



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

Identification of National (Sector) VET Qualification and Skills (Regulatory) Frameworks for Steel

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SECTION I – Description of the deliverable and rationale

1.1 Description of the deliverable

This report focuses on VET characteristics, requirements and regulation in five countries selected from among the ESSA partnership (namely, Germany, Italy, Poland, Spain, UK).

The deliverable (D4.1) is one of the five outcomes of WP4 – *VET Requirements and Regulations/National VET Systems (relevant requirements and regulations for the Blueprint)*, which is aligned with, and is a continuation of, the research carried out in WP2 - *Technological and Economic Development and Foresight*, and WP3 - *(Company) Skills Requirements and Foresight (Skills, Knowledge, Competences; Work 4.0)*.

The report is aimed at providing a picture of regulatory aspects and essential characteristics of the selected countries' VET systems, with a special focus on VET provision related to the Steel Industry. The report is organised in four sections, as follows:

- I) Introduction: description of the deliverable and rationale
- II) Skills formation and VET systems
- III) National VET systems (UK, Germany, Poland, Spain and Italy)
- IV) Concluding remarks

The adopted approach is to move from some general considerations about globalization, market trends and technological innovation (which set the broad context for discussing the VET systems), to the process of *skills formation* and how this relates with vocational education and training in Europe. After this, the report outlines the main characteristics and regulative frameworks of the five selected VET systems¹, how they work and relate with the labour market, with a special focus on how national VET systems are able to connect with, and respond to, the requirements of the steel industry.

1.2 Rationale

The anticipation of skills demands and their integration into VET provision are two of the most challenging and ambitious objectives of ESSA. Identifying skill needs and demands allows building appropriate training and curricula and strategizing for the implementation of new vocational education contents across the sector. This requires a clear understanding of how VET systems currently work across Europe and are capable to provide relevant skills to the sector.

This report ties in strongly with the research conducted under WP2 and WP3, which has addressed the outcomes and consequences of market development and technological innovation on the steel industry, and the current and future skills forecast within the sector.

The research conducted under WP4 focuses on establishing the relevant regulatory framework, functioning and vocational routes of five national VET systems (in particular, as it applies to

¹ Here the concept of “system” is used in a general way i.e. to indicate that vocational education and training is a complex set of programmes, processes and regulation, embedded in a wider legal, political and economic framework, which is the nation-state.

the steel sector), and on setting out the patterns of relations between national VET provision and steel companies in the case study countries.

The logic for selecting the case studies was primarily theoretical (Mason 2002), implying that these have been selected because of their theoretical relevance and significance to the research questions addressed. What has guided the selection was their embodying different institutional layouts that influence the way vocational education and training is organized and carried out. Namely, the case study countries have been selected for their differences in terms of i) economic model, ii) skills formation approach, iii) overall organization. This will be further illustrated in section II (paragraphs 2.1 and 2.2).

A clarification of the terminology that will be used is required. In particular, it is essential for the purposes of this report to define what is intended by the terms *occupation*, *job*, *qualification*, *skill* and *competence*.

- An *occupation* is defined as the “set of jobs whose main tasks and duties are characterised by a high degree of similarity” (Cedefop 2014a, p. 186; ISCO-08).
- A *job* is defined as the “set of tasks and duties performed, or meant to be performed, by one person, including for an employer or in self-employment” (Ivi, p. 139; ISCO-08).
- A *skill* is the ability to carry out the tasks and duties of a given job (ISCO-08) and is more specifically intended as the “ability to apply knowledge and use know-how to complete tasks and solve problems” (Cedefop 2014a, p. 227). It is acknowledged, however, that the concept of skill is extensively debated and the definition provided above is selected to fit narrowly with the aims and objectives of the ESSA project².
- A *competence* is the ability to apply learning outcomes adequately in a defined context or to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development (Ivi, p. 47). The notion of competence is also highly debated, particularly in relation to skill³. The definition applied here, however, fits with aims and objectives of the ESSA project.
- The concept of *qualification* can cover a range of different aspects. As clarified by Cedefop (*Ibidem*), it can be intended as a *formal qualification*, which is defined as “the formal outcome (certificate, diploma or title) of an assessment process which is obtained when competent body determines that an individual has achieved learning outcomes to given standards and/or possesses the necessary competence to do a job in a specific area of work. A qualification confers official recognition of the value of learning outcomes in the labour market and in education and training and can be a legal entitlement to practice a trade” (p. 202). Furthermore, the term qualification can be also used to signify a *job requirement*, meaning in this case the “knowledge, aptitudes and skills required to perform specific tasks attached to a particular work position” (Ivi). From now on we will use the term *qualification* with the meaning of *formal qualification*.

² For a more extensive review of the concept and relevant scientific debates see Atwell (1990), Payne (2000), and Grugulis and Stoyanova (2011).

³ On the relationship between skills and competences see the distinction proposed by Boreham (2002) between process knowledge (skill) and mechanistic-reductionist (competence), and Clarke and Winch (2006).

1.3 Methodological note

The research conducted under this task has been based on a mixed method approach (or methodological triangulation⁴), combining an exploratory survey, documentary analysis and qualitative interviews.

The exploratory survey was aimed at understanding the experience of corporate partners with education and training as a basis for subsequent interviews. While documentary analysis is useful to set up an overall picture of the field(s) under investigation, qualitative interviews can add additional dimensions, or help to approach specific questions emerged from the documentary analysis from a different angle, or in greater depth (Mason 2002).

The five case study countries have been identified because of the specificities of their VET systems and for their representativity in relation to the European steel industry⁵.

In a first stage, an exploratory review was carried out in order to identify the main documentary references and to establish a conceptual structure for the report. In parallel, the survey was launched to start mapping the partners' expertise within the field of vocational education and training.

In a second phase, an extensive documentary analysis related to skills requirements, skills formation systems and European VET systems' regulatory frameworks has been carried out. The collected documents, which included scientific papers, institutional reports and national laws and regulations, have been systematized and integrated within the pre-defined structure of the report.

In a third step, moving from the results of the survey, qualitative interviews addressed to experts in the field of steel production and VET were conducted, in order to discuss, refine and further integrate the contents of the report.

1.4 A premise: global market integration, technological innovation and new skills requirements in the steel sector

Over the last decades, the conditions within which companies' business strategies were formulated have changed deeply. Thanks to the various outcomes of technological innovation (e.g. digitalization, cloud computing, smart technologies etc.), trans-national companies are now provided with options and opportunities for transforming their business models that were not available before (Ibarra *et al.* 2018). Furthermore, modularization of production processes, relocation of plants across the globe, extension of supply chains, all these changes are enabling trans-national companies to think in a different way not only about new production strategies, but also about how to shape and use skills to achieve a competitive advantage on the global market (Lauder *et al.* 2017).

⁴ Since the Seventies, the sociological tradition has witnessed a double understanding of what is the main aim of triangulation. On the one side, scholars such as Denzin (1970) have maintained a use of triangulation to test data convergence and increase data validity and reliability. On the other side, some scholars have maintained a different approach to triangulation, as a way to achieve a more detailed and rounded understanding of a phenomenon. In the latter interpretation, which is the one adopted here, methodological triangulation can "capture a more complete, holistic, and contextual portrayal of the unit(s) under study" (Jick 1979, p.603).

⁵ Germany, Italy and Poland are ranked as the first three countries in terms of employment share in the steel sector in the EU28, while Spain and the UK are respectively 6th and 8th.

Economic, digital and technological developments, plus increasing environmental concerns, are engaging the European Steel Industry with many challenges. As stated by Carl de Marè, Chairman of ESTEP, “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, p. iii). 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 (2019a), 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%. In 2017 the European Commission proposed anti-dumping measures on Hot Rolled Flat steel (HRF), but such measures were considered not effective, a “one-size-fits-all” measure⁶ that couldn’t work for a highly diversified product such as Hot Rolled Flat steel.

As the “ambition of the EU steel industry is to maintain and reinforce a global leadership, which is both sustainable and competitive, given the strong development in other parts of the world, notably Asia” (Estep 2017, p. iv), Estep has identified attracting and securing qualified people and enabling the digitalization of the steel sector as two of the core strategies for supporting the industry.

Embracing technological innovation is therefore recognised as a key to success for the sustainable future of the industry. However, technological innovation inevitably carries with itself the concern it can and will substitute human labour and destroy jobs (Cedefop 2018a). In a well-known paper, Frey and Osborne (2013) have stated that while computerization has so far been confined to routine rule-based tasks, algorithms can now enter in a wide range of non-routine cognitive-based activities. Furthermore, progress in robotics is allowing robots to perform an extended set of manual tasks. The model developed by Frey and Osborne has predicted a scenario in which “most workers in transportation and logistics occupations, together with the bulk of office and administrative support workers, and labour in production occupations” will be at risk” (Ivi, p. 44). Nevertheless, this position appears to be somehow biased, as it exaggerates the extent to which occupations can be automated (Cedefop 2018a). A McKinsey report (2017) has indeed highlighted that less than 5% of occupations are completely automatable, even though 60% of occupations include at least one automatable task out of three.

Although there is evidence that digitalization has contributed to the polarization of the labour market and to the erosion of jobs within the middle-skills range, automation allowed by robotics has mostly substituted jobs characterized by routine and non-cognitive tasks, while a sensible growth has been detected in high-skilled occupations and a moderate growth has also been detected in low-skilled non-routine jobs that require human interaction (Cedefop 2018a).

From an analytical point of view, technological innovation should be split between product and process innovation. Here, some studies have found product innovation to be labour-friendly, while process innovation to be more job-destructive (Harrison *et al.* 2008; Vivarelli 2014). However, these two components are often interrelated, and process innovation is not always linked with job loss as various market compensation mechanisms can counteract the unemployment effects of process innovation (Vivarelli 2015). Plus, the spread of ICTs has proved to be a major job driver in European economies, although not yet enough to absorb job loss due to automation (Berger and Frey 2016; Cedefop 2018a). Nevertheless, “technological progress and

⁶www.eurofer.org/News%26Events/Press%20releases/Press%20Release%20%20Minimum%20Import%20Prices%20for.fhtml

ICT technologies have not only created new, typically high-skilled jobs [...] they are also expanding possibilities for individuals to undertake more interesting and productive tasks at work and online, leaving the more routine activities to the robots best-equipped to do them” (Cedefop 2018a, p. 25).

