



Blueprint “New Skills Agenda Steel”: Industry-driven sustainable European Steel Skills Agenda and Strategy (ESSA)

Sector Skill Framework

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1. Introduction

The present report summarizes the research carried out in the context of the WP4 of the ESSA project, VET Requirements and Regulations / National VET Systems (relevant requirements and regulations for the Blueprint), and provides insights and recommendations based on the findings.

The research conducted aimed at the following objectives:

- a) understating the functioning of VET systems in 5 European countries (in particular, concerning VET provision that could serve the steel industry), identified for their specific institutional layout, organisation and type of skill formation system (D4.1 - Identification of National VET Qualification and Skills Frameworks for Steel);
- b) reviewing the main EU frameworks and tools related to vocational education and training and the state of the art of the implementation of these in the identified countries (D4.2 - Analysis of cross-European VET frameworks and standards for sector skills recognition);
- c) designing a sectoral skills matrix through which matching the industry job profiles with the formal qualifications offered in the national VET systems (D4.3 & D4.4 - Sector Skill-Set Matrix).

More specifically, the objective of this deliverable is to outline the state of play and strategy recommendations regarding the necessary actions needed to overcome the gaps and deficits within the current and future VET provision.

The report is organized into two sections. The first provides a brief overview of the organisation and functioning of the 5 VET systems and of the relevant qualifications related to the steel industry. The second section describes the key findings of the research and some insights that can be useful in the development of the Blueprint strategy (WP5).

A grounded strategy and recommendation for a sustainable steel industry should consider the following drivers as premises:

a) Technological innovation and transformation of work

Cedefop's European Skills and Jobs Survey data (see paragraph 2.1.3, D4.1) show that the share of adult employees who experienced changes in the technologies used in the workplace between 2010 and 2014 (EU-28) was about 49% in the manufacturing sector and about 40% in transportation and storage. The highest share was, as expected in the professional and scientific services and in ICT (respectively 51% and 57%).

In terms of occupation, in the same period¹:

- 55% of European electrical and electronic trades worker experienced some change
- 50% of stationary plant or machine operators
- 46% of metal, machinery and related trades workers
- 40% of assemblers
- 36% of drivers or mobile plant operators

¹ Cedefop, European Skills and Jobs Survey (ESJS).

- 32% of labourers in mining, construction, manufacturing (building, crafts or related trade)

A significant part of these changes is likely to be ascribed to the introduction of new digital technologies. Nevertheless, it has been stated that workers' resilience in moving to a digital economy doesn't rely solely on good digital skills, but on a mix of cognitive soft skills such as problem-solving, creativity, learning to learn, communication, collaboration etc. (Cedefop 2018). This is a significant insight which has also been confirmed by the first round of exploratory interviews. Hence, the relevance of soft and transversal skills must be underlined in the updating of existing VET curricula or in the introduction of new ones.

The document "Skills Forecast: key EU trends to 2030" estimates a growth of about 6% in terms of jobs openings for a total number of 151.337.000 by 2030. The large majority (about 91%) of future job openings will be due to replacement needs, while only 9% of future jobs will be created ex novo. The highest demand will be for business and administration professionals (about 8% of the total openings), sales workers (about 6%) and cleaners and helpers (about 6%). 80% of new job openings will be related to high-skill occupations.

Most of the new jobs will be created for legal, social, cultural and business & administration associate professionals, consistently with the shift towards a business services economy.

As regards the primary sector and manufacturing, on the other hand, it is estimated a negative turnover of the workforce that will affect mostly low-skilled occupations. Cedefop forecasts that 46% and 43% of the future job openings by 2030 will require respectively medium qualifications and higher qualifications, while only 11% of future jobs will be suitable for workers with lower qualifications.

The document "Metal & machinery workers: skills opportunities and challenges (2016)" reports that within the context of EU28, the employment level in the sector has decreased of about 10% between 2005 and 2015, and is expected to further decrease by the same rate in the following decade. Nevertheless, about 2 million jobs are expected to be opened by 2025, mainly due to replacement of old workforce. As regards specifically metal and machinery workers, Cedefop's European Skills and Jobs Survey identifies as key skills for the workers in the sector job-specific skills, problem-solving, teamwork, learning and communication.

b) Industry challenges and macro-economic scenario

Economic, digital and technological developments, and increasing environmental concerns, are engaging the European Steel Industry with many challenges. Global overcapacity and unfair trade practices are creating additional challenges. Thus, the road ahead for the European steel sector clearly shows the need for a fast introduction of innovative technologies while ensuring the competitiveness of the sector (Estep 2017).

The European Steel Industry has experienced in the last few years dumping from China and other countries, as well as protectionist measures from countries such as the US. As stated in Eurofer annual report (2019), the imposition of the US "section 232" measures had a detrimental impact on global steel trade, causing EU imports to rise sharply, up to 2.5 million tonnes from March to December 2018.

As for dumping, between 2010 and 2013 imports from China and Taiwan grew by 70% and their market share in the EU increased by 64%.

The issue of long-term sustainability requires new industrial strategies. Drawing on comparative data between developed and developing economies, Allwood (2016) estimated a saturation

for national steel markets at about 12 tonnes of steel per person: “once we have enough vehicles, infrastructure and buildings we cannot use more, so our requirement for steel is then to replace these 12 tonnes every 35-40 years” (Ivi, p. 3). The future strategy proposed by Allwood to relaunch the industry is to invest and rely more on steel recycling in order to meet the environmental regulations (thanks to a less energy-intensive process) and to transform the scrap into higher-value products (might be both intermediate or final goods).

As maintained by Allwood (*Ibidem*), innovation in steel production has mostly focused in the last decades on new alloys, rather than on steel recycling. More careful sorting of the components of products at the end of their life and the application of new technologies can help to overcome the issue of alloy mixing, allowing companies to produce high-quality steel directly from scrap. Furthermore, considering the low prices of steel scrap, this can be stockpiled at very low cost and used to feed future upcycling.

c) Workers' mobility

The survey conducted in 2018 by the DG for Employment Social Affairs and Inclusion (2019b), shows that intra-EU mobility is still increasing but at a slower pace than before. In 2017, there were 12.4 million of working age (20-64 years) EU-28 movers in the EU, compared to 11,8 million in 2016.

Germany, United Kingdom, Italy, France and Spain host 74% of all movers, while Romanian, Polish, Portuguese, Italian and Bulgarian nationals made up over 50% of EU-28 movers.

Annual inflows of EU-28 movers to other Member States in 2016 declined for the first time since 2012, partly driven by notable decreases in inflows to the UK (-7%) and Germany (-12%). Net mobility of EU-28 movers has declined between 2015 and 2016, corresponding to an increase in return mobility.

The two most important sectors for EU-28 movers are manufacturing and wholesale and retail trade which employ between 12% and 15% each. The total number of movers increased mostly in the following sectors:

- transportation and storage (+12%);
- health and social work (+8%);
- administrative and support service activities (+7%);
- construction (+6%).

The largest share of movers (48%) can be found at secondary level of education and encompasses occupations like clerks, services and sales, craft and trades, plant and machine operators and skilled agricultural workers. Plant and machine operators and assemblers count for the 9% of the total number of movers. One out of five movers work in elementary occupations (with low skill level) and another fifth work in high-skilled occupations, such as legislators, senior officials, managers and professionals; 10% work as technicians and associate professionals. In most Member States distribution appear to be similar. In some destinations, though, movers are mainly employed in high-skilled occupations, such as in Belgium, the Netherlands, Sweden, Switzerland and Luxembourg. Compared to this, the largest destinations for movers, Germany and the UK, have quite low shares of movers in high-skilled occupations (17% and 22%, respectively).

