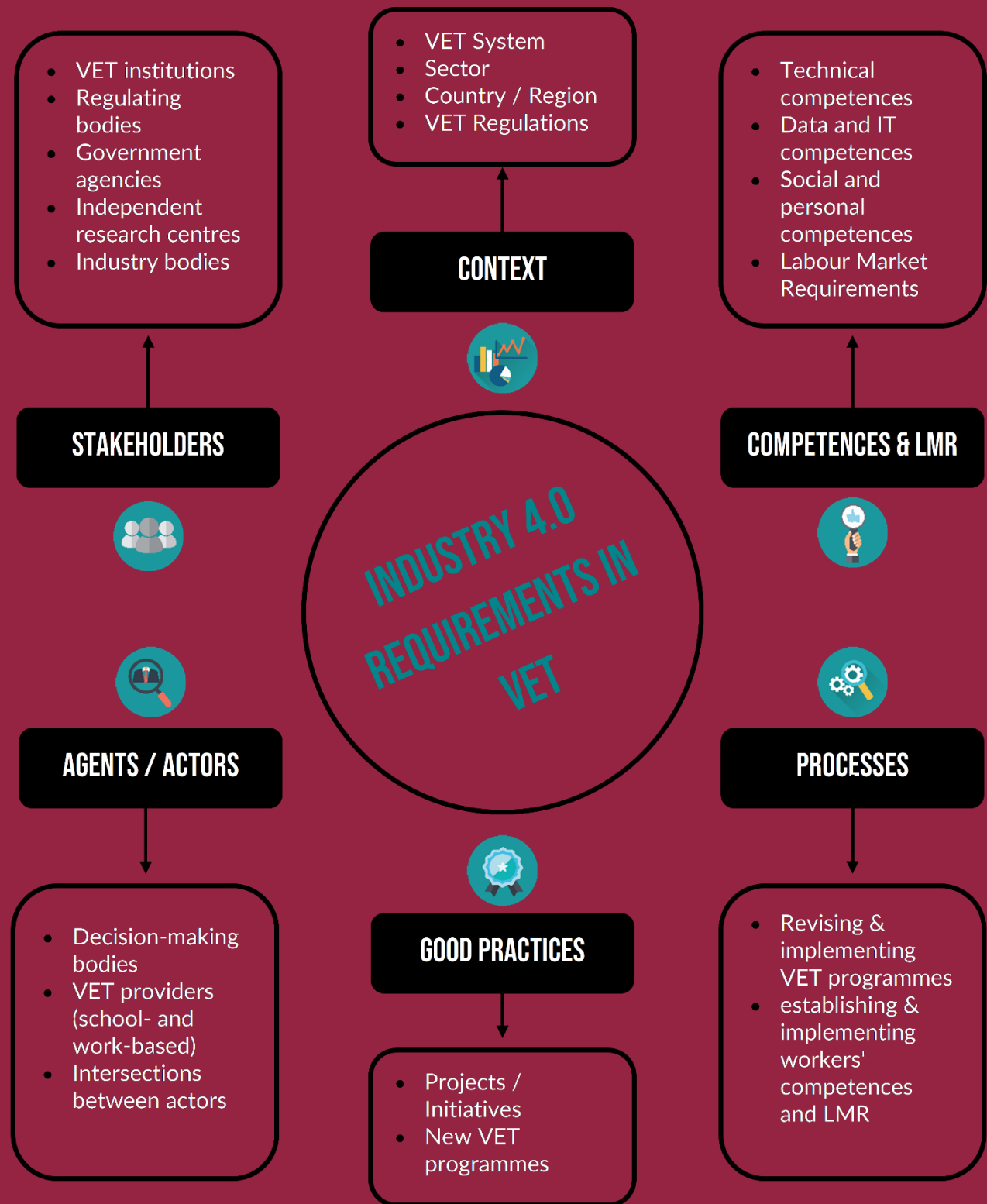# WRITING A COUNTRY REPORT

HOW ARE INDUSTRY 4.0 REQUIREMENTS IMPLEMENTED IN THE VOCATIONAL EDUCATION AND TRAINING SYSTEM OF YOUR REGION AND/OR COUNTRY?

