogue (NSP)** by law and is responsible for updating it in accordance with developments in the Czech labour market.

If relevant, what **specific mechanisms** have been used to identify labour market needs with respect to Industry 4.0 in your country?

The following projects and studies have been prepared in the Czech Republic to determine the needs of the labour market with regard to Industry 4.0.

Work 4.0 and the Work 4.0 Action Plan

In 2016, the Ministry of Labour and Social Affairs prepared a study called the Work 4.0 Initiative, which deals with the expected impact of digitalisation on the labour market. The study examines:

- the impact of technological change on labour demand
- trends affecting further education
- categories of persons at risk of technological change
- impacts of technological change on selected social aspects

A year later, the Work 4.0 Action Plan was created, which defined actions to meet the 4 strategic objectives:

- Regulating the impact of technological change on labour demand
- Support for further education
- Setting labour market conditions in the context of technological change
- Regulating the impact of technological change on selected social aspects

Most of the measures formulated in the Action Plan were aimed at the period 2017-2019, but as a rule, implementation was delayed or the proposed measures were not implemented at all.

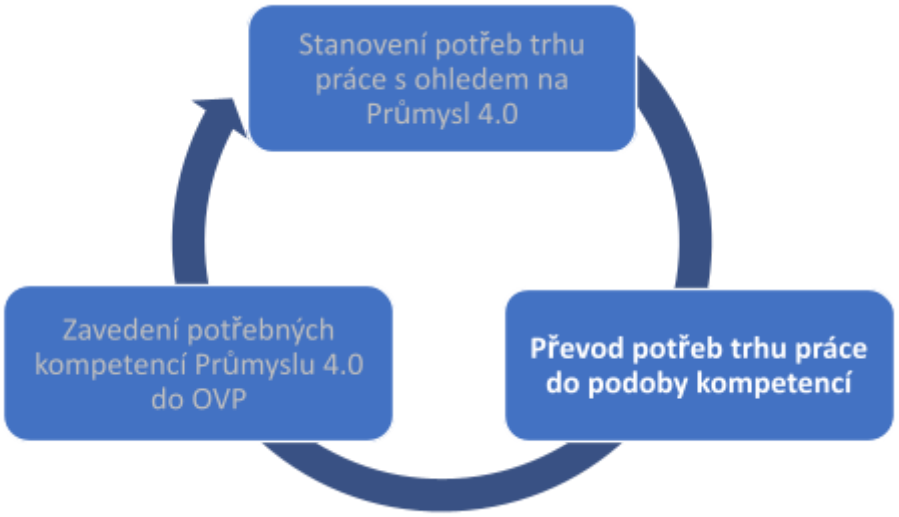
KOMPAS

The project „Labour Market Forecasting – KOMPAS“ (2017-2020) aimed to create a system of labour market forecasting and monitoring in the Czech Republic, which should reflect the significant impact of technological trends on the Czech labour market and take into account the specifics of regional development. The importance of this system in relation to Industry 4.0 should become apparent in the long term, when it will use data to demonstrate the transformation of the labour market under the influence of technology and make appropriate forecasts.

Kompetence 4.0

The project „Mapping future competences as part of systemic measures for defining labour market requirements (Kompetence 4.0) is aimed at setting up procedures for mapping future competences that respond to changing requirements with regard to Industry 4.0 technologies. The project sets up procedures for mapping and identifying new competences. It also carries out the mapping of new competences in ten pilot sectors. The project is described in detail as an example of good practice later in the study.

Processes for translating labour market needs into worker competences



Which of the following actors is mainly responsible for the processes of translating labour market needs into key competences for VET in your country?