Berger and Frey (2016), maintain that technological change has increased the demand for cognitive skills, at the same time reducing the demand for performing routine tasks. Digital innovation has made many occupations redundant and significantly altered the tasks composition in many jobs. At the same time, it has created new jobs, and “there is nothing to suggest that the digital revolution so far has reduced overall demand for jobs” (Ivi, p. 43). As a corollary of this, “investing in skill upgrading is a key policy lever not only to revive faltering productivity growth, but also to mitigate further unwanted increases in inequality while ensuring that ample economic opportunity is available to workers in the twenty-first century” (*Ibidem*).

The work done under WP2 of the ESSA project (Deliverable 2.1) shows how digitalization is affecting the European industry, aiming to increase efficiency and sustainability and reduce the environmental impact. In particular, the report points out that within steel production, technological developments are mostly impacting on the optimization of the production chain, and on decarbonization.

In particular, the report refers to the conclusions drawn in the Best Available Techniques (BAT) Reference Document for Iron and Steel Production⁷. Summarizing the document, D2.1 lists several issues and processes that are being affected by digitalization and smart technologies:

- a) Energy management
- b) Water and wastewater management
- c) Blast furnaces management
- d) Basic oxygen steelmaking and casting
- e) Pollution prevention

Furthermore, referring to the Research Fund for Coal and Steel (RFCS), which represents the most important programme for developing technologies in the European steel sector, Deliverable 2.1 has identified a number of projects dealing with specific processes and technologies that can be applied to the steel industry:

- a) Internet of things
- b) Big data analytics and cloud computing
- c) Robot-assisted production
- d) Production line simulation
- e) Self-organizing production
- f) Smart supply network
- g) Vertical/horizontal integration
- h) Predictive maintenance
- i) Cyber security
- j) Augmented work, maintenance and service
- k) Self-driving logistics vehicles

On the side of steel industry requirements in terms of skills and competences, the research conducted under WP3 has drawn a standardized *European steel family tree* which identifies the key departments (and processes) and job profiles within the steel industry. Each professional role profile has been broken down into a characteristic set of tasks and skills and a mission. The

⁷<https://ec.europa.eu/jrc/en/publication/reference-reports/best-available-techniques-bat-reference-document-for-iron-and-steel-productionindustrial-emissions>.

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task and skills identified include also a set of soft skills and digital skills, which are considered to become increasingly relevant in the coming years.

The skill set, for each job profile has been organized into 2 macro-areas and sub-areas, as follows:

- 1) technical, subject-related (divided into essential and optional)
- 2) transversal (divided into digital, social, individual and methodological)

All the above sets the background for the next sections of this report. It is important to highlight once more the circular approach that has informed this study and the rationale that underlies it. Technological trends and industry transformation impact on how skills are perceived from the companies in terms of relevance and need. As reported above, in a fast-changing context, characterized by strong global competition, continuous technological innovation and pressing challenges, investing in skills' updating and upgrading is a key strategical lever. At the same time, it is crucial to point out the challenges and opportunities this offers in terms of individual development and to identify to what extent national VET systems can adequately deliver the skills and competences required by the companies.

SECTION II – Skills formation and VET systems

2.1 Skill formation and European VET systems

The main aim of ESSA is to address industry skills demands and challenges (training, upskilling, re-skilling, retention and recruitment, etc.), in order to support a sustainable and competitive European steel industry.

Identifying skill needs and demands will allow building appropriate training and curricula and strategizing for the implementation of new vocational education contents across the sector. This requires an understanding of how VET systems currently work and provide skills to the sector in different European countries. The aim of this report is therefore to establish the relevant regulatory framework for VET systems in five European countries and to understand how the selected national VET systems practically deliver skills and competences to the steel industry.

It is important anyway to situate this analysis in a more general theoretical framework. Moving from a neo-institutionalist perspective, we maintain that the different traditions of European countries mark their institutional relations and shared ideology, generating a differentiated set of paradigms (Vallejo-Peña, Giachi 2018). Each country presents peculiar “institutional struggles that determine the dominance of a certain paradigm. This approach helps us to understand the different organizational models existing across countries and nations” (Ivi, p. 24). If we assume that different institutional contexts produce different approaches to the market, industrial relations, skills formation systems, and so on, then it is crucial to identify a set of case studies that embody these differences. A comparison between these is of great interest in the definition of a new skills agenda and strategy for the steel sector as it allows to learn from the best practices, to identify to what extent different VET systems are proactively facing the industry transformation, and what are the common criticalities.

Moving from this premise, the following paragraphs illustrate different types of institutional layouts (2.1.1) and different types of skills formation systems (2.1.2). Drawing on this, five case studies have been identified (United Kingdom, Spain, Poland, Germany and Italy) and will be examined in section III.

2.1.1 The socio-economic context of skill formation

As acknowledged by socio-economic research, skills formation has a variety of important outcomes for the economic system. Furthermore, scholars are aware that the development and availability of skills is not a matter of straight rational choices but is highly dependent on the actual political-economic context (Busemeyer and Trampusch, 2011).

In this regard, the seminal classification developed by Hall and Soskice (2001) has triggered a wide range of contributions within the fields of economic sociology and sociology of education. Hall and Soskice’s Varieties of Capitalism (VoC)⁸ typology distinguishes between Liberal Market Economies (LME) and Co-ordinated Market Economies (CME). The first are characterized by the primary role of the market in regulating economic dynamics. This leads to short-term strategies based on searching high returns on investments and short payback periods, and to low

⁸ The VoC framework is a wider discussion of the institutional similarities and differences among developed economies, which identifies the firm as the organising principle and is not singularly focused on skills formation. The VoC approach is also highly critiqued and contentious.

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trust relations between firms, and firms and institutional actors. CMEs, instead, are characterized by a solid state intervention over the market dynamics. Here firms are strongly linked with a wide range of social institutions, such as trade unions, employers' associations and the state. The outcome of this structural framework is that companies adopt more long-term strategies and are less dependent on financial markets, as they rely more on local banks.

Table 1 – Hall and Soskice VoC typology

	Liberal Market Economies	Coordinated Market Economies
Main form of coordination to overcome transactions costs and collective action problems	Mainly markets - but firms may also use also networks and hierarchies (in the case of vertical integration)	Predominantly negotiation through corporatist institutions (but sometimes also through networks, hierarchies)
Characteristic interaction among stakeholders	Predominantly spot exchange and short-term (but also reiterated exchange among networked firms and orders and directives in vertically integrated firms)	Predominantly longer-term institutionalised meetings (but also reiterated exchange, orders and directives where appropriate)
Firm characteristics	Dispersed stock ownership, specialised managerial corporations, predominantly competitive relations with other firms, limited participation in sectoral associations	Concentrated ownership, often bank-controlled, strong participation in sectoral associations, cooperative relations with other firms.
Employment and Industrial relations	Short-term, market-driven employment relations. Few unions (company unions rather than industrial unions)	Long-term, negotiated employment relations. Strong, encompassing unions, industrial-level bargaining.
Skills	General	Sector specific
Role of the state	Limited to ensuring property rights, key public goods and maintaining the institutional context of the liberal market economy	Committed to facilitating the institutional architecture of co-ordinated outcomes, providing supportive industrial, economic and labour-market policies for co-ordinated market economies
Comparative institutional advantage	Radical innovation, services	Incremental innovation, manufacturing
National cases	USA, UK	Germany, Scandinavia, Japan

Source: Natrass and Seekings (2010)

The institutional layout impacts also on how skills formation systems are organised. Culpepper and Thelen (2007, p. 24) have commented that the VoC model developed by Hall and Soskice “pays particular attention to the link between institutional structures and individual-level incentives, both for firms to train (or not) and for young people to acquire skills (and of what sort)”. Evans and Stroud (2016) point out that “the German ‘skills’ system is renowned for high levels

of industry-specific, engineering and technical skills, cultivated within firms and in the wider VET system” (p. 266), while the LME model “is seen as conducive to high risk processes of radical innovation, with a focus on a fluid labour market, a reliance on general skills and the production of goods requiring lesser skilled but lower cost labour” (Hall and Soskice 2001, p. 39). The UK, which is considered as one of the typical examples of LME, has been described as functioning with a low-skill/low-pay productivity equilibrium, and “voluntarist market-based training systems mean that there is little legal compulsion for employers to engage in skill enhancement” (Evans and Stroud 2016, p. 268). Furthermore, in LMEs, short-term financial strategies, weak employment protections and the tendency of firms to respond to market downturns by reducing workers encourage people to acquire more spendable general skills, rather than job-specific skills (Culpepper and Thelen 2007).

Nevertheless, some scholars draw a more differentiated picture of the strengths and weaknesses of the different systems (Thelen 2009). Some authors have pointed out that the German system is slightly unbalanced as it relies more on initial training (the apprenticeships) and less on further on-the-job training, and that it lacks certain high-end skills as IT and engineering (Crouch *et al.* 1999). Likewise, Green and Sakamoto (2001) maintain that describing the UK as a country characterized by a low-skills economy focuses too much on the manufacturing sector and overlooks the experience of several service companies that rely heavily on high-level skills.

Although Germany had been considered as the primary example of a coordinated market economy, in recent years the German labour market has experienced a transformation similar to that occurring in other EU countries. This transformation has produced a sectoral segmentation of the labour force (into core and peripheral groups) with differentiated protection, and the decline of trade unions’ power and collective bargaining. At the same time, the solid intermediate skills provision and plant-based vocational training, traditionally read as one of the strengths of the German system, has partially given way to a growth in tertiary and higher education (Doering *et al.* 2015).

It has been stated, however, that CMEs are also quite differentiated. In Scandinavian countries, for instance, as social-democratic welfare states, equality and opportunity play a greater role than in Germany, a Christian-democratic welfare state, that displays a highly differentiated school system and more social inequality (Bosch and Charest 2008).

The typology can be further differentiated. Drawing on Amable (2003; 2009), Vallejo-Peña and Giachi, for instance, adopt the idea of a Mediterranean model of capitalism to investigate the diversity of European countries in terms of labour productivity. From Amable’s (2009) perspective, the traditional binary opposition between CME and LME is too general to serve as an effective analytical framework. Too many countries are placed into the residual category of Mixed Market Economies (MMEs), which doesn’t provide any useful insight. Therefore, Amable (*Ibidem*) suggests a more nuanced typology:

- a) neo-liberal (or market based) capitalism
- b) continental European capitalism
- c) social-democratic capitalism
- d) Mediterranean capitalism
- e) asian capitalism.