As regards the Steel industry, from a general EU28 perspective, companies in Bulgaria, Germany, Latvia, Hungary, Malta, Netherlands, Austria, Slovakia and the United Kingdom en-

counter difficulties in finding qualified metal and machinery workers. At the other end, countries such as Greece, Italy, Portugal and Slovenia are experiencing a surplus of workers in these occupations².

2. Overview of the case study countries³

2.1 Germany

The most important characteristics of the German VET system are its solid dual approach and the embeddedness of the most relevant actors in the decision-making process. The German dual system is based on the cooperation between the State, companies and social partners and integrates work-based and school-based learning to prepare the apprentices for their full entry in the labour market. The Ministry of Education and Research (BMBWF) is responsible for VET policies and works closely with the Federal Institute for Vocational Education and Training (BIBB). The federal states (*Länder*) are responsible for the implementation of school-based VET.

Though the main pillar of the German VET system is recognised to be the apprenticeship scheme at upper secondary level (EQF 4) there are also alternative paths available, as getting enrolled in a school-based VET programme at upper secondary level (EQF 2 to 4). The system offers also programmes at post-secondary and tertiary level, such as the Advanced Vocational Training (EQF 6) that leads to a qualification as a craftsperson, technician or specialist.

The system is well-resourced as it combines both public and private funding and is also characterized by a structured set of checks on different levels (from national to local) that ensure that short-term needs of employers do not interfere with broader educational strategies.

The NQF is operational with VET qualifications extended up to Level 7 and the 2011 legislation entitles individuals to have qualifications obtained abroad assessed (Cedefop 2016a).

General Trends and Characteristics of the German VET system are:

- Technology-neutral VET provisions
- Consensual change and adaptation balancing distinct interests
- Multi-layered: reaches from National Level down to local level (difficult to quickly implement radical, paradigm-shifting changes)

Two broad types of vocational education can be distinguished: (1) state-recognised and (2) unrecognised VET provisions. All state-recognised VET provisions are in some way government-regulated. Within the category of state-recognised provision, two main forms of vocational education and training can be distinguished: (1) school-based VET provisions and (2) the ‘dual system’. The most difference between the two forms centre around the way education and training is delivered: while school-based VET provisions are exclusively delivered in schools, dual VET provisions combine school-based learning with practical training, usually provided within companies. A more subtle difference between the two forms relates to their

²https://skillspanorama.cedefop.europa.eu/en/analytical_highlights/metal-machinery-workers-skills-opportunities-and-challenges-2016

³ For a more detailed analysis see D4.1.

governance. The regulation of school-based VET provisions is the responsibility of the individual states (*Länder*), while the ultimate responsibility for regulating the dual system lies with the central government.

The dual system apprenticeships are the backbone of the German VET system and until very recently constituted the most popular VET pathway in Germany. Accounting for more than a third of the German Training market. Apprenticeships usually last 3 or 3.5 years albeit some shorter options are available and those with higher educational attainment such as A-Levels (*Abitur*) can reduce their training period. The ‘duality’ of apprenticeships is achieved by combining school-based and company-based education and training. This means that apprentices spend about half their time in vocational schools “where they are mainly taught theoretical and practical knowledge related to their occupation” (Hippach-Schneider and Huisman, 2016: 18). The other half of their time is spent embedded in companies where they receive “process-oriented training ... which is more based on specific in-house requirements” (Hippach-Schneider and Huisman, 2016: 18).

The training regulations for metal and electricity apprenticeships like plant mechanic or industrial mechanic were complemented with contents on digitization and Industry 4.0 on 1st August 2018.

Purely school-based VET programmes run at least for one year but usually for three years. As they lead to qualifications in a range of non-manufacturing occupations, mainly in the healthcare or commercial sectors.

Another option for those who have achieved a General Certificate of Higher Education Secondary is to attend vocationally oriented high schools (*Fachgymnasium*). A variety of sectoral specialisations are covered by these schools, including construction, metal and economics. Pupils still obtain a general qualification for higher education, but part of the curriculum is taken up by sector-specific subjects.

Key players:

- Ministry of Education and Research (BMBF), responsible for VET policies
- Federal Institute for Vocational Education and Training (BIBB)
- Federal states (*Länder*)
- Association of the Metal and Electrical Industry (Verband der Metall- und Elektro-Industrie)
- IG Metall

Relevant qualifications:

Technical training (apprenticeships)

- Chemical laboratory technician
- Electronics technician for automation technology
- Electronics technician for industrial engineering
- Industrial mechanic
- Design technician
- Mechatronics technician
- IT systems electronics technician
- Process mechanic in the metallurgical and semi-finished products industries
- Materials tester
- Toolmaker
- Cutting machine mechanic

Commercial training (apprenticeships)

- Office administrator
- IT specialist
- Industrial clerk
- IT clerk
- IT systems electronics technician
- Office communication clerk

2.2 Italy

The Italian VET system is characterized by multilevel governance that includes the Ministry of Labour and Social Policies, the Ministry of Education, the Regions and autonomous provinces, and social partners. The Ministries set up the general VET framework and guidelines, while the Regions and Autonomous Provinces are in charge of the implementation of the VET programmes and of most of the apprenticeship schemes; general education falls under the scope of concomitant legislation. This interweaving is regulated through formal agreements within the state-regions conference (*conferenza stato-regioni*).

VET governance in Italy is shared among different actors, namely:

- a) the Ministry of Education, University and Research, which is responsible for the overall design of the VET framework in national programmes (technical and vocational schools, ITS and IFTS);
- b) the Ministry of Labour and Social Policies, which is responsible for defining the framework for IeFP regional programmes and for setting the goals of continuous vocational training (CVT) under the public system;
- c) the Regions and the autonomous provinces, which oversee the planning, organization and provision of IeFP courses, ITS, IFTS, post-IeFP, post-higher education, apprenticeships and CVT activities;

d) social partners (trade unions, employers' associations etc.), which have a general advisory role in VET policy and promote company-level training plans to be funded by the Regions or the joint interprofessional funds.

At secondary level, the system offers five years school-based programmes that lead to a technical or professional diploma, and 3/4 years VET programmes that lead to the acquisition of a qualification as a professional operator (3 years) or a technician diploma (4 years). Such programmes are school-based but may be also delivered through an apprenticeship scheme.

At post-secondary level, two programmes (IFTS and ITS) offer the opportunity to acquire a high technical specialization certificate (EQF 4) or a high-level technical diploma (EQF 5). Apprenticeship schemes are available at all levels and may be addressed to the acquisition of a national qualification or diploma (*apprendistato per la qualifica e il diploma professionale*) or to earn a regional qualification (*apprendistato professionalizzante*).

The lower secondary education program is completed at 14 and after that young people are required to choose between general education (high schools) and VET.

At this stage young people can mainly choose between the following three routes:

- a) 5 years programmes in high schools, technical schools (*istituti tecnici*) or vocational schools (*istituti professionali*);
- b) 3-4 years vocational training programmes (IeFP)
- c) apprenticeship

The strictly vocational education and training (IeFP) is divided into three-year and four-year courses, aimed at obtaining respectively qualifications and professional diplomas. The qualifications and professional diplomas, of regional competence, are recognized and expendable at national and community level, as they are included in a specific national Repertory.

The IeFP courses are carried out by VET centres accredited by the Regions, according to criteria shared at the national level, or by the vocational schools, in a subsidiarity regime.

Technical and Vocational School programmes are aimed at providing the learners with knowledge, skills and competences to carry out technical or administrative tasks (in the case of *istituti tecnici*), or qualified tasks in production fields of national interests (*istituti professionali*).

Technical schools offer a solid scientific and technological cultural background, favouring the development of skills that allow an immediate insertion into the labour market. With the technical school diploma, it is possible to continue the studies at tertiary level in university or to further specialize in higher technical institutes. There are two sectors, economic and technological, in which the programmes are divided. Each course has a duration of five years. At the end of the five-year course, students take the state exam and obtain a secondary school diploma.