This document is supposed to **guide** you through the process of **collecting the relevant information** to answer this question.

INDUSTRY 4.0 REQUIREMENTS IN VET

STAKEHOLDERS
- VET institutions
- Regulating bodies
- Government agencies
- Independent research centres
- Industry bodies

CONTEXT
- VET System
- Sector
- Country / Region
- VET Regulations

COMPETENCES & LMR
- Technical competences
- Data and IT competences
- Social and personal competences
- Labour Market Requirements

AGENTS / ACTORS
- Decision-making bodies
- VET providers (school- and work-based)
- Intersections between actors

GOOD PRACTICES
- Projects / Initiatives
- New VET programmes

PROCESSES
- Revising & implementing VET programmes
- establishing & implementing workers' competences and LMR

Inhalt

Instructions on how to prepare a Country Report

EDU4future International Methodology

1   Introduction

The current situation created by the Covid-19 pandemic has exacerbated some of the challenges industry is facing and is accelerating the need to align industrial practices with the fourth industrial revolution: Industry 4.0. In this context, the training of qualified professionals is vital to effectively support the transformation processes. The transfer of new competences into effective training programmes is a complex process in which different countries can learn a lot from each other through exchange. These processes are often difficult to grasp and different in each country. This International Methodology seeks to capture relevant aspects that are involved in these processes in different countries to enable a comparative analysis of approaches, initiatives and solutions. Based on the gained insights, meaningful recommendations will be formulated.

This document was produced as part of the Edu4Future project, which aims to answer the overarching question: How are Industry 4.0 requirements implemented in different European Vocational Education and Training systems?

To adequately answer this question, taking into account the multitude of perspectives and actors in the VET system, we need to capture the insights and contributions of stakeholders. This input needs to be collected in a structured way so that a meaningful comparative analysis of the material can be performed. EDU4future has opted for the creation of Country Reports to ensure the comparability of the data collected and has developed an international methodology (as outlined in this document) to facilitate this process. The instructions provided in this document will guide you through the development of a Country Report for your country, region and/or sector.

The Country Report created will be mostly descriptive and its main value is that it is comparable to other Country Reports. However, some useful conclusions can be generated from a preliminary analysis of the data you collected for your Country Report. This document will provide some guiding questions that will help you come up with some conclusions and/or first recommendations. This could include the identification of strengths and weaknesses as well as comparisons of good practices across different sectors.

2   Considerations for creating your Country Report

Country Reports will cover a variety of subjects that need to be considered when describing the processes for implementing Industry 4.0 relevant competences in VET in your country. These should cover processes and approaches that were already in place, as well as those that have been instantiated despite, or precisely because of, the added pressures caused by the Covid-19 pandemic. We identified the topics most suitable for comparison and to be included in the Country Reports. In order to adequately cover the contents, you can resort to two main ways of getting the information required: desk research and stakeholder feedback. Of course, your own expertise will also feed into the content creation.

2.1   Desk research

To find pertinent and accurate content that can be included in your Country Report, we recommend that you primarily refer to the following publications for your research:

- industry (body) publications or statements;
- local, regional and national government publications or statements;
- local, regional and national regulatory body publications or statements; and
- independent research publications.

These sources can also help you identify potential stakeholders that you may want to consult for further details (i.e. stakeholder feedback).

In these documents you should be able to find many of the answers to the questions posed in chapter 3 and develop the content of the Country Report. Please make sure you also acknowledge these sources and provide links for further reading (e.g. in the form of footnotes).