These models of capitalism differ, *inter alia*, in terms of labour market and labour relations, social security and education and training systems (*Ibidem*). Amable describes the different models in the following terms:

- a) The market-based model relies on intense product-market competition that makes firms more sensitive to shocks and triggers higher flexibility of employment. Social protection is underdeveloped and there is little incentive to invest in specific skills since these

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would not be protected by the welfare state or by job security and a rapid structural change would quickly devalue them. In such a context, competition extends also to the education system, where colleges and universities compete among them for attracting the best students, and students for entering the best universities.

- b) The Continental European model combines a higher degree of employment protection and a less developed welfare state. Wage bargaining is coordinated and a solidaristic wage policy is developed. Productivity gains are obtained by labour-shedding strategies elaborated in complementarity with social protection.
- c) The social democratic model is characterized by a high degree of flexibility of the workforce: here the retraining of skilled workforce plays a crucial role in terms of adaptation. Other characteristics are a moderate employment protection, a high level of social protection, and an easy access to retraining thanks to active labour-market policies. Also, a coordinated wage-bargaining system enables a solidaristic wage setting which favours innovation and productivity.
- d) The Mediterranean model is based on more employment protection and less social protection than the Continental one. It relies on “a large set of family-based small firms, cross-participation in firms’ governance and the prominent role of the state in the economy” (Vallejo-Peña, Giachi 2018, p. 24). It is also characterized by a relatively low level of market competition and by a workforce with limited skills and level of education, which does not allow for the implementation of a high-skills/high-wages industrial strategy.

Other scholars, within the same research programme, have worked out more specific characterizations for other European areas that couldn’t fit the traditional LME/CME dichotomy. Nölke and Vliegenthart (2009), for instance, have focused on the East Central Europe countries (Czech Republic, Poland, Hungary and Slovakia) pointing out their difference in terms of political economic model compared to the other European countries. Nölke and Vliegenthart define the model developed within these countries as Dependent Market Economy (DME) type of capitalism. These countries are characterised by “comparative advantages in the assembly and production of relatively complex and durable consumer goods”, which are “based on institutional complementarities between skilled, but cheap, labour; the transfer of technological innovation within transnational enterprises; and the provision of capital via foreign direct investment” (Ivi, p. 672). This category tries to overcome some weaknesses of the traditional VoC framework, like underestimating the role of transnational organizations, and intends to highlight that “East Central European economies rely on the foreign capital much more than countries considered to be Liberal or Coordinated Market Economies” (Dudziak 2014). Because of their dependence on exogenous inputs in terms of innovation, DMEs don’t seem to have a strong need in investing in innovation-related skills (Nölke and Vliegenthart 2009). DMEs’ comparative advantages are not based on radical innovation (as LME), neither on incremental innovation (as CMEs), but rather on “an assembly platform for semi-standardized industrial goods” (Ivi, p. 679). Considering transnational companies, while the most innovative segments of the productive process usually remain at the headquarters, the fully developed technologies are transferred to subsidiaries in the DMEs and remain under the control of the corporate hierarchy (*Ibidem*).

2.1.2 Types of skills formation systems

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Following Becker (1993) skills can be divided into general and specific, with the first being fully transportable and spendable in a wide set of working contexts, and the latter being context-dependant and relevant only for the present job or for similar jobs in the same field.

As Thelen (2009) points out, the literature on skills formation and skills development refers mainly to three different levels, the micro-level of the individual worker, the meso-level of firms and the macro-level of economic systems. At the first level (micro), some studies have highlighted a relationship between education and training and wage (see, for instance, Ashton and Green 1996); at the meso level several studies have identified a relationship between skills development and firms' productivity and adaptation to new technologies (Black and Lynch 1996; Bishop 1994); at the macro level, scholars such as Acemoglu and Pischke (1998) have maintained the idea that training can work as an engine for economic growth and can be associated with lower levels of unemployment, as further highlighted also by Lippman (2002) in relation with countries with effective apprenticeships programmes.

Bussemeyer and Trampusch (2011), propose their own classification of skills formation systems. Moving from two analytical dimensions, the degree of firms' involvement in the provision of initial vocational training and the degree of public commitment to vocational training, they produce a 2 x 2 matrix that tries to capture the variety of training regimes. The identified types are:

- a) statist skill formation systems (high public commitment/low firms' involvement), such as Sweden or France. Here policy makers are committed to supporting VET as a viable alternative to academic higher education in order to foster the inclusion of people with weak academic qualifications into the labour market. In such systems, the involvement of employers is quite limited;
- b) liberal skills formation systems (low public commitment/low firms' involvement), such as the US and the UK. In these countries, skills formation is guided through, and provided by, the market and within general education. The general education system provides qualifications that are usually integrated by internships and on the job training. In such countries there is also a considerable asymmetry between the value of academic and vocational paths;
- c) collective skill formation systems (high public commitment/high firms' involvement), such as Germany or Netherlands. These are characterized by a strong commitment of both the state and firms to the formation of vocational skills. Here a high share of firms is available to support the costs of training and intermediary associations (employment associations, trade unions etc.) play a relevant role in the definitions of the VET framework. A relevant characteristic of these systems is that they provide standardized, certified and portable skills that can be spent across the whole country;
- d) segmentalist skill formation system (low public commitment/high firms' involvement), such as Japan. Here, a high share of firms is supportive in providing further training to their employees through job rotation schemes, on-the-job and off-the-job training both in-house and in vocational schools.

Lauder *et al.* (2017) try to systematize the literature on skills formation parting it into two main streams, that of *universal theories* of skills formation and that of *particularistic theories*. The first includes the *human capital theory* (Becker 1993), which states that there is a strong correlation between the level of education and training of an individual, his productivity and income. This hypothesis has three implicit assumptions (Lauder *et al.* 2017): a) that individuals are highly motivated to pursue higher levels of education and training as this will correspond to higher levels of income; b) that employers will always hire the most skilled workers; c) that employers will respond to upskilled workers by investing in technological innovation. Another *universal theory* is the *skill bias theory* (Acemoglu 2002), which maintains that technological

innovation endogenously drives the demand for upskilled workers. These two universal theories share the same background assumption that demand will directly respond to supply.

Both theories have been criticized as they fail to recognise that the relationship between productivity and income and employers' response to the supply of educated labour is not always linear and that technology can be skills replacing rather than skills biased (Lauder *et al.* 2017).

As for *particularistic theories*, these assume that the process of skills formation is embedded in the specific institutional framework and societal structures of the different countries. One of these is the *societal effect approach* (Maurice *et al.* 1986), which highlights the strong influence of national institutional configurations on the type and distribution of skills within a country.

The VoC theory also belongs to this stream. However, considering the economic trends related to globalization and the reconfiguration of the global economic and productive layout, some scholars have raised the question whether what is being characterized by the VoC approach is not so much overall national economies but rather specific economic sectors within them (Lauder *et al.* 2017).

Gospel (2013) identifies three broad sets of perspectives on workforce development and skills formation, characterized by a specific political stance: liberal/pluralists, leftist and rightist.

The assumption in liberal/pluralist systems, based on neoclassical economic thought, is that individuals can freely trade their labour as a commodity and that market is the best social institution for organizing skills formation. A corollary of this assumption is that the parties (workers and employers) share a roughly equal contractual power and that there is perfect information about labour market trends.

The leftist perspective explicitly criticises the first maintaining that owners of capital and workers share unequal contractual power and that employers will only train where there is an actual interest for them in doing so, or when they are forced to do so. Leftist systems have been historically associated with central planning, and they have been criticised for their lack of flexibility in responding to skills shortages or skills gaps.

Lastly, the rightist perspectives have historically emphasized the harmony between national interests, enterprise and community. This perspective's narratives have maintained the idea that the central government and national employers knows the best interest of workers and should intervene to plan skills formation and development, with a specific focus on national enterprises' needs.

2.1.3 Skill mismatches

Besides theoretical classifications, any assumption on *skills formation* must deal with the issue of *skills mismatch*, which is at the core of the ESSA project. The goal of this phase of the research is indeed to identify to what extent national formal systems of vocational education and training can deliver skills that are considered highly valuable by the companies.

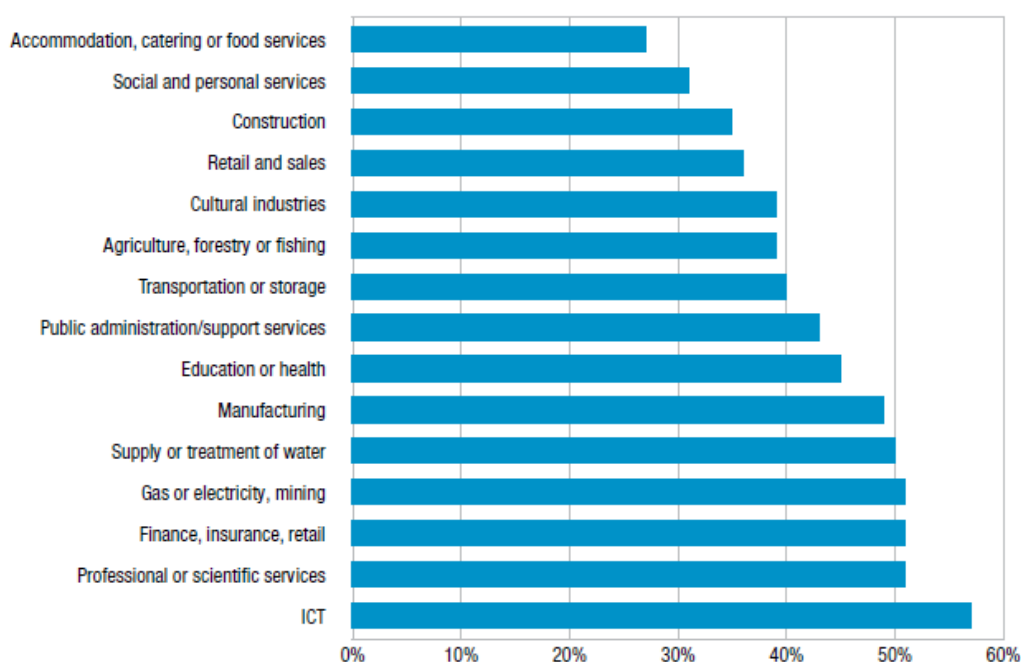
A preliminary clarification is necessary, as the concept of skills mismatch is quite broad and encompasses several dimensions (McGuinness *et al.* 2017), such as:

- a) vertical mismatch (measured in terms of overeducation, undereducation overskilling and underskilling)
- b) skill gaps
- c) skill shortages (measured in terms of unfilled and hard-to-fill vacancies)
- d) field of study (horizontal) mismatch
- e) skill obsolescence.