Vocational schools' programmes include a common two-year unit and a three-year specialization aimed at deepening the student's education according to the chosen address. The professional institutes are characterized by eleven fields of study. At the end of the five-year course, students take the state exam and obtain a secondary school diploma.

As for post-secondary VET programmes, these were reorganised in 2008 and aim at meeting the professional requirements of the labour market in relation to advanced technical skills. These programmes, namely ITS (*Istituti Tecnici Superiori*) and IFTS (*Istruzione e Formazione Tecnica Superiore*), are collectively organised through a partnership made up of schools, vocational centres, universities and companies.

IFTS programmes are coordinated at the regional level and are organized in 800-1000 hours courses, of which at least 30% to be spent as an internship in a company. At the end of the programme, the candidate achieves a higher technical specialization certificate (EQF 4). Regional programmes are defined by a National Repertory which includes 20 technical specializations that are linked with specific technological areas that have been defined as strategic for the country.

ITS are higher technological specialization schools, coordinate at central level by the Ministry of Education, University and Research. They are designed from the very beginning in order to have a strong link with the labour market, their programmes are defined in accordance with the Regions and keep into account the specific characteristics of the territory. ITS programmes last between 1800 and 2000 hours (of which at least 30% to be spent in a company) and half of the teachers are required to come from business and production. The completion of the programme leads to a higher technical diploma (EQF 5).

There are three types of apprenticeship scheme in Italy:

- Apprenticeship for achieving a professional operator certificate or a professional technician diploma (*apprendistato per la qualifica ed il diploma professionale*)
- Professional apprenticeships (*apprendistato professionalizzante*)
- Higher education and research apprenticeships (*apprendistato di alta formazione e ricerca*)

The first scheme is addressed to people aged 15-25, lasts three or four years and offers the opportunity to earn an IeFP qualification (3 years, EQF3) or a IeFP diploma (4 years, EQF4), or even a IFTS diploma.

The professional apprenticeship scheme is addressed to people aged 18-29 who want to acquire a qualification defined through collective bargaining and required on the labour market. This scheme is divided into two components, the acquisition of key skills, which are provided by a training centre, and the acquisition of specific vocational skills, provided by the company. These apprenticeships have a maximum duration of 3 years and allow the apprentice to earn a regional qualification.

The third scheme refers to a contract aimed at the training and employment of young people between 18 and 29 years of age. It allows an individual to combine work and study to achieve a higher education qualification (bachelor's degree, master's degree, Ph.D.) or to carry out research activities. The individual is hired by the company on an apprenticeship contract, with the duty to achieve a defined qualification or develop a research project linked to his work profile.

Key players:

- Ministry of Labour and Social Policies
- Ministry of Education
- Regions
- INAPP (Public Policy Innovation)
- Confindustria
- Federacciai
- FIOM- CGIL

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Relevant qualifications:

Technical schools (Secondary education, EQF 4)

- Mechanics, mechatronics and energy
- Transports and logistics
- Electronics, electrotechnics
- Informatics and telecommunications
- Chemistry, materials and biotechnology
- Constructions, environment and territory

Vocational schools (Secondary education, EQF 4)

- Industry and craftsmanship for Made in Italy
- Maintenance and technical assistance
- Water management and environmental remediation

Vocational Education and Training (Secondary Education, EQF 3 & 4)

- Chemical production operator
- Building operator
- Electrical operator
- Electronic operator
- Thermohydraulic plants operator
- Mechanical operator
- Logistics services and systems operator
- Building technician
- Electrical technician
- Electronic technician
- Technician in running and maintaining automated systems
- Industrial automation technician
- Enterprise services technician
- Heating plants technician

Higher Technical Vocational Education and Training (Post-Secondary, EQF 4)

- Techniques for manufacturing of made in Italy products
- Techniques for industrial design
- Techniques for the industrialization of products and processes
- Techniques for programming production and logistics
- Techniques for the placement and maintenance of civil and industrial plants
- Techniques for environmental safety systems and industrial quality processes
- Techniques for environmental monitoring and management
- Techniques for organizing and managing construction sites
- Innovative construction techniques
- Networks and systems safety techniques
- Techniques for designing and developing IT applications
- Techniques for the integration of TLC systems
- Techniques for database design and management

Higher Technical Education (Post-Secondary, EQF 5)

- Energy efficiency
- Sustainable mobility
- New technologies for life
- New technologies for made in Italy
- Innovative technologies for arts and cultural activities
- ICT

2.3 Poland

The Polish VET system is structured into three-levels governance, national (Ministries), regional (school superintendents) and county (governing schools). The Ministry of National Education is in charge of secondary-level VET, while the Ministry of Science and Higher Education oversees higher VET programmes. Social partners are also involved in the policy-making process as advisors.

More specifically, the management and administration of the education system (including vocational training system) have the following structure.

- National level: at the national level, education policy is formulated and implemented by the Ministry of National Education. In the amendment to the Education Law and the Act on the education system, all ministries competent for professions have been authorized to establish and run schools and educational institutions. Economic departments will also be responsible for vocational education.
- Voivodship level (province): Voivodship authorities primarily play a coordinating role: they supervise the implementation of national policy and provide pedagogical supervision. At this level, the representative of the education authorities is the school superintendent, appointed by the voivode.
- Powiat level: Powiat authorities are responsible for running upper secondary (including vocational) education, post-secondary and special schools (primary and secondary), sports schools and sports championships, practical and lifelong learning institutions, and psychological and pedagogical counselling centres.

The overall education system is currently undergoing a deep reform, started in 2017, that will be finalised in 2022/23. This will bring a substantial restructuring of the primary and secondary education programmes, mainly transforming the current six years primary education in an 8-year programme divided into two four years sub-programmes (basic and lower secondary level), withdrawing the current lower secondary and extending the general education upper secondary and the technical upper secondary school (Cedefop 2018c).

Currently, VET at secondary level is mainly school-based. At upper secondary level the system offers programmes that combine general and vocational education, as the three years sectoral programmes, the five years technical schools, and three years special job training programmes addressed to people with special needs.

At post-secondary level, there are strictly vocational school-based programmes (which do not include any general education) that allow for the acquisition of vocational qualifications in 1 to 2,5 years.

A strength of the system is its flexibility, as it allows changing between different programmes, and the possibility to validate prior learnings acquired in both non-formal and informal contexts by taking external examinations (Ibidem).

Recent initiatives undertaken by the Ministry of National Education address the following challenges:

- the Act on the Integrated Qualifications System (2016) has brought together the qualifications framework, register of qualifications that can be attained, quality assurance and validation principles. General and higher education qualifications were included in the register. Non-statutory qualifications linked to CVET have been registered based on the initiative of VET providers or other stakeholders;

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- the government has revised the incentive system to increase VET participation, develop the vocational guidance system, and expand the implementation of work-based learning in VET by promoting cooperation between schools and employers;
- new sectoral skills councils are being established under the umbrella of the Polish Enterprise Development Agency, giving voice to sectoral stakeholders regarding the demand for competences at sectoral level in order to improve education and labour market matching.

In November 2018, an act introducing significant changes in VET was signed into law. The new law complements the recent structural reform of the education system initiated in 2016. Most changes are taking effect since the beginning of the school year 2019/20. Special emphasis is placed on strengthening the mechanisms of involving employers in the development of VET in all its stages, particularly in practical vocational training and on the systematic adaptation of VET to labour-market needs by forecasting the demand for professions and skills.