2.2   Stakeholder feedback

With your desk research, you will already be able to answer many of the questions posed in Chapter 3 (i.e. cover key content areas of your Country Report). However, some processes and stakeholder involvements may not be all that transparent; you may not find the necessary documentation freely available. As we need to take into account the input of different stakeholders when preparing a Country Report, you will also need to approach stakeholders directly to gain reliable insights into the processes we want to investigate.

2.2.1   Stakeholders you may have to involve

Your Country Report should include and represent as many perspectives as possible. Some details you may not be able to (dis)cover by your desk research; this is where consultations with stakeholders come in. You may already have established networks and connections to relevant stakeholders that you can easily contact; others you may identify in your desk research. Relevant stakeholders can include regional or national representatives, such as:

- representatives of school-based VET (private and public VET institutions);
- education providers other than VET (e.g. education department at university);
- representatives of work-based VET (businesses owners);
- social partners (trade unions, employer associations);
- regulating authorities or bodies (e.g. Chambers of Commerce; School / VET regulatory bodies);
- government agencies, offices and advisory councils (e.g. state agencies for education and entrepreneurship support; Ministries of Labour, Industries and Trade or similar; Labour offices);

- other potentially relevant institutions (Digital Innovation Hubs, technology parks, independent research centres);
- industry bodies and industry representatives.

2.2.2 Different ways these stakeholders can be involved

There are different ways you can capture the perspectives of relevant stakeholders and it is mostly up to you to decide which approach is most suitable and appropriate. Their active feedback can be gathered in the form of:

- in-depth interviews (via the phone or video-conference, email or face-to-face);
- questionnaires (there are many free questionnaire generators available online);
- focus groups (involve multiple stakeholders in a group discussion to confront different perspectives).

3 Contents to be covered in your Country Report

The entire chapter 3 can be used as a template to create a Country Report; you can simply fill in the responses to all questions in this Word document. Add as much detail as you wish; of course, we would prefer that you keep to the general structure provided in this document. Feel free to add any comments and clarifications as needed to elaborate your response.

The Country Report will collect general information related to your country and/or region as well as more specific information related to a particular sector or sectors.

Please identify the author(s) and association of this Country Report:

Please identify your country (and/or region):

The document serves as a guide for authoring reports, which can be of two types: a) Country (or regional) report across sectors or b) Sector report, which analyses 1 selected sector or sub-sector in more depth.

In the case of the Country Report, select all the sectors which, based on your findings, have the greatest impact on the technologies associated with Industry 4.0 in your country and to which VET should respond or is already responding as a matter of priority. When processing a sector report, select exactly 1 sector.

Please identify your applicable industry sector(s) by providing the NACE (Nomenclature of Economic Activities) Code(s). For details please check: https://nacev2.com/en:

| [INSERT NACE CODE 1] | [INSERT NACE CODE 2] | [INSERT NACE CODE 3] | [INSERT NACE CODE …] |

In the rest of the document you can add additional columns and answer options to provide sector-specific responses. Please see the example below:

	C	B8.1	B8.9	B9.1
dual system or very similar	O	x	O	x
mostly school-based	O	O	x	O
mostly work-based	O	O	O	O
differs greatly between sectors	x	O	O	O
differs greatly between occupations	x	O	O	O
other [insert here]	O	O	O	O

Figure 1: Example of Table Column Descriptors

3.1   Covering some basic information

This section will give you the opportunity to provide basic information related to some of the topics we will delve into later.

3.1.1   VET System in [INSERT YOUR COUNTRY]

Which of these options best describe the VET system in your country (C) and specific to your sector(s) [INSERT applicable NACE code(s)]?

	C	[NACE]	[NACE]
dual system or very similar	O	O	O
mostly school-based	O	O	O
mostly work-based	O	O	O
differs greatly between sectors	O	O	O
differs greatly between occupations	O	O	O
other [insert here]	O	O	O

Please provide an estimate on the approximate ratio between work- and school-based learning in the VET system of your country generally and your sector (if applicable).