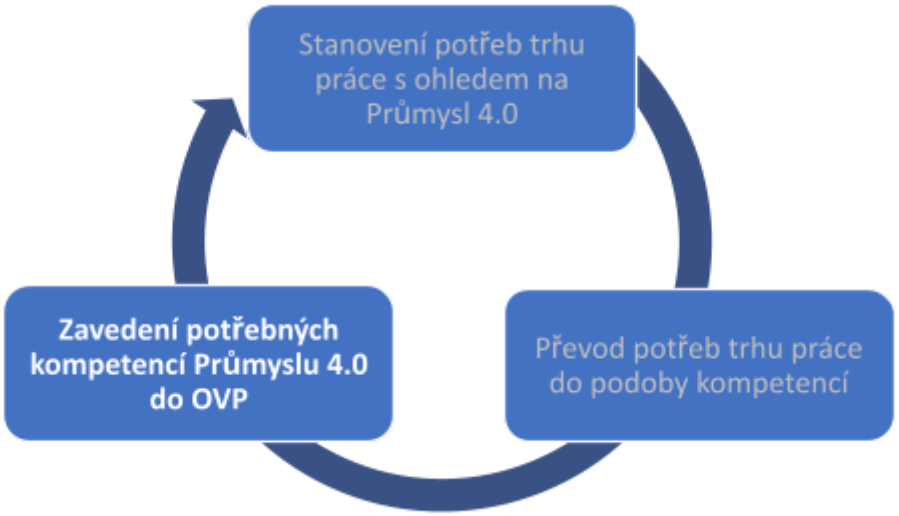
Ministry of Education	✓
Ministry of Industry and Trade	
Ministry of [specify remit]	
School Council	
Trade Unions	
Association of Employers	
Labour Office	
The Advisory Commission for...	
Teachers' Association	
Representation of students and pupils	
VET providers - schools	
VET providers - employers	
Industry/economy (representatives)	

What processes **generally regulate or organise the** "translation" of labour market needs into competences in your country?

The organisation of the "translation" of labour market needs into competences in the Czech Republic is mainly ensured through the administration and continuous modernisation of the National Occupational Catalogue (NSP) under the responsibility of the Ministry of Labour and Social Affairs. It currently contains 2 231 occupations, including various specialisations. The competences required for individual occupations are stored in the Central Competence Database (CDK) with almost 27,000 professional knowledge and skills, general skills, soft competences and digital competences.

The CDK forms a common competence base with another important catalogue: The National Qualifications Framework (NSK). It is a register of professional qualifications existing on the labour market in the Czech Republic. It enables candidates to obtain a nationally recognised certificate of their professional qualification. The certificate demonstrates the acquisition of professional competences that people have acquired informally, outside the system of formal school training. The composition of vocational qualifications in the NSK system can be used by vocational schools in structuring the school curricula of the VET courses offered.

Processes for implementing the competences needed for Industry 4.0 in VET



Which of the following actors are mainly responsible for the processes regulating or organising the implementation of key competences in VET in your country?

Ministry of Education	✓
Ministry of Industry and Trade	
Ministry of [specify remit]	
School Council	
Trade Unions	
Association of Employers	
Labour Office	
The Advisory Commission for...	
Teachers' Association	
Representation of students and pupils	
VET providers - schools	
VET providers - employers	

Industry/economy (representatives)	
Other [insert here]	

What processes **generally regulate or organise the** implementation of new competences in your country and in your specific sector(s)? How are competences usually transferred from policy to VET practice?

The Education Act requires that educational programmes (including VET programmes) should correspond to the latest knowledge of the scientific disciplines whose foundations and practical application education is intended to convey. The methods and organisation of education are then to be in line with the latest findings in pedagogy and psychology and adapted to the age and level of development of pupils.
However, the more specific procedures by which the new competences are implemented in the national standards are not specified.
New education policy requirements that are more general in nature (e.g. in mathematics, financial literacy or digital competences) appear across the board in the standards. In general, there is a greater emphasis on providing a broader educational base in order to make graduates more employable in the labour market and in civic life, including in the case of VET programmes.

If relevant, what **specific processes** have regulated or organised the implementation of the competences needed for Industry 4.0 in VET practice in your country? What technical, infrastructural and staffing arrangements were in place and who implemented these changes in VET institutions?

No specific processes have been established to regulate or organise the implementation of the competences needed for Industry 4.0 in vocational education and training in the Czech Republic. The modernisation of VET programmes and their addition of new content has taken place (see below), but attention has been paid to the new requirements of the fields, regardless of whether these were technologies typically associated with the Industry 4.0 phenomenon. However, it is clear that many of the newly added elements of education are indeed directly related to Industry 4.0.
The National Pedagogical Institute - an organisation established by the Ministry of Education of the Czech Republic - is responsible for the management and modernisation of the VET system. NPI experts organise revisions through consultations with experts in working groups, identify new subject requirements and evaluate the possibilities of their implementation.