The new law:

- makes it mandatory for VET learners to pass a State vocational examination or a journeyman's examination to graduate from secondary education;
- introduces, in cooperation with employers, apprenticeship as a new form of vocational learning for learners in upper secondary VET and first-stage sectoral programmes;
- allows VET schools to organise short-cycle vocational courses for adults;
- makes it mandatory for schools to cooperate with employers when launching new programmes (this cooperation may include patronage classes, the organisation of practical training, teacher training, participation in the organisation of vocational examinations, providing schools with certain equipment and participation in teachers' council meetings);
- introduces obligatory professional training for VET teachers in companies;
- introduces a labour market needs forecast mechanism; forecasts will consider various data sources, including data from Statistics Poland, education information system, social insurance data and opinions of skills councils;
- increases state subsidies to local governments for VET schools educating in higher demand occupations and to employers involved in training VET students in higher demand occupations;

Key elements of the reform include:

- a) phasing out lower secondary school (*gimnazjum*);
- b) restructuring six-year primary education (*szkola podstawowa*) into an eight-year programme, taking place in one institution, divided into two four-year parts (basic and lower secondary level);
- c) extending the general upper secondary programme (*licea ogólnokształcące*) - to four years instead of three - and the vocational upper secondary programme (*technika*) to five years instead of four;
- d) introducing two-stage sectoral programmes (*dwustopniowa szkoła branżowa*); the first stage sectoral school has replaced the basic vocational school (*zasadnicza szkoła zawodowa*) as of 2017/18, while the second stage sectoral schools will begin to operate in 2020/21.

The school system will be transitioning until 2022/2023. During this period, the previous programmes will be functioning alongside the new ones until they are completely phased out.

Currently, education in Poland is compulsory up to 18 years of age, while full-time school education is compulsory up to age 15. Compulsory education for 15-18 years old can take place

as part-time education, both in and out of school, e.g. in the form of short qualification courses or vocational training for juvenile workers.

As regards VET provided at the secondary level:

(a) three-year first stage sectoral programme (*branżowe szkoły I stopnia* – BSI, ISCED 353, EQF 3) introduced in 2017 are part of the formal education and training system. This programme is available to primary school graduates (usually 15 years-old) and applies also to lower secondary school graduates during the transition period. The first stage sectoral programme combines general and vocational education and leads to a vocational diploma for a single-qualification occupation (after passing the State vocational examination). The school director decides on the share of work-based learning; however, it cannot be less than 60% of the hours foreseen for vocational education (which combines both theoretical and practical training). Completion of this programme provides access to further education: at the second year of study at general upper secondary schools for adults or in the two-year second stage sectoral programme.

(b) two-year second stage sectoral programme (EQF 4) will begin to operate in the 2020/21 school year. This second stage sectoral programme aims at further developing the vocational qualifications attained in the first stage sectoral programme and will be available to the graduates of the first stage sectoral programmes - usually 18 years-old. Depending on the profession being taught, education in it will be available in full-time or extramural forms. The second stage sectoral programme will lead to a vocational diploma for occupations consisting of two qualifications (after passing the State vocational examination). General education in this programme is planned to be limited, with the focus placed on the vocational training. The school director decides on the share of work-based learning; however, it cannot be less than 50% of the hours foreseen for vocational education (which combines both theoretical and practical training). Second stage sectoral programme graduates will be eligible to continue to tertiary education after passing the secondary school leaving examination (*matura*).

(c) five-year vocational upper secondary programme (*technika*, EQF 4), part of the formal education and training system. This programme is available to primary school graduates, usually 15 years-olds. The vocational upper secondary programme combines general and vocational education and leads to a vocational qualifications diploma for occupations consisting of two qualifications after passing the State vocational examination. The school director decides on the share of work-based learning; however, it cannot be less than 50% of the hours foreseen for vocational education (which combines both practical and theoretical training). Graduates of these programmes, after passing the secondary school leaving examination (*matura*), are eligible to continue to tertiary education.

(d) three-year special job-training programme for learners with special education needs (SEN) leads to a job-readiness certificate. This programme is designed for learners with moderate and severe intellectual disabilities or multiple disabilities. It provides educational activities (personal and social functioning classes; communication skills development classes, creativity development classes, physical education and job training classes) as well as revalidation activities. Job training classes constitute over half of the hours foreseen for educational activities.

Post-secondary level

At the post-secondary non-tertiary level, vocational qualifications can be attained in one to two and a half years school-based programmes (*szkoły policealne*, ISCED 453). Post-secondary programmes are part of the formal education and training system and are available to the graduates of general and vocational upper secondary programmes (usually 19 and 20 years-old), as

well as in the future to the graduates of the second stage sectoral programmes (usually 20 years-old). These programmes are strictly vocational and do not include general education. The school director decides on the share of work-based learning; however, it cannot be less than 50% of the hours foreseen for vocational training.

Adult learning and out-of-school VET are available in continuing education centres, practical training centres, further training and professional development centres, and initial VET (IVET) schools offering:

- vocational qualification courses (*kwalityfikacyjne kursy zawodowe – KKZ*) based on the curricula for a qualification in a given occupation; they allow learners to take the State vocational examination and obtain a vocational qualification certificate;
- vocational skills courses based on the core VET curriculum, including learning outcomes for a qualification or common learning outcomes for all occupations;
- at least 30-hour general skills courses that are based on the general education curriculum;
- theoretical courses for juvenile employees.

A special path for young people over 15 years of age lacking a lower secondary education who want to attain vocational qualifications and/or supplement their education is provided by the Voluntary Labour Corps (*Ochotnicze Hufce Pracy - OHP*), which offer vocational training both in their own workshops or as on-the-job training with an employer.

Key Players:

- Ministry of National Education
- Ministry of Science and Higher Education
- Polish Enterprise Development Agency
- Sectoral Skills Councils
- Voivodeship
- Powiat
- Centre for Education Development (ORE)

Relevant qualifications:

- foundry modeler,
 - operator of foundry machines and devices,
 - operator of machinery and equipment for the metallurgical industry,
 - foundry technician,
 - technician of the metallurgical industry.
- M.6. use of machinery and equipment used in metallurgical processes,
 - M.7. using machines and equipment for metal forming (plastic deformation),
 - M.38. organization and carrying out of metallurgical processes and metal forming.
- E.20. Operation of electronic devices → 311408 *Technik elektronik*

2.4 Spain

In Spain, two different VET systems have been developed, respectively by the education authority and by the labour authority.

The General Council for Vocational Training is the national advisory body for VET policies. Social partners and employers are well engaged in the system, both at the national and local level (OECD 2015). Stakeholders are involved in designing and updating the qualifications in the education system and in defining occupational standards in all the economic sectors. Qualifications and standards are collected into a national registry, the *Catálogo Nacional de Cualificaciones Profesionales* (CNCP). The two VET systems provide different qualifications and programmes, but as both refer to the occupational standards collected in the CNCP, mutual recognition of some parts of the training is possible.

The Ministry of Education and Vocational Training (*Ministerio de Educación y Formación Profesional*) is responsible for establishing the core legislation on IVET, defining standards for quality and setting up formal qualifications and procedures for further implementation and assessment. The 17 autonomous communities (*comunidades autónomas*) oversee further regulation and execution of the IVET principles and guidelines defined at the central level.

The Ministry of Labour, Migration and Social Security (*Ministerio de Trabajo, Migraciones y Seguridad Social*) is responsible for the definition of VET policies within the employment system. Programmes under the employment authority are normally considered continuing VET, as they are likely to take place after completion of IVET at some level. VET for employment aims at skilling, upskilling or reskilling workers (both employed or unemployed) encouraging a lifelong approach to training. Programmes in VET for employment are of two types, they can be linked to the National Catalogue of Occupational Standards (*Catálogo Nacional de Cualificaciones Profesionales - CNCP*) or can be independent of it.

CNCP can be considered the basis of the Spanish VET system. It comprises the most important occupations in the national context, organised in 26 sectoral branches. Currently, the catalogue consists of 668 occupational standards (*Cualificación Profesional*), organised in three progressive levels (based on the degree of complexity, autonomy and responsibility), which are defined and systematically updated by the National Institute of Qualifications (Instituto Nacional de Cualificaciones – INCUAL).