	C	[NACE]	[NACE]
work-based learning	____ %	____ %	____ %
school-based learning	____ %	____ %	____ %
	100%	100%	100%

Which types of vocational schools exist to train workers in the industry sector in your country? Please provide detailed information for each type of vocational school in the following table (please copy and paste the table for further entries).

Training for occupation of following NACE sector(s):	
Ratio between work- and school-based learning:	
Initial or further education:	
EQF Level of school-leaving qualification:	
Entry requirements:	
Additional information:	

Is VET regulated by law in your country?

yes	O
no	O

If applicable, provide details regarding the law(s) in place to regulate VET in your country and/or sector(s). Which aspects of VET are regulated?

3.1.2   Workers' competences needed for the Industry 4.0 work environment

Workers need particular competences to succeed in the Industry 4.0 work environment. It is useful to organise competences into four overarching competency levels: technical skills, data and IT skills, social competence and personal skills. In a comparative analysis of 26 studies and research reports key competences of relevance for Industry 4.0 were identified[1]. These are used in the following section as a basis for the questions. Regarding the occupation-specific competences, you can use the ESCO[2] classification of occupations for support.

Technical competences are all those skills that relate to basic and specialist knowledge from a particular discipline, sector or job profile (e.g. understanding of processes, production system knowledge, process management, quality assurance).

Related to your sector(s), which specific technical competences have been identified as particularly relevant to Industry 4.0?

General technical competences (please identify general technical competences, relevant to all occupations).
Occupation-specific technical competences (please clearly identify these in relation to specific occupational profiles).

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[1] For more, see Schmid (2017) What type of competencies will Industry 4.0 require?
[2] ESCO classification of occupations.

Data and IT competences are all types of knowledge and skills that relate to data collection, analysis and protection as well as the monitoring, usage and maintenance of data-based systems (e.g. documentation, cloud-computing, use of analysis and digital tools, programming, software development, artificial intelligence, 3D printing, IT support, user experience design).

Related to your sector(s), which specific data and IT competences have been identified as particularly relevant to Industry 4.0?

General Data and IT competences (please identify general technical competences, relevant to all occupations).
Occupation-specific Data and IT competences (please clearly identify these in relation to specific occupational profiles).

Social competences are all those skills that relate to communication and collaboration activities (e.g. interdisciplinary and intercultural collaboration, translation and transfer competences, user oriented engagement, motivate innovation and performance).

Related to your sector(s), which specific social competences have been identified as particularly relevant to Industry 4.0?

General social competences (please identify general social competences, relevant to all occupations).

Occupation-specific social competences (please clearly identify these in relation to specific occupational profiles).

Personal competences are all types of knowledge and skills related to personal dispositions and capacities (e.g. willingness for continuous improvement and lifelong learning; holistic, analytical and creative thinking; problem-solving; self-guided learning, recognition of transferable skills; tolerance of ambiguity; flexible).

Related to your sector(s), which specific personal competences have been identified as particularly relevant to Industry 4.0?

General personal competences (please identify general personal competences, relevant to all occupations).
Occupation-specific personal competences (please clearly identify these in relation to specific occupational profiles).

3.1.3   Labour market requirements

This section is dedicated to collecting content related to labour market requirements on a general (European or even global) and country-specific or regional level.

If applicable, what labour market requirements related to Industry 4.0 have generally been identified **in your country / region**?

What specific labour market requirements related to Industry 4.0 have been identified **in your sector(s)**?

3.1.4 Fair opportunities

This section provides space for descriptions of changes and/or trends in the labour market regarding the provision of fair opportunities and their relevance for Industry 4.0.

If applicable, which types of programmes have there been in the last 5-7 years that deal with the gender gap or changing demographics (particular focus on age) in relation to Industry 4.0?