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Albeit the idea of a perfect and complete skills matching is a chimera and a certain degree of mismatch is to be considered as not surprising in a dynamic economy, the European Skills and Jobs Survey (ESJS) carried out by Cedefop have highlighted that “skill shortages that genuinely arise due to an absence of job-ready candidates affect Europe’s most innovative, internationally competitive and dynamically growing enterprises, posing productivity and growth constraints” (Cedefop 2018a, p. 13). However, it is also pointed out that institutions should not only focus on employers’ issues in finding the required skills, but also on the unrecognised and underutilised skills that are already available in the labour market: in this perspective, “policy-makers must carefully distinguish the part of skill shortages that may be mediated by adapting/reforming publicly funded VET systems from that which can be best tackled by a wider set of labour market and other policy reforms” (Ivi, p. 15).

Figure 1 - Share of adult employees who experienced changes in technologies used in the workplace by economic sector, 2010-2014, EU-28



Source: CEDEFOP, European Skills and Jobs Survey

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Table 2 – Share of adult employees who experienced changes in the technologies used in the workplace by occupation, 2010-2014, EU-28

Occupation	% of group	Occupation	% of group
ICT technician/Associate professional	67%	Legal, social and cultural professional	40%
ICT professional	60%	Skilled agricultural worker	40%
Science and engineering associate professional	57%	Assembler	40%
Production or specialised services manager	55%	Agricultural, forestry and fishery labourer	40%
Health professional	55%	General or keyboard clerk	38%
Electrical and electronic trades worker	55%	Street and other sales or services worker	38%
Science and engineering professional	51%	Street or related sales/services labourer	37%
Business and admin associate professional	50%	Teaching associate professional	36%
Stationary plant or machine operator	50%	Protective service worker	36%
Administrative or commercial manager	48%	Driver or mobile plant operator	36%
Hospitality, retail or other services	48%	Skilled forestry, fishery and hunting	35%
Teaching professional	48%	Other skilled trade (building, crafts or related trade)	35%
Health associate professional	48%	Sales worker	33%
Legal, social and cultural associate professional	48%	Labourer in mining, construction, manufacturing (building, crafts or related trade)	32%
Handicraft and printing worker	48%	Another building and related trades worker	31%
Metal, machinery and related trades worker	46%	Labourer in mining, construction, manufacturing (elementary occupations)	31%
Business and admin professional	44%	Personal services worker	27%
Other associate professional	44%	Personal care worker	27%
Chief executive, senior official or legislator	43%	Food preparation assistant	27%
Other clerical support worker	43%	Other elementary worker	22%
Customer services clerk	41%	Agricultural, forestry and fishery labour	18%
Numerical and material recording clerk	41%	Cleaner or helper	12%

Source: Cedefop, European Skills and Jobs Survey (ESJS)

As shown in Table 2, 46% of European metal, machinery and related trades workers have experienced, between 2010 and 2014, changes in the technologies used in the workplace. A significant part of these changes is likely to be ascribed to the introduction of new digital technologies. Nevertheless, it has been stated that individual 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 2018a). Hence the relevance of soft and transversal skills must be underlined in the development of new VET programmes.

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As a general trend, Gospel (2013) highlights the shift from primary and secondary sector to advanced manufacturing and tertiary, following the reconfiguration of economic and industrial structures. As for the type of required skills, the trend points towards a higher requirement of both “hard” technical/digital skills and “soft” social skills (*Ibidem*).

The overall reconfiguration of skill formation and provision that has been going on in the last decades is likely moving towards a polarization of skills and workforce, “with skills overall increasing, but increasing fastest in top-end jobs and least in lower-end jobs where there may also be deskilling” (Ivi, p. 30).

In recent years Cedefop has launched, in cooperation with the European Commission’s Directorate-General for Employment, Social Affairs and Inclusion, the Skills Panorama initiative, through which it aims at improving the EU’s capacity to assess and anticipate skill needs, improving responsiveness to labour market changes, and more effectively match skill demand and supply .

From a general perspective, the document “Skills Forecast: key EU trends to 2030” estimates a growth of about 6% in jobs (an average growth rate of about 0.4% per year, starting from 2016), for a total number of 151.337.000 job openings 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, in consistency with the shift towards a business services economy. As regards 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.

As regards specifically metal and machinery workers, Cedefop’s European Skills and Jobs Survey (ESJS) identifies as key skills for the workers in the sector job-specific skills, problem solving, teamwork, learning and communication.

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.

Employers in Bulgaria, Germany, Latvia, Hungary, Malta, Netherlands, Austria, Slovakia and the United Kingdom are encountering (or have encountered) difficulties in finding qualified workers. On the other side, Greece, Italy, Portugal and Slovenia are experiencing a surplus of workers in this sector.

Medium-level qualifications will still represent the higher share of the workforce, though about 9% of the future workforce is expected to hold higher qualifications (a significative increase from the past).

Technological change is recognised as a major driver of transformation of the workforce composition, both at the level of production and maintenance. Future metal and machinery workers should be able to set up, operate, monitor and maintain automated systems, and will need to

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possess sufficient entry level digital skills that should be kept up to date, at pace with technological progress.

2.2 Brief overview of VET systems in the five countries⁹

This section provides a brief outline of VET systems in the five case study countries, focusing on their overall structure and essential characteristics. Drawing on the theoretical classifications presented above (paragraphs 2.1.1 and 2.1.2), and driven by a theoretical sampling approach¹⁰ (Mason 2002), we have selected five European countries that embody the main features of the typologies proposed by scholar and different ways to organise the skill formation and delivery system.

Table 3 – Categorization of the case studies

Country	Economic model	Skills formation system	Functional organization
Germany	Coordinated Market Economy (Hall & Soskice 2001)	Collective (Busemeyer and Trampusch 2011)	Dual system
	Continental European Capitalism (Amabel 2003; 2009)		
Italy	Mixed Market Economy (Hall & Soskice 2001)	Statist → (collective) (Busemeyer and Trampusch 2011)	Regional
	Mediterranean Capitalism (Amabel 2003; 2009)		
Poland	Dependent Market Economy (Nölke and Vliegenthart 2009)	Statist → (collective) (Busemeyer and Trampusch 2011)	Centralised
Spain	Mixed Market Economy (Hall & Soskice 2001)	Collective (Busemeyer and Trampusch 2011)	Company oriented
	Mediterranean Capitalism (Amabel 2003; 2009)		
United Kingdom	Liberal Market Economy (Hall & Soskice 2001)	Liberal (Busemeyer and Trampusch 2011)	Market oriented
	Neo-liberal Capitalism (Amabel 2003; 2009)		

In the perspective of the ESSA project, a comparison between this case study countries is significant as they provide practical examples of how different institutional contexts have generated different economic models, labour markets and skills formation systems, that are structurally coupled with the industry in different ways. Identifying the main characteristics of the VET systems in these countries, their mechanisms and the way they serve the industry and adapt to

⁹ This paragraph draws mainly on Cedefop (2019a), *Spotlight on VET 2018*, and OECD (2015), *Reviews of Vocational Education and Training*.

¹⁰ Mason defines theoretical sampling as a form of “strategic sampling” that implies selecting groups or categories to study on the basis of their theoretical relevance and significance to the research questions to be addressed.

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social change provide substantial insights to the design of the Sectoral Blueprint, which is the main outcome of ESSA.

The national VET systems will be analysed extensively in Section III, also highlighting the steelworks-related formal qualifications (IVET) offered in the countries.

2.2.1 Germany

The German dual system is based on the cooperation between the State, companies and social partners. It 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 (BMBF) 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.

The main pillar of the German VET system is the apprenticeship scheme at upper secondary level (EQF 4) that leads to a professional qualification. An alternative is 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 qualifications as that of craftsperson, technician or specialist, and confers the right to start an independent trade and to hire apprentices. As for adult learning and continuing education and training (CVET), the German system offers courses for unemployed people and vulnerable groups, training courses held by private providers and training for employees. One of the main strengths of the German VET system is considered to be the high engagement of employers and other social partners. 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 (OECD 2015). Nevertheless, two criticalities have been highlighted: the career guidance and the regulation of exam quality seem to be quite variable across the *Länder* without a clear standard; moreover, as the school performance is not taken into account in the Chamber exam (at the end of the apprenticeship), students may not take their schooling seriously, in so limiting their opportunities for moving into tertiary education (*Ibidem*).

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).

2.2.2 Italy

The Italian VET system is characterized by a 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*) (Cedefop 2018b).

Compulsory education in Italy is free and lasts 10 years (up to age 16); furthermore, learners have the right/duty (*diritto/dovere*) to stay in education or vocational training until age 18 to obtain a high school diploma or a vocational qualification (at least within a 3 years vocational programme) (*Ibidem*).

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At upper 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 of professional operator (3 years) or a technician diploma (4 years). Such programmes are school based but may be also delivered through an apprenticeship scheme.

There is permeability across the different programmes and it is possible to move from a vocational programme to a general education one or to a vocational or technical school-based programme after the completion of a whole cycle (Cedefop 2018b).

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*).

Continuing vocational training (CVET) is provided by private sector and/or regional institutions.

2.2.3 Poland

The Polish VET system is structured into a three-levels governance, national (ministries), regional (school superintendents) and county (governing schools). The Ministry of Education is in charge for 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.

The overall education system is currently undergoing a deep reform, started in 2017, that will be finalised in 2022. This will bring a substantial restructuring of the primary and secondary education programmes, mainly transforming the current six years primary education in a 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 upper and post-secondary level is mainly school based, similarly to other European countries such as France and Sweden. 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.

Regarding adult learning and CVET, this is available in continuing education centres, practical training centres, further training and professional development centres and VET schools (*Ibidem*). The Polish system offers programmes for unemployed and other vulnerable groups, training in crafts and specialised programmes for employees.

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*).

2.2.4 Spain

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In Spain, two different VET systems have been developed, respectively by the education authority and by the labour authority (Cedefop 2016b).

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 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 (*Ibidem*).

The education authority VET was reformed in 2013, introducing basic VET and easier access to intermediate VET. The reform has also introduced the possibility to acquire IVET qualifications through dual track schemes.