5. Examples of good practice

This section is dedicated to collecting concrete examples of good practice from your country. We are interested in any good practices that you may already be aware of, as well as those that you have identified through desk research and stakeholder feedback. The examples are focused on the field of upper secondary education (ISCED level 3, equivalent to EQF level 3-4). They should include projects, initiatives and programmes that have already been put in place, as well as those that have been developed despite, or because of, the additional pressures caused by the Covid-19 pandemic.

Revision of existing VET training programmes

How specifically (if at all) have the new needs and demands of the labour market in the context of Industry 4.0 been reflected in changes to existing VET programmes over the last 5-7 years? Identify existing programmes that have been revised to meet the labour market requirements of Industry 4.0.

VET programmes in the field in ecology and environmental protection

Title of the VET programme:	Ecology and environment Industrial ecology
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	Ecology and environmental protection
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	Reinforcing the curriculum with new knowledge in ecology and new production technologies: ● energy and its impact on the environment ● environmentally friendly technological alternatives in industry and agriculture.
What makes this project/initiative an example of good practice?	Upgrading the sector's programmes with new technologies in terms of their environmental impact
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education:

	https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field in information technology

Title of the VET programme:	**Information Technology**
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	**ICT**
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	A **cyber security element** is incorporated: ● Cybersecurity principles ● Dangers in cyberspace ● Hardware and software resources for setting up cyber security ● Cybersecurity standards
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the fields in Mining and Mining geology, Metallurgy and Foundry

Title of the VET programme:	Geotechnics; Metallurgist operator; Model equipment technician; Metallurgist; Model maker; Foundryman

Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	**Mining and mining geology, metallurgy and foundry**
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	• 2D and 3D graphic software • 3D modelling • 3D printing • simulation technology programs • basics of CNC machine tools and robotic workplaces programming • aerial photogrammetry (only for Geotechnics)
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field of engineering

Title of the VET programme:	Mechanical engineering; Mechanical engineer; Toolmaker; Locksmith; Metalworker; Blacksmith; Fine mechanic; Machinist; Road machinery machinist; Gunsmith; Gunsmith technician; Machine and equipment mechanic; Adjuster mechanic; Aeronautical mechanic; Optician;
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	**Engineering**

What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	Elements have been added in all branches of secondary vocational education falling under the field of engineering: ● 3D printing ● 3D scanning ● working with programs for 2D drawings ● working with 3D modelling programs ● robotization, automation and digitalization of engineering production
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field of electrical engineering and telecommunications

Title of the VET programme:	Electrical engineering; Electrician; Electrical mechanic for equipment and apparatus; Coupling mechanic; Electrical mechanic;
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	**Electrical engineering and telecommunications**

What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	Electrician: • intelligent wiring • security systems • photovoltaic sources Electrical mechanic for equipment and instruments: • PC-based measuring systems • remote measurement of electrical and non-electrical quantities • photovoltaic sources • automation technology • programmable logic automaton • fluid technology • industrial robots • industrial networks • sensors of non-electrical quantities Coupling mechanic: • data transmissions • technology and data networking • analog signal sampling • quantization and coding Electrical mechanic: • photovoltaic sources • PLC automats Electrical Engineering: • principles of fixed and mobile data networking • data transmission technology • data network services • signal digitization
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate

	these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field of chemistry

Title of the VET programme:	Applied Chemistry
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	**Chemistry**
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	• Automation - the basics of robotics
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field of Textile and clothing industries

Title of the VET programme:	Textiles; Clothing technician; Clothing industry; Textile manufacturer; Tailor
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic

What sector does the example represent?	Textile production and clothing
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	• graphic programs for garment design and modelling • assembly of cutting positions using PC • producing outputs from graphic software (e.g. work with printer and plotter) • automation and automation elements in textile production • automated equipment and production lines • application programs for creating technical documentation
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field of Leather and footwear industry

Title of the VET programme:	Manufacture of leather, plastics and rubber; Manufacturer of leather goods
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	Leather and footwear production
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	• Product modelling and drawing in CAD • Application software for creating technical drawings and technical documentation

	• Application software for pattern construction • Modelling of footwear using computer technology
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field of Wood processing industries

Title of the VET programme:	Woodworking and furniture production operator; Furniture and wood production; Carpenter; Upholsterer
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	Wood processing
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	• automated and computer-controlled production equipment
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national

	standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field of construction, geodesy and cartography