Name of the programme:	
Initiator/creator of the programme:	
Which sector does the programme come from?	
How does it address Industry 4.0 or relevant competences?	
Transfer potential of the GP:	
What are the results achieved by or recommendations of this programme?	
Link (website, where to find more information):	
Additional information:	

3.2 Actors involved in VET reform processes

3.2.1 Decision-making bodies

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

ministry of education	
ministry of economy	
ministry of …	
school board	
trade unions	
employer associations	
agency of labour / employment office	
advisory board of …	
teacher associations	

student representation	
VET providers (school-based)	
VET providers (work-based)	
industry (representatives)	
other [insert here]	

3.2.2   Cooperation between different actors

In your desk research and exchange with stakeholders, which general and specific **strengths or achievements** have been identified in terms of collaboration and/or communication between the different actors involved in VET reform processes?

In your desk research and exchange with stakeholders, which general and specific **challenges or barriers** have been identified in terms of collaboration and/or communication between the different actors involved in VET reform processes?

In your desk research and exchange with stakeholders, what **suggestions and/or recommendations** were identified with the aim of improving collaboration and/or communication between the different actors involved in VET reform processes?

3.3 Processes

This section focusses on the various processes involved in the (re)shaping of the VET sector across your country / region more generally as well as your particular sector(s).

3.3.1 Revision and reform processes

Under revision and reform processes we mainly understand the processes involved in revising existing VET programmes and reforming it with new VET programmes.

In your sector, which actors are generally the drivers of innovation (e.g. instigating change and making proposals for VET reforms)? Please assign the approximate percentages to show the different levels of contribution from the various actors.

ministry of education	_____ %
ministry of economy	_____ %
ministry of …	_____ %
school board	_____ %
trade unions	_____ %
employer associations	_____ %
agency of labour / employment office	_____ %
advisory board of …	_____ %
teacher associations	_____ %
student representation	_____ %
VET providers (school based)	_____ %
VET providers (work based)	_____ %
industry (representatives)	_____ %
other [insert here]	_____ %
	100%

What mechanisms are in place to ensure the revision of existing VET programmes in your country? Do revisions take place regularly and at specified intervals?

Briefly describe the review and revision process of existing VET programmes in your country. In which way(s) are adjustments brought forward, considered, implemented? How long can these process(es) take? Are the conditions set for it in the law or by-laws? Feel free to visualise this process in a flow chart.

Briefly describe the introduction process of new VET programmes in your country. How long does this process (usually) take? Please include any relevant laws, regulations and stakeholders. Feel free to visualise this process in a flow chart.

Which of the following aspects are taken into consideration in the revision and reform processes of the VET sector in your country / region generally and your sector(s) more specifically?

	C	[NACE]	[NACE]
infrastructure	O	O	O
technology	O	O	O
staff availability	O	O	O
staff competences	O	O	O
wording of job descriptions	O	O	O
European standards (e.g. ESCO, ISCO….)	O	O	O
VET provider needs	O	O	O
industry / labour market needs	O	O	O
staff needs	O	O	O
student needs	O	O	O

|			
evidence-based research	O	O	O
European trends	O	O	O
international trends	O	O	O
local / regional / national politics	O	O	O
other [insert here]	O	O	O

Which three of the above mentioned aspects receive the **most attention** in the transfer processes in your country or sector(s)?

Which three of the above mentioned aspects receive the **least attention** in the transfer processes in your country or sector(s)?

What mechanisms are in place to ensure the **needs of VET providers, teachers and students** are met and their voices are heard? How are their perspectives translated to policy?

3.3.2 Mechanisms for establishing labour market needs with regard to Industry 4.0
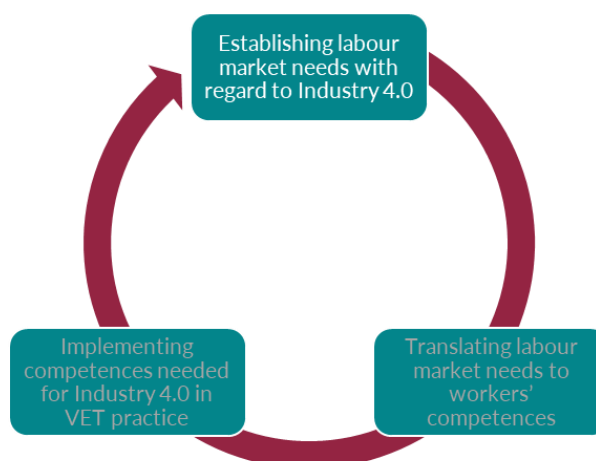
Which of the following actors are predominantly responsible for the mechanisms in place to establish labour market needs in your country and in your specific sector(s)?