As for VET under the Education authority, in 2013, a reform introduced basic VET programmes (*Formación Profesional Básica*) for those aged 15 who and wanted to end the mandatory education with a professional qualification. Basic VET programmes last 2 years, award a relevant certificate (*Título de Profesional Básico*) and give the possibility to move further to intermediate VET (*Formación Profesional de Grado Medio*) or to earn the *Educación Secundaria Obligatoria* certificate and continue in general education at upper secondary level.

The *Formación Profesional de Grado Medio* consists of 2 years training and, after successful completion, awards a technician certificate (*Título de Técnico*). After this programme is it possible to move directly to higher VET and after two years of study and training it is possible to acquire a higher technician diploma (*Título de Técnico Superior*).

School-based VET diplomas are based on the *Cualificaciones Profesionales* collected in the CNCP and their curricula are structured in a national component (usually between 55% and 65%) and a regional component (between 45% and 35%) in order to adapt them to the local needs without losing in terms of national consistency.

In 2012 dual VET was implemented in order to support youth employment and the acquisition of a formal professional qualification. Essentially dual VET in Spain can follow two different routes, that of training and apprenticeship contracts and dual VET projects under the education system implemented by the regions. In the first case, apprenticeship contracts must be linked to a formal qualification, are usually signed by people aged between 16 and 30 years, and last from 1 and 3 years.

It is relevant to underline the modularity of the Spanish VET system as it allows for the recognition and transfer of units of competences from a programme to another or through the validation of prior learning. As for adult learning and continuous training, this encompasses training initiatives at company demand, professional certificate programmes as well as non-formal training. Individual competencies which are now certified together with the completion of the diploma.

VET in the employment system is coordinated by the Ministry of Labour, Migration and Social Security (though other ministries can regulate training in their specific area of competence) and is implemented by the regions. Labour authorities, employers and trade unions cooperate, both at the local and national level, to define the regulatory framework of the system. The rationale of the system is to provide training programmes for both employed and unemployed workers in order to support their personal development, improve their employability, upskill the workforce, contribute to the competitiveness of the companies.

Under the employment system, there are mainly two types of programmes, programmes that are linked to the CNCP and allow the trainee to obtain a formal certificate (*Certificados de Profesionalidad*) and programmes that are not linked to the CNCP, as the training organised by the companies for their own employees (this can be offered by the company itself or by external providers hired by the company), or training provided to employees under agreements signed between companies and trade unions.

Certificados de Profesionalidad are issued based on common national curricula, they are related to a specific professional standard contained in the CNCP and have a modular structure.

ESSA: Sector Skill Framework (Deliverable 4.5)

As for the programmes not linked to the CNCP, some of these are usually included in the catalogue of training specialities (*buscador de especialidades formativas*) updated by the state public employment service.

Key players:

- Ministry of Education and Vocational Training
- The ministry of Labour, Migration and Social Security
- *Comunidades autónomas*
- National Institute of Qualifications (INCUAL)
- State public employment service (SEPE)
- General Council for Vocational Training (*Consejo General de la Formación Profesional*)
- General Council for the National Employment System (*Consejo General del Sistema Nacional de Empleo*)
- State Foundation for Training in Employment (*Fundación Estatal para la Formación en el Empleo*)
- Joint Sectoral Structures (*Comisiones Paritarias Sectoriales*)

Relevant qualifications:

Basic VET programmes (Secondary education)

- Basic Professional Degree in Metal Fabrication
- Basic Professional Degree in Manufacturing and Assembly
- Basic Professional Degree in Electrotechnical and Mechanical Installations

Intermediate VET programmes (Secondary Education)

- Technician in Forming by Metal and Polymer Molding
- Machining Technician
- Technician in Assembly of Structures and Installation of Aeronautical Systems
- Welding and Boiler Technician
- Montaje y mantenimiento de sistemas de automatización industrial

Advanced VET programmes (Post-secondary education)

- Senior Technician in Metallic Constructions
- Higher Technician in Mechanical Manufacturing Design
- Senior Technician in Production Programming in Mechanical Manufacturing
- Senior Technician in Production Programming in Metal and Polymer Molding

2.5 United Kingdom

In the UK, education or training is compulsory up to age 16 (18 in England) and learners can access a VET programme starting from age 15. VET is funded by government agencies up to age 18, but adult learners can apply for grants and loans.

VET qualifications exist in a variety of sectors and VET programmes are provided by both public institutions and private centres. The two pillars of VET in the UK are school and college-based VET programmes, and apprenticeships, both extend from lower secondary to tertiary education. Interest in the apprenticeship is rising in the UK and this is also increasing competition for the best apprenticeship places.

Qualifications in the UK are designed by independent awarding organizations which are also responsible for issuing the certificates. The central government has devolved the governance of VET to the administrations of Wales, Scotland and Northern Ireland. The four countries have different regulation and quality assurance authorities. In England, the policy-making authority for VET is the Department for Education; in Northern Ireland, the main authorities are the Department of Education and the Department for the Economy; Scottish and Welsh governments are responsible for VET policies in Scotland and Wales.

The autonomy of further education colleges in England, which allows them to have an entrepreneurial and flexible approach, has been considered a strength of the system. Furthermore, quality assurance arrangements in England are demanding (OECD 2105). However, England has been recognised to have a limited vocational provision at post-secondary level and the current system of awarding organizations for qualifications has been blamed for inhibiting employers' engagement in the development of qualifications and for causing confusion among many overlapping qualifications.

UK qualifications are provided by awarding organisations, external to the education or training provider. Awarding organizations are private companies, mainly funded by examination fees. They develop and deliver qualifications to meet government policy requirements and changing skills requirements and to respond in a dynamic and flexible way to the market demand. Awarding organisations must be recognised by the qualifications regulator before they can propose qualifications for accreditation

The UK general education and VET provision is divided and organized in several national qualifications frameworks, such as the Regulated Qualifications Framework (RQF) in England and Northern Ireland, the Credit and Qualifications Framework for Wales (CQFW) and the Scottish Credit and Qualification Framework (SCQF).

Within these macro-frameworks, specifically VET repertoires are:

- the National Vocational Qualifications (NVQ), which feeds into the Regulated Qualifications Framework (as for England and Northern Ireland), and the Credit and Qualifications Framework for Wales;
- the Scottish Vocational Qualifications (SVQ), that feed into the Scottish Credit and Qualification Framework.

Responsible authorities for the RQF are the Office of Qualifications and Examinations Regulation (Ofqual) and the Council for the Curriculum, Examinations and Assessment (CCEA). The SCQF falls under the responsibility of the Scottish Credit and Qualifications Framework Partnership, while responsible for the CQFW is the Welsh Government.

School and college-based VET is at EQF level 3 and 4 can be taken as an alternative to compulsory general education at secondary schools or as stand-alone qualifications at a VET college. Adults may also start VET at this level.

There is a wide variety of qualifications at this level, including BTEC (Business and Technology Education Council) Awards, Certificates and Diplomas as well as NVQs (National Vocational Qualifications) and SVQs (Scottish Vocational Qualifications).

The British Department for Education is currently working on the development of new technical study programmes (T levels) in England, with the aim is to simplify the national VET system at the same time raising the credibility of qualifications with employers.

T Levels are 2-year courses that have been developed in collaboration with employers and companies and will be available in September 2020, following GCSEs. This programme will offer students a mix of classroom learning and ‘on-the-job’ training during an industry placement of at least 315 hours. They will provide the knowledge and experience needed to move to skilled employment, further study or a higher apprenticeship.

T Levels are intended to become one of the main choices for students after achieving the General Certificate of Secondary Education (GCSE) alongside apprenticeships for students who wish to learn a specific occupation on the job and A levels for students who wish to continue academic education.