Compulsory education is free and lasts up to age 16. Basic school-based VET programmes are available from the last year of compulsory education (age 15) and last two years. After completing these, students may move forward to intermediate VET, or move to upper secondary education after passing the compulsory education final exams. Intermediate VET programmes usually begin at age 16, last two years, and allow access to higher VET programmes. Intermediate VET programmes lead to the acquisition of technician qualifications. At the tertiary level, higher VET programmes allow learners to acquire an advanced technician qualification.

Learners who have completed the compulsory education may also shift to employment authority VET, which runs in parallel with the education authority one. Employment authority VET is structured into three levels that award a professional certificate. These programmes can work both as IVET or CVET, depending on the background of the learner (*Ibidem*).

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.

Over the last years, reforms have been carried out to improve the permeability of the VET system and the access to post-secondary education. Furthermore, a recent reform has aligned the VET diplomas with individual competences which are now certified together with the completion of the diploma (OECD 2015).

2.2.5 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 founded by government agencies up to age 18, but adult learners can apply for grants and loans (Cedefop 2017b).

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.

Within school-based programmes, strictly vocational curricula exist alongside curricula that combine general education with vocational elements. Apprenticeships are based on a formal

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work contract and usually include a vocational qualification and core transversal skills (literacy, numeracy, ICT).

In general, the duration of the vocational courses varies from 1 to 4 years, depending on the specific field and contents of the curriculum.

Permeability between VET and general education is well established as candidates holding vocational qualifications at upper secondary level can access tertiary university programmes (though at discretion of the institution) (*Ibidem*).

It is relevant to highlight that the UK qualifications have already in place the main components (units of learning outcomes, credits) to implement the European Credit system for Vocational Education and Training (ECVET)¹¹ (*Ibidem*).

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 (*Ibidem*).

The UK general education and VET provision is divided and organized in several national qualifications framework, 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) (Abusland 2019).

Most of the UK countries are undergoing a review and update of formal qualifications. The qualification regulator in Wales (Qualifications Wales), for instance, is currently reviewing and reforming vocational qualifications in each major economic sector in order to find out whether current qualifications are effective in meeting the needs of learners as well as addressing the needs of companies.

Apprenticeship frameworks have been reformed as well. In England most apprenticeship frameworks are currently being replaced by new standards developed by groups of employers since 2015/16. In Wales, a review of the apprenticeship frameworks is currently considering issues such as design and accreditation of apprenticeships, how to move more apprenticeship above EQF 2 level, how to make all apprenticeships occupationally specific and how to include key competences and Welsh language. In Northern Ireland, traineeships at EQF3 and apprenticeships from EQF 4 to 8 are currently being piloted. These new apprenticeships will last at least two years and training will be increased in terms of occupational range and introduced at higher education level.

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 (*Ibidem*).

¹¹ See also paragraph 2.3.2, Deliverable 4.2 "Analysis of cross-European VET frameworks and standards for sector skills recognition".

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As regards adult learning and continuing education is part of the formal education system, but it is also offered as non-formal training by employers (Cedefop 2017b). The VET system includes community learning programmes for unemployed and vulnerable people and further training for employees.

SECTION III – National VET systems (case studies)

3.1 Italy

3.1.1 Italian Steel sector

In 2017, Italy was confirmed as the second largest steel-producing country in Europe, after Germany, and the first in terms of recycling of ferrous scrap, thus playing a strategic role for the country's overall economy, supporting and feeding the entire supply chain of manufacturing (Federacciai 2018). Such result is even more appreciable considering that 2017 has known critical situations for Italian Steel, such as the international problem of unfair competition or dumping, or purely national critical situations such as the cases of Taranto¹² and Piombino¹³.

In 2016 there were 41 sites for steel production in Italy, of which 39 electric arc furnaces, 2 oxygen converters and 3 blast furnaces (Federacciai 2017).

Table 4 – Steelmaking plants in Italy (2016 data)

ROUTE	AREA
Blast Furnace	(Piombino)
	Taranto
	Trieste
Oxygen Converter	Piombino
	Taranto
Electric ARC Furnace	Aosta
	Bergamo
	Bolzano

¹² The plant located in Taranto is the most important site for steel production in Italy. The project was launched by the state company Italsider in 1960 and the plants started the production in 1964. During the Eighties, the steelmaking sector was affected by a macro-economic crisis and Italsider was subsequently broken down and privatised. The Riva group acquired the Taranto site in 1995 and re-nominated it ILVA, but in 2012 the plant was put under external administration after a judiciary investigation for pollution and environmental crimes. In 2018, after a public call, the plant was leased to ArcelorMittal under an agreement with the Italian government that included a plan for relaunching the site, at the same time modernising it and improving the environmental conditions of the surrounding area. On November 2019 ArcelorMittal made public the intent to rescind the contract for the lack of the legal guarantees promised by the Italian government and to return the company to the external administration.

¹³ The steelworks located in Piombino was the first blast furnace plant in Italy. It was launched in 1905 and its early fortune was linked to the development of the Italian railways, of which it was a major supplier. Between WWI and WWII the plant was nationalised and in the Sixties it became part of the state company Italsider. The Piombino site was privatised again in 1992 with the acquisition by the Italian company Lucchini. In 2005, the majority of the shares of the Lucchini company was acquired by the Russian group Severstal'. After a further period of crisis and stop of the production, the plant was acquired in 2015 by the Algerian Cevital and in 2018 by the Indian company Jindal South West.

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	Brescia
	Catania
	Cremona
	Cuneo
	Padova
	Potenza
	Reggio Emilia
	Torino
	Terni
	Trento
	Udine
	Varese
	Verona
	Vicenza

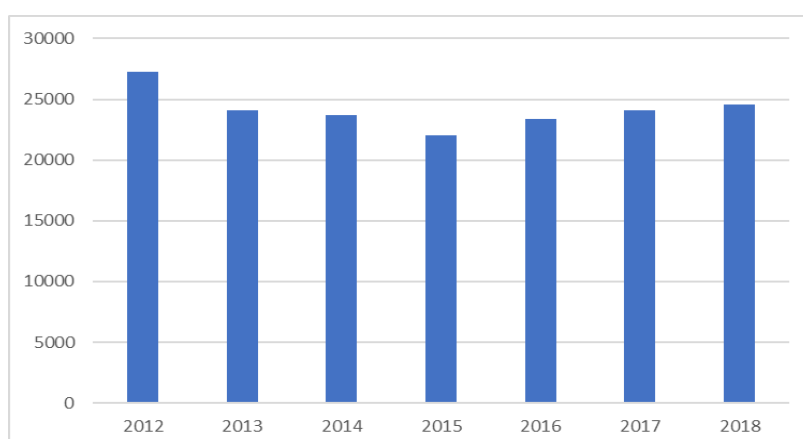
Source: Federacciai 2017

At the end of 2017, the number of employees in the primary steel industry moved from 34,226 in 2016 to 33,668 workers, with a loss of 558 jobs over the previous year, confirming the downward trend in progress since 2008. Between 2008 and 2017, the Italian steel sector lost around 6,000 employees (*Ibidem*).

Since 2009 (after a loss of 10 million tonnes) the industry struggled to recover the previous levels of production. After a partial recovery in 2010 and 2011, there has been a new decrease in production output, up to a minimum of 22 million tonnes in 2015, from which a steady recovery began again, which continues even today¹⁴.

¹⁴ www.econopoly.ilsole24ore.com/2018/10/23/industria-siderurgica-italiana-acciaio/

Figure 2 – Italian total crude steel production (all qualities) in metric tonnes



Source: Eurofer data

The sectorial outcome however is heavily influenced by local crisis at company and plant level, the most important of which is currently that of Taranto (see footnote 13). Should the plant in Taranto be closed, that would cost in a loss of 6 million tonnes at full capacity, quantifiable in an economic loss of about 24 billion euros. Given that in 2017, according to Istat¹⁵ data, the Italian GDP was estimated at around € 1.725 billion, the closure of the former Ilva would count for a loss of about 1,4% of Italian GDP. To this should be added the loss of employment that currently counts 8.200 workers in the Taranto plants¹⁶. Furthermore, without the production made in Taranto, there would be a heavy imbalance in favour of steel imports of.

Table 5 – Metal workers in Italy by educational level (2018)

Compulsory Education	VET	High School Diploma	University Degree	Total
29.710 (22,2%)	56.610 (42,2%)	41.190 (30,7%)	6.480 (4,8%)	133.990 (100%)

Source: Excelsior Unioncamere

3.1.2 Italian VET system and steel sector related qualifications¹⁷

In Italy, Law 53/2003 establishes for young people the right and duty (*diritto/dovere*) to pursue their education for at least 12 years before their 18th year and that they should not leave education and training without a qualification. 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:

¹⁵ Italian Institute for Statistics

¹⁶ www.corriere.it/economia/aziende/19_novembre_04/ilva-chiusura-costa-24-miliardi-l-italia-perderebbe-l-14percento-pil-6aca2b02-ff12-11e9-aa9d-60f7e515e47b.shtml

¹⁷ This paragraph is mainly based on INAPP *et al.* (2016). Vocational education and training in Europe – Italy. Cedefop ReferNet VET in Europe reports.

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- 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

At post-secondary level, people have the further opportunity to opt for higher technical training (IFTS, ITS) and short training courses (post-IeFP). VET courses also exist at higher education level.

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 planning, organization and provision of IeFP courses, ITS, IFTS, post-IeFP, post-higher education, apprenticeships and CVT activities;
- d) the 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.

In 2010, the overall reform of secondary level education and training has entered into force. Secondary education is divided into five-year school-based courses (high schools, technical schools, professional schools) and VET programmes, of regional competence. It is now possible to fulfil the obligation of education and to exercise the right and duty to education and training both in the five-year school-based education and in the three-year or four-year VET courses (IeFP).

In 2013, the National Repertoire of Educational and Vocational Qualifications was established by the Legislative Decree No. 13 on the definition of a general regulation for the recognition and validation of non-formal and informal learning and minimum standards of the national system of certification of competences. According to the Decree, the Repertoire is the unitary framework for the certification of competences through the progressive standardization of the essential elements of education and training certificates (including vocational education and training). The National Repertoire consists of all the education and training certificates and vocational qualifications issued in Italy by an authorised institution or following an apprenticeship contract. The National Repertoire thus recomposes the system of qualifications issued in Italy with reference to the following subsets: university, secondary school, education and vocational training, national framework of regional qualifications, apprenticeship.