	C	[NACE]	[NACE]
ministry of education	O	O	O
ministry of economy	O	O	O
ministry of …	O	O	O
school board	O	O	O
trade unions	O	O	O
employer associations	O	O	O
agency of labour / employment office	O	O	O
advisory board of …	O	O	O
teacher associations	O	O	O
student representation	O	O	O
VET providers (school-based)	O	O	O
VET providers (work-based)	O	O	O
industry (representatives)	O	O	O

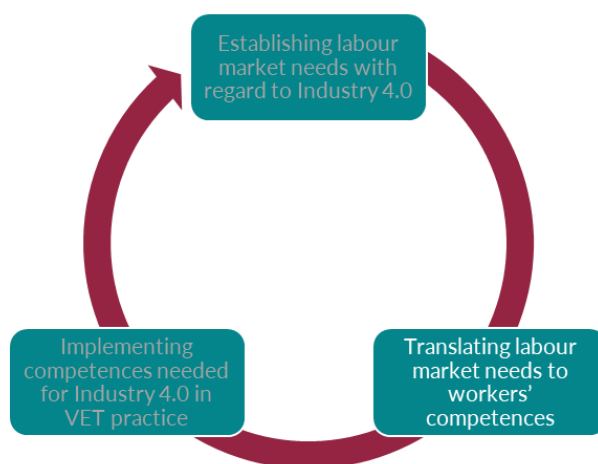What general mechanisms are in place to establish labour market needs in your country and in your specific sector(s)?

If applicable, which specific mechanisms were used to establish labour market needs with regard to Industry in 4.0 in your country and in your specific sector(s)?

3.3.3 Processes for translating labour market needs to workers' competences
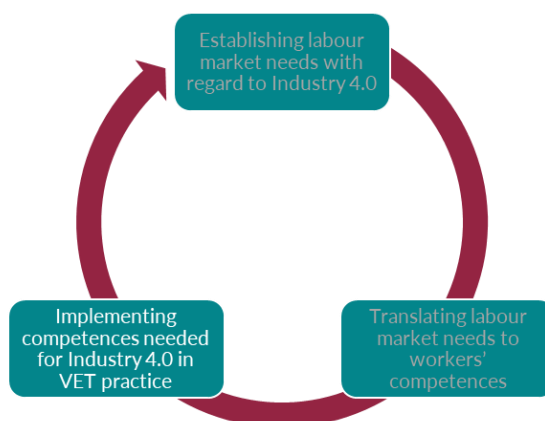

Which of the following actors are predominantly responsible for translating labour market needs to key competences in VET practice of your country and your specific sector(s)?

	C	[NACE]	[NACE]
ministry of education	O	O	O
ministry of economy	O	O	O
ministry of …	O	O	O
school board	O	O	O
trade unions	O	O	O
employer associations	O	O	O
agency of labour / employment office	O	O	O
advisory board of …	O	O	O
teacher associations	O	O	O
student representation	O	O	O
VET providers (school-based)	O	O	O
VET providers (work-based)	O	O	O
industry (representatives)	O	O	O

What processes **generally regulate or organise** the translation of labour market needs to competences in your country and in your specific sector(s)?

3.3.4 Processes for implementing competences needed for Industry 4.0 in VET practice

Which of the following actors are predominantly responsible for the processes regulating or organising the implementation of key competences in VET practice of your country and your specific sector(s)?