Apprenticeships are typically structured in 80% on-the-job training and 20% classroom learning and are more suited to those who know what occupation they want to pursue, want to earn a wage and learn at the same time and are ready to enter the workforce at age 16.

In England, Wales and Northern Ireland, apprenticeships are offered within frameworks that include a work contract, a technical/occupational qualification within the RQF/CQFW and Functional Skills/Essential Skills/Key Skills/GCSEs in English, mathematics and other general subjects relevant to the profile.

In England, most apprenticeship frameworks are currently being replaced by new standards developed by groups of employers since 2015/16. The new standards comprise on-the-job and off-the-job training and learning and apprentices are going to be assessed by an independent assessor from industry or a separate training provider to the one the student attended.

Scottish Modern Apprenticeships include a work contract and are required to include SVQs or alternative competence-based qualifications and core skills such as ICT, problem-solving, numeracy and communication.

As for Wales, a review of the apprenticeship frameworks is currently considering issues such as design and accreditation of apprenticeships, how to move more apprenticeship above EQF2 level, how to make all apprenticeships occupationally-specific and how to include key competencies and Welsh language.

At the completion of the chosen programme, an apprenticeship certificate is awarded along with a vocational qualification, such as BTEC First Awards, Certificates and Diplomas, NVQs and SVQs.

Degree apprenticeship schemes (EQF 6 -7) provide a different pathway to obtaining university degrees. In such schemes, academic ability, including grades and numerical and reasoning skills, is assessed by the university or college, whilst candidates are also interviewed by a company in relation to a specific job (unless they are already employed with the company). Both employers and universities must agree that the applicant meets their requirements. Apprenticeships at this level are called higher apprenticeships, higher-level apprenticeships, degree apprenticeships, graduate apprenticeships, professional apprenticeship, technical apprenticeships and modern apprenticeships.

A certificate may be awarded along with a vocational qualification, such as a Foundation degree, BTEC Higher National Certificates and Diplomas, along with NVQs and SVQs. Usually, degree and professional apprenticeships result in the award of a bachelor’s degree (EQF 6).

ESSA: Sector Skill Framework (Deliverable 4.5)

Wales is currently piloting Degree Apprenticeships with delivery initially focused on skills gaps identified by Regional Skills Partnerships in digital, ICT and advanced engineering.

Scottish apprenticeship programmes were also renewed through the introduction of Higher and Graduate apprenticeships, designed in 2015-16. The distinctive feature of these schemes is the potential to obtain a Higher National Diploma (HND) (EQF 5), or a bachelor's degree (EQF 6) leading to professionally recognised qualifications.

In October 2013 the English government set out a plan to reform apprenticeships by replacing the existing “apprenticeship frameworks” with new industry-led “apprenticeship standards”. The first standards were introduced in England in 2014 and all frameworks will be discontinued by the end of 2020. In Scotland and Wales, Apprenticeships will still be delivered through apprenticeship frameworks.

Key players:

- Office of Qualifications and Examinations Regulation (Ofqual)
- Council for the Curriculum, Examinations and Assessment (CCEA)
- Scottish Credit and Qualifications Framework Partnership
- Welsh Government
- Qualifications Wales
- Department for Education (DfE) [EN]
- Department for Education [NI]
- Scottish Government
- Scottish Qualifications Authority
- UK Commission for Employment and Skills

Relevant qualifications:

T-Levels (EQF 4) [EN]

- Building services engineering
- Craft and design
- Design, development and control
- Design, surveying and planning
- Digital business services
- Digital production, design and development
- Digital support and services
- Maintenance, installation and repair
- Manufacturing and process
- Science

Other qualifications [EN & NI]

- Edexcel Level 3 NVQ Diploma in Electrical and Electronic Engineering (QCF)
- EAL Level 2 Certificate in Metals Industries Processes
- EAL Level 2 NVQ Diploma in Metal Processing and Allied Operations (QCF)
- EAL Level 2 NVQ in Metal Processing and Allied Operations
- EAL Level 3 NVQ Diploma in Metal Processing and Allied Operations (QCF)
- EAL Level 3 NVQ Extended Diploma in Metal Processing and Allied Operations
- EAL Level 3 NVQ in Metal Processing and Allied Operations
- ECITB Level 2 Diploma in Erecting Steelwork Components (RQF)
- ECITB Level 2 NVQ in Constructional Steelwork Site Operations
- GQA Level 2 NVQ Diploma in Cold Formed Steel Frame (Construction)
- MPQC Level 2 Diploma in Maintenance for Mineral Products Operations
- MPQC Level 2 Diploma in Mineral Products Mobile Plant Operations
- MPQC Level 3 Diploma in Laboratory and Associated Technical Activities for Mineral Products Operations
- MPQC Level 3 Diploma in Maintenance Supervision for Mineral Products Operations
- MPQC Level 3 Diploma in Quarry and Mineral Processing Maintenance Operations (QCF)
- MPQC Level 3 Diploma in the Extractives and Mineral Processing Industries (QCF)
- MPQC Level 4 Diploma in Managing Laboratory and Associated Technical Activities for Mineral Products Operations
- MPQC Level 4 Diploma in Safety, Health and Environmental Management in Mineral Products Operations
- MPQC Level 6 Diploma in Safety, Health and Environmental Management in Mineral Products Operations
- MPQC Level 7 Diploma in Safety, Health and Environmental Management in Mineral Products Operations
- OCR Level 2 NVQ in Fabricating Constructional Steelwork
- OCR Level 2 NVQ in Metal Processing and Allied Operations
- OCR Level 3 NVQ in Fabricating Constructional Steelwork
- ProQual Level 2 Diploma in Steel Erecting
- ProQual Level 3 Diploma in Fabricating Steel Structures in Construction
- ProQual Level 3 Diploma in Steel Erecting

Other qualification [Wales]

- EAL Level 3 NVQ Diploma in Metal Processing and Allied Operations
- EAL Level 3 NVQ Extended Diploma in Metal Processing and Allied Operations
- ECITB Level 2 Diploma in Steel Erecting
- ECITB Level 2 Diploma in Supporting the Fabricating of Engineering Construction Steel Structures - Plating
- ECITB Level 3 Diploma in Erecting Engineering Construction Capital Plant Steel Structures
- ECITB Level 3 Diploma in Fabricating Engineering Construction Steel Structures - Plating
- MPQC Level 2 Diploma in Processing Operations for the Extractive and Minerals Processing Industries
- MPQC Level 3 NVQ Diploma in Shotfiring for the Extractive and Minerals Processing Industries
- MPQC Level 4 Diploma in Health, Safety and Environmental Management for the Extractive and Minerals Processing Industries
- MPQC Level 4 Diploma in Managing Processing Operations for the Extractive and Minerals Processing Industries
- NOCN Level 2 Diploma in Steelfixing Occupations (Construction)
- NOCN Level 2 NVQ Diploma in Steelfixing Occupations (Construction)
- Pearson BTEC Level 3 Diploma in Blacksmithing and Metalworking
- Pearson BTEC Level 3 Extended Diploma in Blacksmithing and Metalworking
- Pearson BTEC Level 3 Subsidiary Diploma in Blacksmithing and Metalworking

3. Key findings

To different extents, the 5 countries examined have recently undergone (or are undergoing) partial reforms of their VET system, addressed at overcoming some recognised limits as, for instance, their capacity to effectively connect with the labour market and with the actual company requirements.

In Italy, Spain, Poland and the United Kingdom, the reforms aimed at a more direct engagement of the sectoral employers' associations in the process of updating the qualifications. In general, this results in an attempt to move the system towards a more *collective type* of skills formation approach (Busemeyer and Trampusch 2011). Such shift can cause, however, a critical expansion in the time needed to complete the process of definition of new qualifications and updating of existing qualifications, in the case of highly fragmented governance (with the absence of strong coordination at central level).