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 level, as they are included in a specific national Repertoire, shared between State and Regions through the Agreements of 27 July 2011 and 19 January 2012¹⁸. The repertoire has been recently updated again through the State-Regions Agreement of August the 1st 2019.

¹⁸ <https://www.istruzione.it/archivio/web/istruzione/dg-ifts/area-iefp.1.html>

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The IeFP courses are carried out by VET centres accredited by the Regions, according to criteria shared at national level, or by the vocational schools, in a subsidiarity regime¹⁹.

Technical and Vocational School programmes are aimed at providing the learners with knowledge, skills and competences to carry out technical or administrative tasks (in case of *istituti tecnici*), or qualified tasks in production fields of national interests (INAPP *et al.* 2016).

Technical schools offer a solid scientific and technological cultural background, favouring the development of skills that allow immediate access to 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.

Technical institutes enhance the combination of science and technology to foster the growth of a culture of innovation. There are two sectors, economic and technological, in which the programmes are divided (see table 3). Each course has a duration of five years divided into two two-year periods and a fifth year. At the end of the five-year course, students take the state exam and obtain a secondary school diploma.

With the legislative decree n. 61 of the 13th April 2017 the vocational schools have become territorial schools of innovation, conceived as laboratories of research, experimentation and didactic innovation.

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 (see table 4).

Table 6 – Steel-related technical school (*istituti tecnici*) programmes

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

Source: Ministry of Education, University and Research

Table 7 – Steel-related vocational school programmes (*istituti professionali*)

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

Source: Ministry of Education, University and Research

¹⁹ Supplementary subsidiarity means the possibility, for the students enrolled in the reformed five-year courses of vocational schools to acquire, at the end of the third year, also the corresponding professional qualification. Complementary subsidiarity means that the students enrolled in the vocational schools can obtain the relevant VET qualifications and or diploma in special classes expressly activated.

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Regional IeFP programmes last 3 or 4 years and end with the professional qualification of operator (EQF 3) and/or the diploma of technician (EQF 4) in a specific field.

The Italian regions issue qualifications and diplomas recognised at a national level, as defined in the National Classification of Professional Roles. The repertoire of IeFP qualifications is made of 22 qualifications and 21 diplomas. Table 5 provides a list of national IeFP qualifications and diplomas related to the steel industry (though 4-years courses that lead to diplomas haven't been yet activated in all the regions) (INAPP 2019).

Table 8 – Steel-related qualifications and diplomas in IeFP programmes

VET Qualifications (Operator)	VET Diplomas (Technician)
1. Chemical production operator (8131)	1. Building specialist
2. Building operator	2. Electrical specialist
3. Electrical operator	3. Electronic specialist
4. Electronic operator	8. Specialist in running and maintaining automated systems
5. Thermohydraulic plants operator	9. Industrial automation specialist
6. Mechanical operator (8121)	12. Enterprise services specialist
7. Logistics services and systems operator	19. Heating plants specialist

Source: CEDEFOP, based on the State-Regions agreement of 27th July 2011.

As INAPP report (2016) points out, regional training centres seems to be more effective in tackling school drop-out than professional institutes, this “mainly thanks to the didactical approach, work based learning and the connection with the labour market which are typical of training institutes” (Ivi, p. 24).

Data provided by INAPP show a divide between northern and southern Italy in terms of IeFP routes: while northern regions seem to rely more on VET centres for the delivery of such IeFP courses, in southern regions these are mainly delivered through vocational schools in subsidiarity regime (see footnote 17). This can be explained considering the density of industrial districts in northern regions and the embeddedness of VET centres in the industrial fabric (INAPP 2019).

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 organized by schools, vocational centres, universities and companies.

IFTS programmes were first introduced with Law 144/1999 (art. 69) and then reformed by Ministerial Decree of the 25th January 2008. IFTS are coordinated at regional level and are organized in 800-1000 hours courses, of which at least 30% to be spent as an internship in a company. Access requirement is the possession of a 5-years school diploma or a 4-years VET diploma. At the end of the program the candidate achieves a higher technical specialization certificate (EQF 4). Regional programmes are defined by a National Repertory which includes 20 technical specializations (see table 3) that are linked with specific technological areas that have been defined as strategic for the country.

Table 9 – IFTS technical specializations

Professional Area	Title of the Specialization
Manufacturing and Handicraft	Techniques for manufacturing of made in Italy products
Mechanics, Plant and Constructions	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
Culture, Information and IT	Techniques for designing and developing IT applications
	Techniques for the integration of TLC systems
	Techniques for database design and management

ITS programmes have been introduced with the Ministerial Decree of the 25th January 2008. The Interministerial Decree of the 7th February 2013 has also contributed in defining the governance and the organization of the programmes (both IFTS and ITS). ITS are higher technological specialization schools, coordinated at central level by the Ministry of Education, University and Research (MIUR). 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. To access these courses, it is required the possession of a 5-years school diploma, or a 4-years VET diploma plus the accomplishment of an IFTS course. The completion of the programme leads to a higher technical diploma (EQF 5). The ITS programmes refer to the following 6 areas:

- a) Energy efficiency
- b) Sustainable mobility
- c) New technologies for life
- d) New technologies for made in Italy
- e) Innovative technologies for arts and cultural activities
- f) ICT

The rationale of the IFTS and ITS system established through the 2008 reform is to offer a consistent and integrated route for training at secondary and post-secondary level (*filiera lunga della formazione professionale*) to those learners willing to further specialise and increase their

professional skills (INAPP 2019). The set-up of two complementary highly technical and technological programmes represents the attempt of the country to establish a highly specialized training system, capable of matching the growing need of increasingly specialized labor on the side of companies.

IFTS and ITS programmes could also support the transition to Industry 4.0 paradigm offering up-to-date and valuable skills to the industry (the “new technologies for made in Italy” area was indeed the most relevant one in 2017 with a total of 46 courses out of 97).

As regards apprenticeship schemes, there are currently three types of apprenticeship scheme in Italy:

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

As for the first scheme, it is addressed to people aged 15-25 and it allows them to fulfil their right/duty (*diritto/dovere*) in terms of education and training. These schemes are regulated by the State-Regions conference agreements, they last three or four years and offer 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 fit to 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 qualification²⁰.

The third type of apprenticeship 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 in order 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. This type of contract offers employers the opportunity to include and build specialist skills in their staff, which can leverage innovation and productivity.

The severe crisis faced by the country in the period 2008-2014 has encouraged the central government to devise new mechanisms of integration between the labour market and the education and training system. The experience of dual systems in continental Europe has shown that these are more effective in tackling the effect of economic crises on employment levels and to reduce the gap between companies' requirements and young workers' competences. Moving from these considerations, the Italian government has introduced in 2015 some principles of the dual system in general education and VET (INAPP 2019) envisioning an “Italian way to dual system”. The main three instruments through which the dual system currently runs in Italy are the school-work alternance (*alternanza scuola-lavoro*), the simulated educational enterprise (*impresa formative simulate*), which refer to general education, and the reformed apprenticeships, as described above. The 1st and 3rd type apprenticeships, poorly implemented in recent years, were relaunched through the Legislative Decree no. 81/2015 (art. 43), the Legislative Decree

²⁰ A full list of apprenticeship contracts and relevant qualifications can be found on the Atlas of Jobs and Qualifications (Atlante del Lavoro e delle Qualificazioni) developed by INAPP at the following link: https://atlantelavoro.inapp.org/atlante_professioni.php

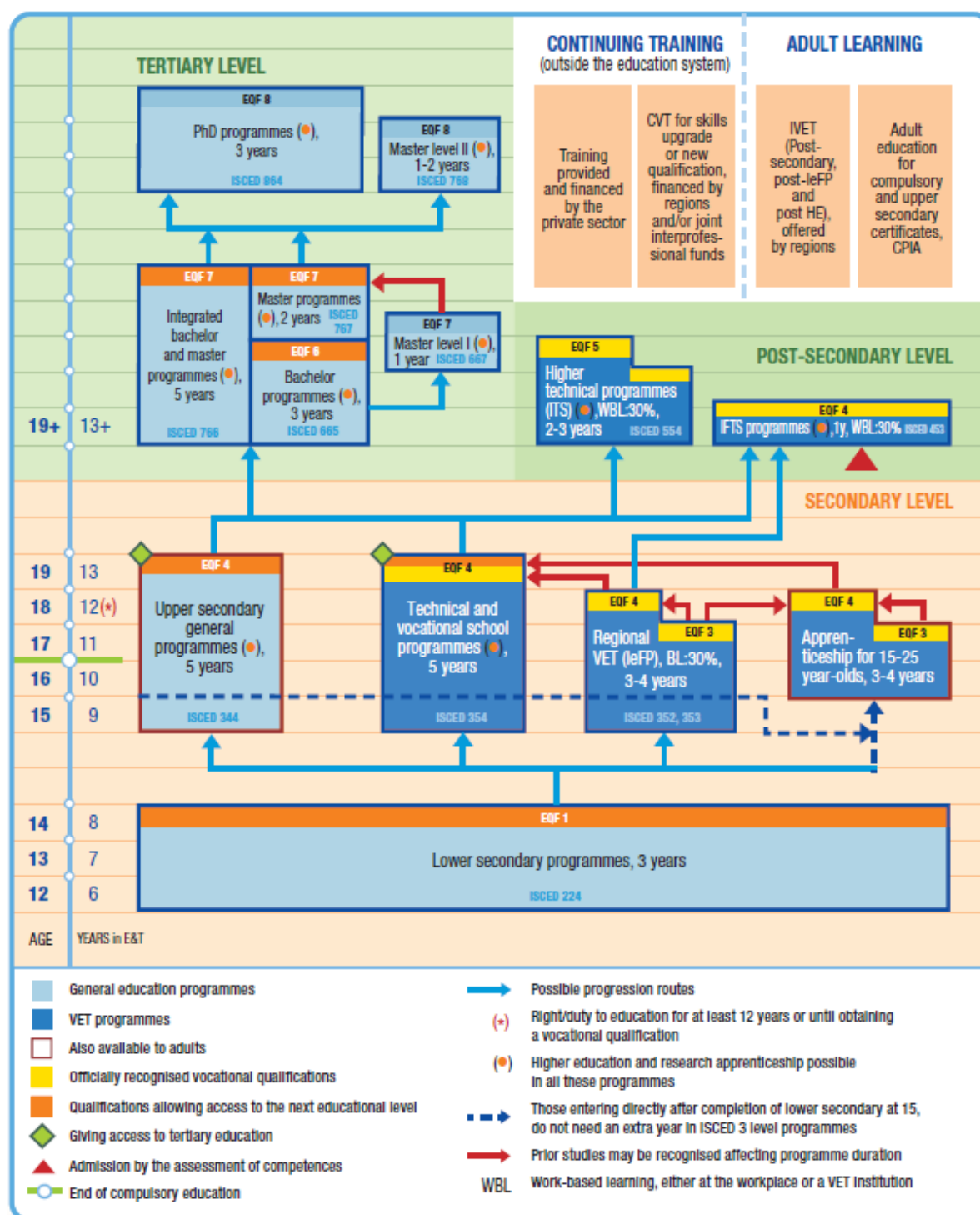
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n. 150 of the 24th September 2015 and the Interministerial Decree of 12 October 2015 (on training standards and general criteria for the realization of the courses in apprenticeship). The new regulatory framework expands the qualifications achievable through the 1st type apprenticeship, sets limits for training outside the company and establishes tax incentives aimed at encouraging companies in recruiting of young people aged 15 to 25.