Title of the VET programme:	For the large number of VET programmes in this area, the relevant programmes are listed under each new element
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	Construction, geodesy and cartography
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	The chimney sweep: ● 2D and 3D imaging software Carpenter: ● Displaying carpentry structures using programming applications ● preparation of simple project documentation in CAD Waterman: ● digital documents in the field of hydrology, erosion risk of land, land registry Building materials: ● Building Information Management (BIM) method ● BIM information model ● BIM supporting software Technical equipment of buildings: ● BIM supporting software ● BIM method ● BIM information model ● IFC data exchange format Geodesy and cadastre:

	• Automatic data processing in 2D and 3D • SW supporting BIM • Geoinformatics • total station (working with data) • Global Navigation Satellite Systems (working with data) Construction: • BIM method • BIM information model • BIM graphic programs
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field of Gastronomy, hotel and tourism industries

Title of the VET programme:	Chef-waiter; Gastronomy; Hospitality; Tourism;
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	Gastronomy, hotel and tourism
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	Chef-waiter: • communication with the customer (web, online) • cash register and information systems for recording sales

	Gastronomy: • working with office equipment, electronic templates and templates for documents Hospitality: • information technology and reservation systems in accommodation • information technology in the search and provision of information in tourism services • cashier systems • electronic records of sales • communication systems for operation and production • online distribution channels • social networks and support services • online marketing and online communication • creation of websites and mobile applications • online check-in • online concierge and service promotion Tourism: • Social media and ways of communicating tourism through social media
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education:

	https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

VET programmes in the field of Arts and applied arts

Title of the VET programme:	For the large number of VET programmes in this area, the relevant programmes are listed under each new element.
Initiator/creator of the revised programme:	National Pedagogical Institute of the Czech Republic
What sector does the example represent?	Art and Applied Art
What new elements have been added to the programme with regard to Industry 4.0 or relevant competences?	Artistic blacksmith and locksmith, pimp; Artistic carpenter and carver; Goldsmith and jeweller; Artistic ceramist; Fiber artist and make-up artist; Artistic plasterer; Artistic gilder; Artistic glazier; Artistic engraver: ● 2D software (technical drawing and design) Antiquarian: ● 2D software (photo editing, export and work with presentation software) Arts and crafts textile processing: ● 2D software (design) ● Specific application programs ● Presentation programmes Arts and crafts stone and ceramic processing; Arts and crafts glass processing; Arts and crafts construction of musical instruments: ● 2D and 3D software (designing shapes, creating visualizations in 3D) ● Presentation programmes Arts and crafts metalworking; Arts and crafts woodworking: ● 2D and 3D software (designing and constructing, designing shapes, creating visualizations in 3D) ● Presentation programmes Applied painting: ● graphic software ● visual software for creating custom graphics Applied photography and media: ● digital photography and image recording,

	• 2D and 3D graphics (working with sound, video and animation) Stage and exhibition design; Industrial design; Metal and precious stone art; Toy and game making; Model making and design of footwear and fashion accessories; Wood carving; Interior design; Ceramic and porcelain art; Glass and light object art; Jewellery making and patterning; Stone carving; Arts and crafts organ building: • 2D and 3D software, • reproduction using CNC equipment or 3D printing (designing and constructing, designing shapes, creating visualizations in 3D) • presentation programs Multimedia production: • graphic programs for 2D and 3D graphics, digital photography, animation • programs for combining text, image, sound, animation or film data • digital models and spatial visualisations Model making and clothing design; Textile art: • 2D or 3D software • specific application programs • presentation programs Conservation and restoration: • 2D or 3D software for solving art tasks • programs for operating equipment and machines
What makes this project/initiative an example of good practice?	All VET programmes in the sector have been upgraded with the newly required elements.
What is the transfer potential of the revisions made?	All secondary vocational schools in the Czech Republic that offer these VET programmes will be required to incorporate the new elements into their curriculum.
What results have been achieved or what are the recommendations of the review?	In 2020, the relevant national standard(s) was upgraded. Vocational schools will incorporate these elements into their curriculum as a result of adding them to the national standards for these programmes from September 2022 at the latest.
Link to the website with more information:	Full text of the current standards for secondary vocational education:

	https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcove-vzdelavaci-programy-stredniho-odborneho-vzdelavani-rvp-sov/

New VET training programmes

Which new VET programmes with a particular focus on Industry 4.0 have emerged in the last 5-7 years?

No new VET programmes were created during this period. A systemic review of the system of secondary education (apprenticeship) is currently underway, based on the priorities set out in the National Education Policy Strategy 2030. However, at the time of the preparation of this Report, it was not clear whether new VET programmes would be initiated on the basis of this review.