In Germany a solid and long-lasting consultation mechanism was already in place, under the coordination of the federal government and with the support of the BiBB, acting as the core institution for consensus building between all parties (state, federal state, and social partners) involved in VET at the national level. Initiatives have been undertaken in Germany to face the problem of skills mismatches. This has been addressed, for instance, through "occupations

screenings” with the aim to understand the impact of technological innovation on some industrial key sectors, including metalworking. This resulted, considering the metal industry, in the introduction of a specific learning module titled “Digitalisation of work, data protection and information security” (*Digitalisierung der Arbeit, Datenschutz und Informationssicherheit*), which has been included in the core curricula for the metal sector qualifications.

Digitalisierung der Arbeit, Datenschutz und Informationssicherheit (contents):

- Digitization of work, privacy and information security
- Influence of digitization on production, logistics, etc.
- Smart Devices, Mobile Devices
- Search engines and cloud services
- Occupational apps and digital learning media
- Communication via Skype, videoconferencing, etc.
- Tools for collaborative work
- Current privacy policy
- Special features of the new EU GDPR
- Creation of a data protection concept
- Cybercrime
- Viruses, Trojans and other pests
- Analysis of cyber attacks.
- Protect the work environment against attacks from the Internet

In England, the Department for Education has published in April 2019 the National Standards for Essential Digital Skills that will inform the new Essential Digital Skills Qualifications (EDSQs) that will be available for teaching (as a stand-alone qualification) in September 2020. EDSQs must cover the five skills areas set out in these national standards (using devices and handling information, creating and editing, communicating, transactions and being safe and responsible online), and may cover some, or all, of the skills statements in each skill area. The standards will also inform the development of new subject content for digital Functional Skills qualifications, that will be available from 2021.

As for the gap between formal training and practical working skills, the reforms in Italy, Spain and Poland have also introduced apprenticeship schemes on the model of the German dual mode. These reforms are recent and still under development, but the aim is to shorten the distance between formal training and practical skills acquired in a real working environment.

Also, the new apprenticeship schemes, as the “higher apprenticeships” in England and Wales, or the “*apprendistato per la qualifica ed il diploma professionale*” in Italy, extend to higher EQF levels and offer the opportunity to acquire a post-secondary or tertiary professional certificate. The aim of this is to relaunch the apprenticeship schemes in terms of attractiveness and to unlock them from a low-middle EQF range.

ESSA: Sector Skill Framework (Deliverable 4.5)

The competence of new VET trainers is considered fundamental to relaunch the attractiveness and effectivity of vocational education and training. In different systems, new programmes and curricula have been (or are being) introduced (like “ITS” in Italy, “T levels” in England) which require the participation of professionals from the specific sector as trainers or a relevant on-the-job training component. The importance of training the trainers was stressed also in the 2016 reform of the Polish education and training system.

Istruzione Tecnica Superiore:

- 6 professional areas (Energy efficiency, Sustainable mobility, New technologies for life, New technologies for made in Italy, Innovative technologies for arts and cultural activities, ICT)
- EQF 5
- 30% of the course to be done on the job
- 50% of trainers from companies
- On the job training can be done through an apprenticeship
- Opportunities for training abroad
- Consistent path from secondary to tertiary
- Europass diploma supplement

Example: Industrial Mechatronics

Modules: Productive processes & innovative technologies, PLC, Foundations of automatics, Drives, Pneumatics & hydraulics, CAD, Machine Tools & Manufacturing Studies, Virtual commissioning and 3D Printing, CNC, Microcontrollers, Systems Supervision, Industrial Networks, Robotics, CAM, CAE & Technical writing, Machinery directive, Electrical panels, Maintenance troubleshooting, Metrology, Industry 4.0.

T Levels:

- Designed by employers
- Mix of classroom learning and ‘on-the-job’ training during an industry placement (at least 315 hours)
- Based on the same standards as apprenticeships and approved by the Institute for Apprenticeships and Technical Education
- Includes core theory, concepts and skills for an industry area alongside with specialist skills and knowledge for an occupation or career
- Industry placement with an employer
- Minimum standard in maths and English
- EQF 4

Steel industry relevant curricula

Building services engineering; Craft and design; Design, development and control; Design, surveying and planning; Digital business services; Digital production, design and development; Digital support and services; Maintenance, installation and repair; Manufacturing and process; Science.

The consistency of the education and training systems is now taken more into account. In countries such as Spain, Italy, Poland and the UK, VET offer at post-secondary level has been (or it is being) consolidated. Also, permeability and flexibility of the paths have been enhanced through better connecting VET with higher education programmes. This aims also at reducing the divide between IVET and CVET, allowing for more flexible and adaptive paths.

All the countries have developed their own National Qualifications Repertoires and have undergone the process of referencing it to the EQF (except Spain, in which formally the referentiation to EQF has not been done, though there are documents which provide examples on how to link the national qualifications to EQF).

Another key feature is the alignment of all the countries on the establishment of proactive mechanisms of skills forecast (based on data collected by dedicated research centres and through the engagement of the employers' associations), the definition of national databases of occupations and related skill-sets, and the planning for systematic reviews of the qualifications.

Mapping Occupation & Skills Forecast

- Excelsior information system [Italy]
- Occupations/Skills database <http://professionioccupazione.isfol.it/> (INAPP) [Italy]
- Qualifications Wales (Wales) [United Kingdom]
- UK commission for Employment and Skills [United Kingdom]
- Federal Institute for Vocational Education and Training (BIBB) [Germany]
- Institute for Employment Research (IAB) [Germany]
- National Catalogue of Occupational Standards (CNCP) [Spain]
- National Institute of Qualifications (INCUAL) [Spain]
- Sectoral Skills Councils [Poland]
- Registry of occupations and qualifications [Poland]

As regards the trajectory established by the EU policies and frameworks, the convergence process started gradually in the second half of the 21st century, and sped up in the 90s and early 2000s with the launch of mobility and research transnational programmes (Erasmus and Leonardo da Vinci) and the establishment of EQF (2008), ECVET (2009) and EQAVET (2009). The process is still incomplete, nevertheless all the EU countries have made significant steps forward in the collective challenge of increasing transparency and mutual recognition through the harmonization of national VET systems with the EU meta-frameworks (see Deliverable 4.2).

In summary, the main outcomes of this process are:

- a. the progressive shift to a learning outcomes approach;
- b. the progressive establishment of a credit system and shift to a unit-based/modular approach;
- c. the introduction of regulatory mechanisms for the recognition, validation and certification of informal and non-formal learnings

- d. the establishment of national quality assurance systems in line with the EU requirements
- e. the establishment of cross-national databases and systems for mapping education and vocational qualifications, increasing transparency and comparability.

As for the learning outcomes approach, EQF and ECVET Recommendations have encouraged a shift to a description of qualifications in terms of learning outcomes. If the traditional teaching paradigms focused on the inputs, the new paradigm focuses on the outcomes, aiming at placing the individual at the centre of the training process.

Credit systems as ECVT are devised to support modularisation and the acquisition of learning outcomes, and to facilitate mobility and transfer across different learning contexts. The shift towards learning outcomes, integrated by a modular approach, increases the flexibility of VET paths, both from the point of view of labour market and from the point of view of learners. Modularisation can, for instance, support the creation of tailor-made curricula, that respond to specific skills needs.

Flexibility is now an important requirement of VET paths, along with more effective connections between different levels and with higher education. Flexible VET systems need to take into account the role of informal and non-formal learnings and to establish mechanisms to incorporate these into VET systems, thus offering learners the opportunity to shorten their paths through the recognition and validation of prior learning and the exemption of some modules.

Transparency and cross-referencing are prerequisites for transferability of skills and geographical mobility.

In this perspective, the work done with the ESCO database, offering a common understanding on skills, occupations and qualifications, and references to ISCO-08 and ISCED-F 2013, enhances the transparency and comparability of occupations and relevant skill-sets across different countries. Also, tools as DigComp and the e-CF framework define standards and proficiency benchmarks for companies, training providers, policy-makers, and learners in the ICT domain.