The dual system in Italy took shape also with the signing of the State-Regions Agreement of the 24th September 2015 which hinges the dual system on the vocational education and training system by recalling the essential levels of performance, the training and organizational standards, the repertoire of current qualifications and professional diplomas and those relating to first apprenticeship level.

The implementation of the dual system piloting was transferred to the regions, as these are responsible for VET policies. The data reported by INAPP (2019) depicts a scenario in which the dual system appears well enough established in those regions with a stable and long-lasting VET offer (namely, north-east and north-west regions), while it appears to be struggling in regions with a less rooted VET culture (Central and Southern regions).

Figure 3 - General Education and VET system in Italy



Source: Cedefop and ReferNet Italy.

Considering IVET, Cedefop data (2017a) show that Italy's performances are slightly higher than the European average. The percentage of IVET students at upper-secondary level in Italy is higher (55.8%) than the EU average (47.3%) and the share of upper secondary IVET students with access to tertiary education (80.7%) is also well above the EU average (66.7%).

On the other hand, as for continuing vocational training, the share of adults involved in lifelong learning programmes is lower (8.3%) than the European average (10.8%), with older adults with a low level of educational attainment and unemployed adults less likely to engage in LLP.

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In 2010, the average of Italian employees involved in continuing training programmes was still slightly below (36%) the EU average (38%) and 11% of Italian employees were involved in on-the-job training, compared with an average of 20% of Europe as a whole (*Ibidem*).

Considering the production sector, recent surveys have shown a significant turn in terms of on-the-job training in Italian companies. In 2015, 60,2% of Italian companies with at least 10 employees have put into place training activities for their workers. Though in the European 2015 ranking Italy is still 22nd within EU28, the data is relevant because it represents the highest value since 1993 (INAPP 2019).

Considering CVET and adult learning, each of the 20 Italian regions have consolidated a regional repertoire of vocational qualifications (though there is a strong convergence between the different regional repertoires) on the basis of which short term courses (usually between 100 and 900 hours) are activated free of charge for a limited number of unemployed young adults (between 18 and 35 years usually) and founded by European funds (ESF), the Ministry of Work and Social policies, and regional funds.

Some regions have activated specific projects in order to address the issue of skills mismatch and to deliver up-to-date skills to the industry. Tuscany has, for instance, activated the Digital Industry (*Fabbrica Digitale*) project, through which are organised and delivered courses such as the “Technician of installation activities, programming and maintenance of programming systems and control of industrial production” course (*Tecnico delle attività di installazione, programmazione e manutenzione di sistemi di programmazione e controllo della produzione industriale*²¹).

Table 10 – Metalworks regional qualifications (Apulia, Tuscany)

Apulia - Metalworks		Tuscany - Metalworks	
Qualification	ISCO 08	Qualification	ISCO 08
Machinery tooling, welding and welding processes quality control operator	Minor Group 721: Sheet and Structural Metal Workers, Moulders and Welders, and Related Workers	Processing, construction and repair of mechanical parts operator	Minor Group 723: Machinery Mechanics and Repairers Minor Group 722: Blacksmiths, Toolmakers and Related Trades Workers Minor Group 812: Metal Processing and Finishing Plant Operators Minor Group 313: Process Control Technicians

²¹ <http://www.toscanaformazione.net/cms/firenze-tecnico-delle-attivita-di-installazione-programmazione-e-manutenzione-di-sistemi-di-programmazione-e-controllo-della-produzione-industriale/>

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Construction, processing and repair of machinery parts operator (Mould shop)	Minor Group 722: Blacksmiths, Toolmakers and Related Trades Workers	Electrical plants maintenance operator	Minor Group 741: Electrical Equipment Installers and Repairers
Maintenance of electrical plants operator	Minor Group 741: Electrical Equipment Installers and Repairers	Maintenance of production machinery operator	Minor Group 723: Machinery Mechanics and Repairers
Maintenance of production machinery operator	Minor Group 723: Machinery Mechanics and Repairers	Machine tooling, welding and quality control of welding processes operator	Minor Group 721: Sheet and Structural Metal Workers, Moulders and Welders, and Related Workers
Maintenance manager	Minor Group 214: Engineering Professionals (excluding Electrotechnology) Minor Group 311: Physical and Engineering Science Technicians	Planning and carrying out maintenance interventions and preparing and checking the maintenance budget	Minor Group 214: Engineering Professionals (excluding Electrotechnology) Minor Group 311: Physical and Engineering Science Technicians
Computer-based industrial product design with technician (CAD drawing)	Minor Group 311: Physical and Engineering Science Technicians	Design technician of industrial products by information technology	Minor Group 311: Physical and Engineering Science Technicians
Automatization of production processes technician	Minor Group 311: Physical and Engineering Science Technicians	Production process automation technician	Minor Group 311: Physical and Engineering Science Technicians
Industrial products design technician	Minor Group 311: Physical and Engineering Science Technicians	Industrial product design technician	Minor Group 311: Physical and Engineering Science Technicians
Mould design technician	Minor Group 311: Physical and Engineering Science Technicians	Mould design technician for product production	Minor Group 311: Physical and Engineering Science Technicians
Production planning technician in the short, medium and long term	Minor Group 311: Physical and Engineering Science Technicians	Production planning technician in the short, medium and long term	Minor Group 311: Physical and Engineering Science Technicians

Source: Italian regional national repertoires of qualifications

As concerns labour market requirements and skills anticipation, an important reference is the “Excelsior information system for employment and training” and the “National Repertoire of Educational and Vocational Qualifications”.

The Excelsior system was established in 1997 as the result of a partnership between the Italian Union of Chambers of Commerce, Industry, Craft and Agriculture, and the Ministry of Labour.

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The system provides national and local data about job offer and job demand as well as professional and educational demand on the side of enterprises by economic sector.

Excelsior aims at monitoring the prospects for work demand and the professional requirements, as well as training and skills needs expressed by companies. It is considered one of the largest surveys envisaged by the National Statistical Program and represents the most complete information device available in Italy for monitoring the professional and training needs of companies.

3.2 United Kingdom

3.2.1 UK Steel Sector

Eurofer data for 2018 show the UK at the seventh position in the EU ranking for crude steel production, with a share of 4.3% and an output of 7.2 million tonnes (Eurofer 2019b). In the same year, the steel sector displayed a direct employment of 15,811 workers (*Ibidem*). Data show a sensible fall in production compared to 2014 when the production was about 12 million tonnes. In September 2015, the UK steel industry faced an important crisis, that led to reduction in capacity, or closure in some cases, of important plants²² located in England, Scotland and South Wales, with a loss of about 7,000 jobs (Rhodes 2018).

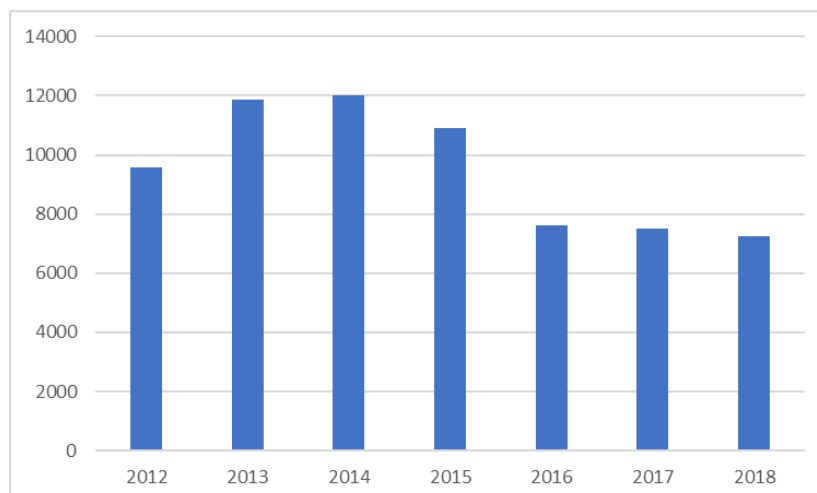
Table 11 – Steelmaking plants in the UK

Blast Furnace and/or Oxygen converter	Scunthorpe
	Port Talbot
Electric ARC Furnaces	Cardiff
	Newport
	Rotherham

Data show that the steel sector economic performance is in countertrend with the overall UK economic performance, which has increased by 68% from 1990 to 2015, while the steel sector has decreased of about 40%, moving from a weight of 0.4% on the whole economy to the 0.1% of 2016 (*Ibidem*).

²² The steelworks in Redcar, since 2011 property of the Thai company Sahaviriya Steel Industries, was closed in 2015 in consequence of the drop of steel prices, causing a loss of about 2,000 jobs. The steelworks in Scunthorpe, formerly owned by Tata Steel, was mothballed at the end of 2015 and then reopened as British Steel (owned by Greybull capital) in 2016. On May 2019 British Steel was placed into insolvency process. The collapse of the company was ascribed by the Chief Executive to a combination of weak market demand, high raw material prices, the weakness of sterling and uncertainty over the outcome of Brexit. In November 2019, the UK has announced the acquisition of the assets by the Chinese company Jingye, an acquisition that should safeguard about 4000 jobs at risk in the scenario of the closure of the Scunthorpe plants. Jingye is currently planning to invest about 1.2 billion pounds in British Steel over the next decade, including upgrading, lowering emissions and improving energy efficiency.

Figure 4 – UK total crude steel production (all qualities) in ‘000 metric tonnes



Source: Eurofer

3.2.2 UK VET system and steel sector related qualifications²³

Skills development of the current and future workforce is recognised as a priority of all four UK countries and is a joint responsibility of the UK Government and devolved administrations of the UK.