	C	[NACE]	[NACE]
ministry of education	O	O	O
ministry of economy	O	O	O
ministry of …	O	O	O
school board	O	O	O
trade unions	O	O	O
employer associations	O	O	O
agency of labour / employment office	O	O	O
advisory board of …	O	O	O
teacher associations	O	O	O
student representation	O	O	O
VET providers (school based)	O	O	O
VET providers (work based)	O	O	O
industry (representatives)	O	O	O
other [insert here]	O	O	O

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?

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If applicable, which specific processes regulated or organised the implementation of competences needed for Industry 4.0 in VET practice of your country and your specific sector(s)? What technical, infrastructural and personnel measures were provided and by whom to implement these changes at VET institutions?

3.4   Examples of good practice (GP)

This section is dedicated to the collection of specific examples from your region and/or country. We are interested in any good practice that you may already know as well as the ones you have identified in your desk research and feedback from stakeholders; with a particular focus on upper secondary education (ISCED level 3, equivalent to EQF level 3-4) programmes. These should cover projects, initiatives and programmes that were already in place, as well as those that have been instantiated despite, or precisely because of, the added pressures caused by the Covid-19 pandemic.

3.4.1   Revisions of existing VET programmes

How specifically (if at all) did the new labour market needs and requirements of Industry 4.0 translate into changes to existing VET programs in the last 5-7 years? Please identify existing programmes that have been revised to accommodate Industry 4.0 labour market requirements. Please copy and paste the table for additional entries.

Name of the VET programme:	
Initiator/creator of the revised programme:	
Which sector does the programme come from?	
What new elements have been added to this programme that address Industry 4.0 or relevant competences?	
What makes this initiative a GP?	
Transfer potential of the undertaken revisions:	
What are the results achieved by or recommendations of this programme?	
Link (website, where to find more information):	
Additional information:	

3.4.2   New VET programmes

Which new VET programs with a particular focus on Industry 4.0 have emerged in the last 5-7 years in your country? Please copy and paste the table for additional entries.

Name of the VET programme:	
Initiator/creator of the new programme:	
Which sector does the programme come from?	

How does it address Industry 4.0 or relevant competences?	
What makes this programme a GP?	
Transfer potential of the GP:	
What are the results achieved by or recommendations of this programme?	
Link (website, where to find more information):	
Additional information:	

3.4.3   Other Projects / Initiatives

What projects or initiatives have taken place in the country aimed at the VET sector at national, regional and/or sectoral level, which for example:

- identify competences relevant to Industry 4.0 (perhaps with a focus on a particular sector),
- analyse new labour market requirements with regard to Industry 4.0,
- provide instructions on how to implement Industry 4.0 relevant competences in VET teaching.

Which GP (projects, initiatives or similar) are you perhaps already aware of or have you identified in your desk research and exchange with stakeholders? Please copy and paste the table for additional entries.

Name of the GP:	
Initiator/creator of the GP:	
Which sector does the GP come from?	
Which general topics or topic areas does this good practice cover?	
What makes this initiative a GP?	
How does it address Industry 4.0 or relevant competences?	
Transfer potential of the GP:	
What are the results achieved by or recommendations of this GP?	
Link (website, where to find more information):	
Additional information:	

3.5   Conclusion

You can use this chapter to reflect on some of the insights you have gained in the description process. These could give you an overview of the way Industry 4.0 requirements are implemented in your country's VET system and can support the development of recommendations that could improve transfer and implementation processes.

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

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

Did you come across any aspects that are not sufficiently taken into consideration when changes in the VET sector are implemented (see 3.3.1)?

Which existing changes have you identified and how difficult was their implementation (see 3.3.1)?