4. Strategy and recommendation⁴

Relying on the considerations made above, prospective qualifications should make the most of the cross-national EU frameworks, in order to speed up the convergence process and to support the emergence of a common VET field, which will facilitate the establishment of common sectoral vocational contents and quality standards, the recognisability of qualifications between countries, and the mobility of skilled workers.

As previously mentioned, transparency and cross-referencing are prerequisites for transferability of skills and geographical mobility. To different extents, all the 5 countries have received the recommendations made by the European Commission and have implemented links to the most important cross-national frameworks, even though the ESCO database still seems to lack engagement on the side of the relevant authorities in the partner countries (for instance, in informing about the qualifications available).

⁴ This section depends highly on the further developments of the project, in particular on the data that will be acquired during the fieldwork and on the interaction between WP3, WP4 and WP5 through the next iterations. In accordance with this, the strategy and recommendation will be progressively built along the whole project duration.

Also, 4 countries out of 5 among the ones taken into account have recently undergone (or are still undergoing) partial reforms of the VET system to:

- a) overcome skills mismatches through a higher engagement of the industry in designing the qualifications;
- b) filling the gap between training and work through dual VET and apprenticeships;
- c) extending the apprenticeships at higher EQF levels.

The main objectives of ESSA include the proactive identification of skill needs and demands for building appropriate training and curricula, and the identification, development and promotion of successful sectoral recruitment and upskilling schemes. These challenging objectives require, in the perspective of WP4, first a convergence in terms of qualifications design. In order to approach the established objectives, prospective qualifications should:

1. be designed in terms of Competences Units (CU), made up of a clearly defined set Learning Outcomes (LO), which in turn are made up of a set of knowledge, skills and/or competences an individual has acquired and/or is able to demonstrate after completion of a learning process, either formal, non-formal or informal (this implies also the existence of nation-wide regulated procedures for the assessment and certification of non-formal and informal learning).
2. establish links to EU frameworks and use as much as possible the EU vocabulary (e.g., DigComp for generic digital skills and e-CF for specialised IT skills) in order to avoid ambiguity and to consolidate transnational digital standards.
3. be organised hierarchically, with core and special modules (that could be easily replaced or updated, avoiding the reformulation of the core structure of the qualification).
 - Hierarchical design of the curricula offers the opportunity to combine (core) transnational, national and local requirements through the combination of different modules. This could open up to a European set of sectoral qualifications.
 - Spain provides an interesting example of good practice in this sense, combining national and local needs: about 70% of the contents of VET curricula are established at the national level, about 30% is defined at the local level (*comunidad autónoma*).
 - This approach establishes also a virtuous circle between IVET and CVET, where workers can easily update their qualifications acquiring the new modules through CVET, also through international mobility⁵.
4. establish a formal relationship between workload and ECVET points to measure the weight of each CU in relation to its specific learning outcomes and in relation to the whole qualification.
5. follow the T-shape design, including substantial transversal (soft) skills and thorough theoretical and professional knowledge. Such design is important to support the resilience of both workers and companies, as transversal skills and general knowledge are essential for building new specialistic knowledge and adaptation. An effective combination of practical on-the-job training with wider theoretical knowledge and enhancement of transversal skills (T-shape approach) could:
 - enhance vertical and horizontal mobility within the industry

⁵ These practices are already in place in some countries, the fieldwork will permit the acquisition of information about good practices and translate them into a recommendation.

ESSA: Sector Skill Framework (Deliverable 4.5)

- enhance both workers' and companies' resilience in a rapidly changing market. In this sense, it is also important to draft a skills/knowledge hierarchy in order to point out which type of transversal skills and knowledge are more relevant in producing new (specialistic) ones.
- improves the connection between VET and HE.

Two preliminary organizational considerations should be made on the above, the first one is that longer courses fit better the scope as they provide more systematic learning procedures and normally include well structured theoretical components; the second is the need to consider the risk of responding to the work-training gap through an overweight of on-the-job practical training, which could result in higher practical capabilities, but less adaptive capacities.

As regards the type of skills that new curricula should deliver, great importance has been attributed by the literature to transversal skills. This relevance has been also highlighted by various ESSA partners during the first stages of the project. We adopt the classification operated by ESCO, which is based on skills 'reusability' (see Deliverable 4.3), that distinguishes between 4 levels:

1. Transversal
2. Cross-Sectoral
3. Sector-specific
4. Occupation-specific

It is also possible to add to these a fifth level of specificity that refers to Job/Task-Specific skills.

ESCO defines transversal skills (often referred to as core skills, basic skills or soft skills) as relevant to a broad range of occupations and sectors. Transversal knowledge, skills and competences are considered the building blocks for the development of the "hard" skills and competencies required to succeed in the labour market. Hence the importance that ESSA should place on them.

Cross-sectoral skills, according to ESCO, "are of growing importance all over Europe. They are relevant to occupations across several economic sectors". Sector-specific skills are specific to a particular sector but are relevant for more than one occupation within those sectors, while occupation-specific skills are usually applied only within one occupation and its specialisms. As mentioned above, it is also possible to move down to the level of task- or job-specific skills and define them as skills, competences and knowledge that is found in some practical incarnations of specific occupations.

There is a unidirectional transitive relationship between the four levels (that we can also define domain-specific): all of the skills that can be categorised as 'cross-sectoral' are, logically, sector-, occupation- and task-specific, but occupation-specific skills are not necessarily sector-specific or cross-sectoral skill.

Transversal skills can be instead defined as 'domain-independent', in the sense that their usefulness or applicability is not limited to a particular domain, sector, occupation or task.

Of particular interest at this stage of the analysis is what we would call the *degree of inclusivity* of the various skills provision routes. This is based on the relative number and diversity (in terms of belonging to potentially different domains of specialisms) of people passing through the different routes. The degree of inclusivity is inversely related to the degree of specificity with regard to the type of educational/vocational content that is transmitted. It allows us to state

that the more inclusive a skills provision route, the less domain-specific should the educational content be. The matrix reported in Deliverable 4.3 (table 1) shows graphically that transversal skills, which have been characterised as domain-independent, could be transmitted through any of the skill-provision routes, including formal school education. Moving to domain-specific skills, the most inclusive type are cross-sectoral skills, while job- or task-specific are potentially the most ‘niche’ of skills which potentially only very few people will have to master.

This ties in with the argument maintained above that the delivery of transversal (soft) skills requires longer programmes which allow building knowledge, skills and resulting competencies progressively, from general/transversal to domain-specific. This is coherent with a T-shape approach, where the horizontal segment encompasses theoretical non-domain specific knowledge and transversal skills (such as numeracy, literacy, communication, problem-solving, teamworking⁶) along with cross-sectoral ones, and the vertical segment corresponds to progressive quotas of sector-, occupation- and job-specific skills.

As also mentioned previously, it is likely that some transversal skills are more important than others in the sense that one requires the possession of some transversal skills to acquire other transversal skills (for example, the ability to communicate fluently in a natural language is fundamental to the acquisition of all sorts of other transversal skills). This assumption triggers a new research question about a possible hierarchy of transversal skills⁷. The most effective approach to building new specialised skills on the basis of well-established background knowledge and skills is crucial in the contemporary labour market, in which workers are required to possess a high degree of adaptivity and to be able to up-skill or re-skill timely to meet the requirements of the companies and preserve their employment opportunities (in so becoming more resilient).

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⁶ These skills are called core skills in the Scottish Qualification Framework and key skills in the English one, and are delivered also a standalone qualification.

⁷ To some extent school curricula already reflect this, so whether not explicitly formalised, it is possible to infer an hierarchy from school curricula’s organisation.

ESSA: Sector Skill Framework (Deliverable 4.5)

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