Other projects and initiatives

What VET projects or initiatives have taken place in your country at national, regional and/or sectoral level?

These are examples of good practice focused on:

- Identification of competences relevant to Industry 4.0 (possibly with a focus on specific sectors),
- analysis of the new labour market requirements with regard to Industry 4.0,
- providing guidance on how to implement relevant Industry 4.0 competences in VET.

Describe examples of good practice (projects, initiatives, etc.) that you are aware of or have identified in desk research and stakeholder consultations.

EXAMPLE No. 1: KOMPETENCE 4.0

Name of (project, initiative):	Mapping future competences as part of systemic measures for defining labour market requirements (Kompetence 4.0)
Initiator/Creator:	Ministry of Labour and Social Affairs of the Czech Republic
What sectors does the example represent?	Electromobility; Energy; Chemicals; ICT; Creative Industries; Logistics; Retail with a focus on e-commerce and internet marketing; Modern Industrial/Engineering; Food; Construction.
What topics or subject areas does the example cover?	Identification of new competences related to new technologies. New competency model (testing the "competence pyramid" model) Possibilities of transferring the newly identified competences to vocational training through competence pyramids.

	Cooperation between employers and vocational schools at local level.
What makes this project/initiative an example of good practice?	In the case of the Czech Republic, this is the first attempt to systematically identify new trends, technologies and resulting new competences in selected sectors. The newly identified competences are evaluated, sorted and classified according to their nature into the corresponding levels of the competence pyramid. The competence pyramid model contains different types of competencies (soft skills, general education competencies, cross-cutting workplace competencies, professional sector competencies, competencies required for employment in different sub-sectors, managerial competencies). Each tier of the pyramid consists of different thematic blocks. Within the blocks, the clusters of competences and the competences themselves are listed. The competence pyramid model is internationally transferable. The project also includes piloting various forms of cooperation between employers and vocational schools in 4 regions of the Czech Republic. Representatives of the National Pedagogical Institute (NPI) also have access to the interim results. The NPI can use the findings for a possible revision of the VET programs and for its modernisation. Individual vocational schools can use the findings to adapt their school curricula. The Ministry of Labour of the Czech Republic can use the newly defined competences for the modernisation of the national catalogue of occupations.
How does it reflect Industry 4.0 or related competences?	The name of the initiative already implies that it focuses primarily on competences arising in the context of Industry 4.0 technologies. In each of the sectors studied, key new trends and technologies are first analysed. It examines which of these are already in common use and which have the potential to change the sector in the future. The trends and technologies already applied are then further specified. It identifies for which jobs employers require relevant competences, at which qualification level. The relevant competences are specifically defined. Various methods are used for this identification (desk research, in-depth interviews with experts and expert group work). Each of the 10 groups consists of an average of 13 members, representing mainly employers, academia and research.
What results have been achieved?	The project runs from 2019-2022. The results are ongoing and the project outputs are still being worked on. Planned project outcomes:

	- 10 sectoral competency pyramids - 20 occupational profiles (2 per sector) that can be used by the state for new/upgraded VET programs - 10 new competency cards that will help to modernise the Czech national occupational catalogue - A developed methodology that defines the activities of the working groups, the methods used, the rules for the production of sub-outputs (e.g. monitoring of new competences or rules for the implementation of the competence pyramids) and the possibilities for cooperation between vocational schools and employers at local level. - Pilot partnerships between enterprises and vocational schools at local level, testing different possibilities of cooperation.
Link to website with more information	https://www.mpsv.cz/kompetence

EXAMPLE No. 2: COMPETENCES FOR AUTOMATION AND ROBOTIZATION IN THE PILSEN REGION

Name of (project, initiative):	Competences for automation and robotization
Initiator/Creator:	Employment Pact of the Pilsen Region
What sectors does the example represent?	Electrical engineering, mechanical engineering, ICT
What topics or subject areas does the example cover?	Automation Robotization Cooperation between companies and vocational schools Regional dialogue between enterprises and vocational schools
What makes this project/initiative an example of good practice?	It is a regional initiative in the Pilsen region. The Regional Employment Pact of the Pilsen Region initiated a debate between vocational schools and employers. The aim of the initiative is to agree on the need and possibilities of changes in education for automation and robotics.
How does it reflect Industry 4.0 or related competences?	The initiative responds to the accelerating process of automation and robotization in companies and seeks to transfer these requirements to vocational education and training in schools in the Pilsen region. The initiative facilitates dialogue between companies and vocational schools in the following areas: - Introduction of a new field specialisation "robotics" at school level