Glossary

Augmented Reality (AR): System able to superimpose some additional elements on the visual reality (attributes, explanations, schemes, internal elements not visible). It can be managed in the simplest way using the smartphone/tablet camera, but usually it requires the use of special glasses. Since this is a technique based on user experience, the quality of devices and software are essential for the diffusion of technology. (Source: t2i Glossary)

Competence: Ability to apply learning outcomes adequately in a defined context (education, work, personal or professional development).

or

Ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. (Source: Cedefop Terminology of European Education and Training Policy)

Country Report: Document that collects key data and country-specific information based on a common methodology. These can then be compared and evaluated to describe how labour market requirements are translated to VET in a given country.

Industry 4.0 refers to the fourth industrial revolution; the first industrial revolution was the arrival of the steam engine in the 1700s, the second industrial revolution was the invention of electricity and Fordism (which enabled mass production), the third was the appearance of media and computers. This most recent industrial revolution describes the current phase of transformation of industrial processes, with a strong digitization of production processes and services, the introduction of interconnected sensors, the internet of things, intelligent machines (robots), artificial vision and autonomous driving systems together with new additive manufacturing technologies, augmented reality and virtual reality. This fourth revolution is called "4.0" following the revision-numbering model used in the software to emphasize its digital nature. (Source: t2i Glossary)

Internet Of Things (IoT): Literally "internet of things" refers to the connection to the internet of devices other than computers, tablets, smartphones, smart TVs such as: appliances, light bulbs, thermostats, sensors, cameras, air conditioners, cars, street lamps, or any electronic device. In this way the device will be accessible from the network and can communicate autonomously with other devices. To have IoT, a "thing" connected to the internet should have: (a) an IP address, (b) a processor capable of handling communications. The term has a certain overlap with the concept of M2M, which, however, is understood as a set of intermediate level industrial protocols, as is the case with smart meters for example. (Source: t2i Glossary)

The Industrial IoT (IIoT): is a subclass of the IoT that focuses on the particular needs of industrial applications such as manufacturing, the oil sector, utilities. Although they share the same technologies (sensors, cloud, connectivity, analytics), industrial applications have demanding requirements that can be summarized in the following ten criteria: security, interoperability, scalability, precision and accuracy, programmability, low latency, reliability, resilience, automation, maintenance. (Source: t2i Glossary)

Knowledge: Ability to apply knowledge and use know-how to complete tasks and solve problems. (Source: Cedefop Terminology of European Education and Training Policy)

Robot: Mechanical systems endowed with manipulative abilities (mechanical arms, systems for taking objects) and in some cases with walking ability (wheels or mechanical limbs for movement). The most advanced robotic technologies are equipped with artificial vision systems capable of recognizing

objects and possibly taking/manipulating them autonomously according to non-predefined patterns. There are wide differences in models: humanoid robots (such as the famous Japanese Pepper robot, IIT's Italian R1 or social robots), domestic robots (such as the vacuum cleaner robot), drones, logistics robots (such as Amazon's Kivas and similar wheeled cargo robots that now frequent hospitals), robot animals, robot exoskeletons and limbs, combat megabots four meters high, industrial robots (collaborative robots). (Source: t2i Glossary)

Skills: Ability to apply knowledge and use know-how to complete tasks and solve problems. (Source: Cedefop Terminology of European Education and Training Policy)

Stakeholder: Person or organization that has an interest in, can influence, be influenced by, or perceive itself as influenced by a decision or activity. Examples: customers, owners, people of an organization, suppliers, bankers, legislative authorities, trade unions, partners or communities that may include competitors or opposing pressure groups. (Source: t2i Glossary)

Vocational Education and Training (VET): Education and training which aims to equip people with and training (VET) knowledge, know-how, skills and/or competences required in particular occupations or more broadly on the labour market. (Source: Cedefop Terminology of European Education and Training Policy)

Virtual Reality (VR): Highly immersive visual simulation of artificially generated environments and scenarios through screens or special wraparound glasses. In the most advanced versions, in addition to sounds, it can include tactile sensations and mechanical feedback thanks to special interactive ergonomic devices. Unlike augmented reality which adds synthetic elements to real ones, in virtual reality the stimuli of the real world are completely replaced by artificial ones. (Source: t2i Glossary)