	- Innovation of school curricula for related apprenticeships (mechanic, adjuster, electrician) - Innovation of other school curricula in the field of soft and general competences - Cooperation between schools and companies The initiative started with a survey among companies in the region to gauge interest in cooperation in specific areas. In the next phase, the initiators gathered companies' needs for new competences and skills, incorporated them into a general competence model, and identified relevant training programmes. In the next step, the competences are synthesised according to their links to the identified training programmes of vocational schools in the region. The final step is to innovate the VET programs of specific schools to reflect the proposed competence models. The next step is to set up specific forms of cooperation between vocational schools and companies.
What results have been achieved?	A questionnaire survey was conducted among employers in the region. Structured interviews were conducted with representatives of 14 major employers from the Pilsen region on the following topics: advanced technologies used in production - job positions working with these technologies - main work activities of these positions - necessary knowledge, skills and competences for these work activities. On the basis of the survey, a comprehensive summary of the issue was prepared for the Department of Education, Youth and Sport of the Regional Authority of the Pilsen Region as a basis for the decision on further coordinated action and specific reflection of the labour market needs in the field of education. A meeting was held with the Regional Office of the Pilsen Region and the directors of the relevant vocational schools, where a consensus was reached on adjusting the sectoral structure and updating the school curricula of key subjects. Thus, from the school year 2022/23, electrical engineering, IT and mechatronics VET programs will be opened in more schools and the capacity of these fields will be expanded in schools that already teach these fields. The school curricula will be updated for all subjects. In addition, an extension course focusing on CNC programming and a new specialisation "Data analyst" will be opened.
Link to website with more information	https://www.pzpk.cz/aktuality/obory-pro-automatizaci-a-robotiku/
Additional information:	The Employment Pact of the Pilsen Region is a platform supporting the cooperation of institutions, businesses and other entities dealing with employment, education and the labour market in the Pilsen Region.

	The Pact is based on the agreement of partners to share data, information, knowledge and experience related to the labour market in the Pilsen Region. It creates a space for partners to exchange information and cooperate in solving regional labour market problems. Employment pacts have been established for several years in individual regions of the Czech Republic as effective tools for the development and implementation of employment strategies. In the Pilsen Region, the Employment Pact was established in 2016 and started its activities at the beginning of 2018 with the financial support of the Pilsen Region.

6. Conclusions

In this chapter you can summarize the knowledge you have gained in the description process. They can provide you with an overview of the way in which Industry 4.0 requirements are implemented in the VET system in your country, as well as support the further development of recommendations that could improve transfer and implementation processes.

In terms of the effectiveness of the conditions and processes described, what works really well (e.g. cooperation between actors) and why?

In the current Czech VET system, local cooperation between specific enterprises and specific vocational schools works best. There are many examples of excellent cooperation between companies and schools, working to mutual satisfaction and to the benefit of the very good professional employability of graduates of these schools. There is ongoing communication between the two actors on new qualification needs of the company, to which the school can respond flexibly. The company provides in-company training for pupils at company workplaces. There are company instructors who are dedicated to the pupils. The enterprise invests in the equipment of its own workplaces for pupils and in school equipment. Where possible, the enterprise provides internships and the necessary information to teachers of vocational subjects to keep them in touch with developments in the field. They also cooperate in the field of career guidance. In turn, the schools meet the needs of local employers and implement new qualification requirements in the school curricula. Although vocational schools have to comply with the requirements of the national qualification frameworks for the different VET programs, they have a certain degree of freedom and flexibility. Active vocational schools are as accommodating as possible to employers and cooperate with them in many different ways. In practice, the new statutory requirement for cooperation between vocational schools and employers in the forms laid down in the Education Act has proved very useful.

Furthermore, cooperation between labour market and vocational education actors at regional level is gradually improving. This is despite the fact that there are no legislative requirements for regional cooperation in VET. The improvement of regional dialogue is linked to the development of voluntary regional initiatives, the so-called Regional Employment Pacts. Employment Pacts act as platforms to promote cooperation between institutions, businesses and other actors involved in employment, education and the labour market. The pacts are based on the partners' agreement to share data, information and experience and their willingness to work together to address regional labour market challenges.

In terms of the effectiveness of the conditions and processes described, what do you think could be improved and how?

There is significant potential for improving conditions and processes at national and regional level in the Czech Republic. The key challenge is to change the perception of the state as a central actor in the VET system into a partner in the process, on an equal footing with the social partners (especially employers and trade unions) and the regions. This partnership principle should be adequately reflected in the relevant legislation. If this is not done, the OECD comments on the Czech VET system from 2010 will remain valid. The OECD criticises that the position of the Czech social partners in the VET system is weak and should be strengthened. Sub-projects aimed at changing processes to strengthen social partners have generally been funded as ESF projects. In many cases, the recommendations were not reflected in the proposed changes after the end of the projects. Therefore, the most appropriate solution seems to be to enshrine the partnership

principle in law. Provisions could cover, for example, the definition of the role of the social partners in the quality management of VET, the requirement to ensure that VET programmes are in line with labour market needs, the relevant processes for programme revisions and the creation of new fields, and the bodies for managing the system at national and regional level (e.g. in the form of Councils). Employers need to be involved more widely and systematically in the modernisation of the VET system and its content than is currently the case (individual participation in working groups). The review of programmes should take place on a regular basis, for example after a set period of time since the approval of the previous version of the relevant programme.

Another problem in the CR is that employers and other social partners are not invited from the outset to initial discussions on strategic needs and priorities when work on major national education strategies is launched. The consequence is that the strategies do not sufficiently reflect the challenges of VET from a labour market perspective and address the issue almost exclusively from the perspective of the state and educators. Employers are often given the opportunity to comment on documents only after they have been elaborated in detail, with little space to prepare comments and make major revisions.

Conditions and processes also need to be improved at regional level. Similar to the national level, regional practices need to be introduced in school legislation (e.g. in the form of Regional VET Councils). It is important to note here that about three quarters of vocational schools are established by regional authorities. The role of regional governments in the VET system is therefore important. It is therefore essential to introduce the principle of partnership dialogue also at regional level.

Have you encountered any aspects that are not sufficiently taken into account when implementing changes in VET?

The VET system in the Czech Republic should respond to 2 key changes in the labour market related to Industry 4.0.

Accelerating change
New trends and technologies are emerging and being introduced at an ever faster pace. This brings with it a higher dynamics of new requirements for workers' competences. However, there is no requirement in the Czech VET system to check VET programs whether they still meet sectoral requirements. The absence of such a revision increases the risk that the National Standards for VET programs will become outdated. Currently, the revision of VET programmes is not systematically approached. A process should be introduced in legislation to ensure that VET programmes are in line with developments in the labour market. A possible solution is, for example, to set a maximum period of validity for an approved national standard, after which the validity of the program must be checked and, if necessary, upgraded. Similarly, procedures for initiating new VET programs and phasing out outdated programs should be established.

Multidisciplinary qualification requirements
The new competency requirements for workers that are emerging in the context of Industry 4.0 have one common feature. They often occur at the boundaries of traditional disciplines. The narrow division of VET programs in the Czech Republic cannot easily respond to this demand. For example, in the Czech Republic, VET programs are divided into many separate categories (e.g. separate mechanical engineering and separate electrical engineering). As a result of this division, it is difficult (if at all) to "construct" a standard for a program that is multidisciplinary. A solution

would be to simplify the structure of the discipline groups, which would allow for easier preparation of modularly appropriate programs.

What existing changes did you identify and how difficult was it to implement them?

A relatively large package of changes to existing VET programs was implemented by the National Institute of Education (NPI) and the Ministry of Education between 2018 and 2020. All additions are listed above in the Report. However, this revision did not reflect much on the requirements for general digital competences. At the same time, no new VET programs have been published in recent years. For vocational schools, the publication of the revised standards means that they have to adapt their curricula by September 2022 at the latest. Thus, it will take up to 4 years from the start of work on the revisions to the change in the teaching of first year students.
Further new changes (revisions, new programs) can be reflected in the VET thanks to the cooperation between the NPI and the implementers of the „Kompetence 4.0“ project. The time needed to implement the new requirements is difficult to estimate, especially in the case of completely new VET programs.
As mentioned above, the most complex changes needed are related to the paradigm shift from a school-based VET system to a model of partners led VET system. Such changes require political will to reform VET, and their implementation is always very complex and with uncertain outcomes.