Vocational education and training is available in the UK at both secondary and tertiary level, from EQF levels 2 to 7, although most qualifications are taken at levels 3 and 4. School-based programmes that combine general education with vocational elements exist alongside broad VET programmes and specialist programmes.

In the four UK nations, skills are delivered through a range of organisations within the technical and vocational education and training (TVET) sector. These organizations are mainly:

- Schools, set at the lower secondary level and deliver core skills and vocational courses addressed mainly to young people from 14 to 18.
- Further Education Colleges (FE), which are the most important VET institutions in the UK and deliver vocational, core, enterprise and employability skills at secondary and tertiary level. Learners are predominantly young people 16 years old and upwards, but FE includes also a large number of adult learners.
- Universities
- Private Training Providers, these mostly deliver vocational and employability skills and offer courses for young people over the age of 16.
- Employers, which often provide on and off the job training and the opportunity for skills and competences update and upgrade.

The UK general education and VET provision is divided and organized in several national qualifications framework, 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:

²³ This paragraph is mainly based on Abusland (2019), Vocational education and training in Europe: United Kingdom, Cedefop ReferNet VET in Europe reports 2018.

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- 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.

Table 12 – UK Qualifications frameworks

Framework	Responsible Authority/Regulator
RQF	<ul style="list-style-type: none">• Office of Qualifications and Examinations Regulation (Ofqual)• Council for the Curriculum, Examinations and Assessment (CCEA)
SCQF	<ul style="list-style-type: none">• Scottish Credit and Qualifications Framework Partnership
CQFW	<ul style="list-style-type: none">• Welsh Government
FHEQ	<ul style="list-style-type: none">• Quality Assurance Agency for Higher Education (QAA)

Source: Cedefop and ReferNet UK

As shown in Figure 3, the UK VET system is organized in a complex set of institutions and processes that includes providers, awarding organizations, funding bodies, qualification regulators, inspection agencies and employers' associations.

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.

Their role is to design and develop qualifications, to approve and monitor centres to offer qualifications to the required standards, to ensure that assessment is carried out in a way that is fair, valid and reliable and conforms to the rules, and to ensure equality of access to qualifications²⁴.

The Regulated Qualifications Framework (RQF) currently recognises 225²⁵ qualification awarding bodies (in England and Northern Ireland). Qualification Wales recognises a total number of 98 awarding bodies²⁶, While the Scotland Qualifications Authority (SQA) recognises 38 awarding organizations²⁷.

Figure 5 – UK Technical and Vocational Education and Training system organization

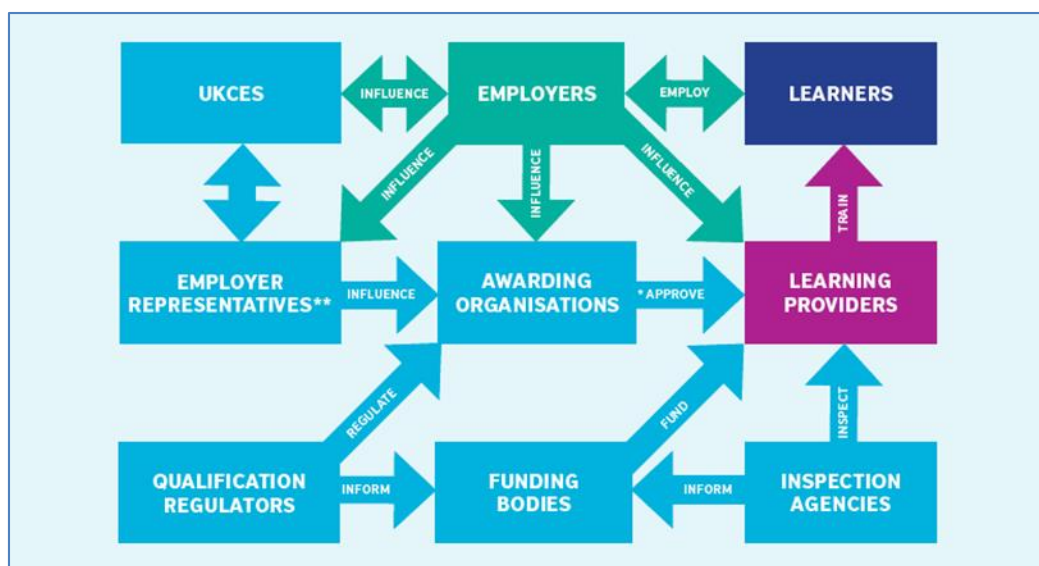
²⁴ https://eacea.ec.europa.eu/national-policies/eurydice/content/national-qualifications-framework-93_en.

²⁵ <https://register.ofqual.gov.uk/Search?category=Organisations&sort=relevance-None> (accessed October 14th 2019).

²⁶ <https://www.qualificationswales.org/english/our-work/regulating-awarding-bodies/directory-of-awarding-bodies> (accessed October 14th 2019).

²⁷ https://accreditation.sqa.org.uk/accreditation/Awarding_Body_Approval/Approved_Awarding_Bodies (accessed October 14th 2019).

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Source: British Council

Table 13 – UK policy-making authorities

England	• Department for Education (DfE) – all levels of education
Wales	• Welsh Government – all levels of education
Scotland	• Scottish Government – all levels of education
Northern Ireland	• Department of Education (DE) – schools and teacher training • Department for the Economy – further education colleges and higher education

Source: Cedefop and ReferNet UK

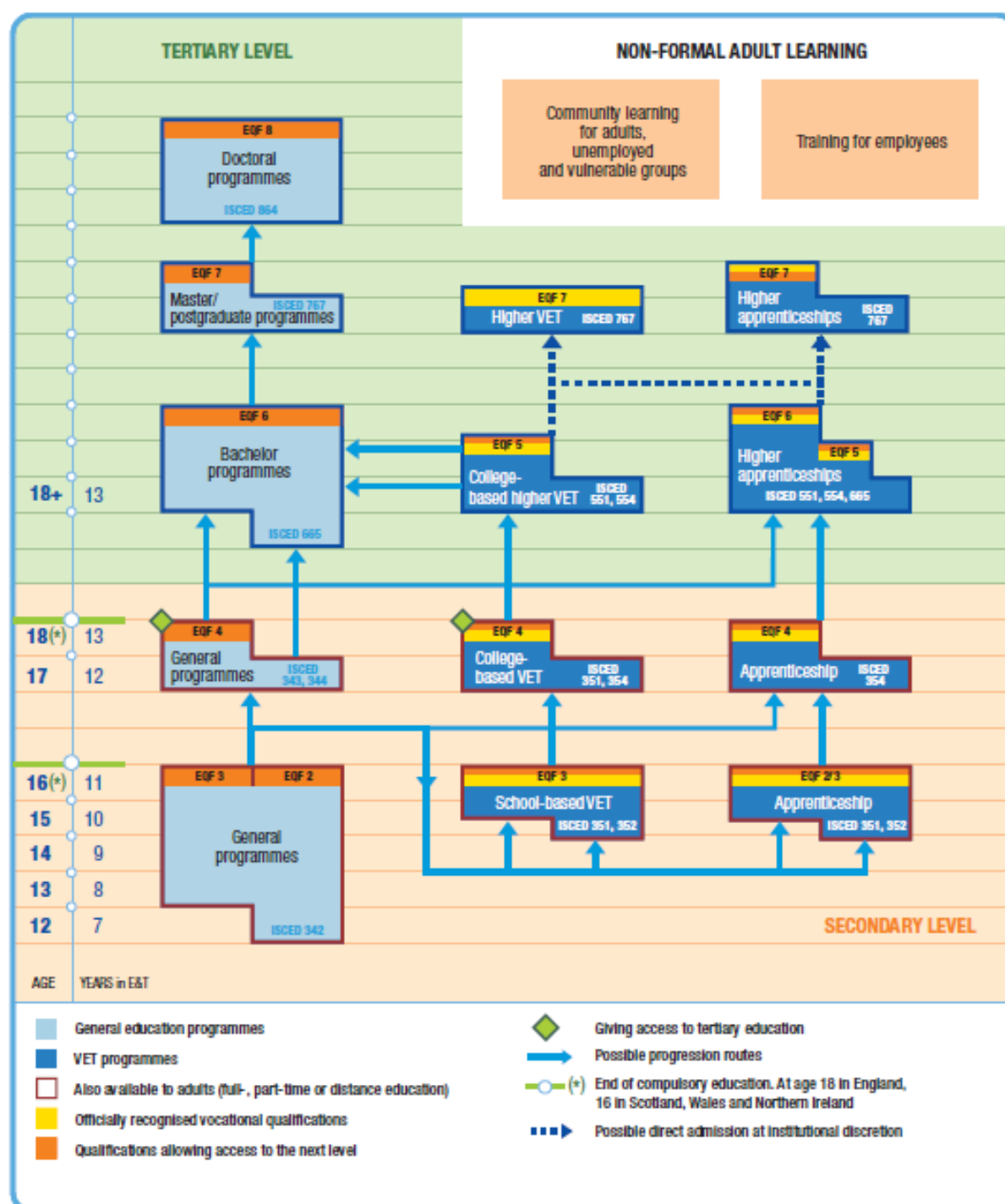
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Table 14 – UK VET providers

England	<ul style="list-style-type: none"> • Schools/academies – general academic and vocational secondary education • Further education colleges – secondary and post-secondary VET • Independent training providers – secondary and post-secondary VET • Higher education institutions – higher vocational education
Wales	<ul style="list-style-type: none"> • Schools – general academic and vocational secondary education • Further education institutions – secondary and post-secondary VET • Colleges – secondary and post-secondary VET • Higher education institutions – higher vocational education
Scotland	<ul style="list-style-type: none"> • Schools – general academic and vocational secondary education • Tertiary colleges – secondary and post-secondary VET • Private training providers – secondary and post-secondary VET • Higher education institutions – higher vocational education
Northern Ireland	<ul style="list-style-type: none"> • Schools – general academic and vocational secondary education • Further education colleges – secondary and post-secondary VET • Private, community and voluntary sector providers – secondary and postsecondary VET • Training organisations - secondary and post-secondary VET • Higher education institutions – higher vocational education

Source: Cedefop and ReferNet UK

Figure 6 – General Education and VET system in the UK



Source: Cedefop and ReferNet UK

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).

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The Scottish Qualification Authority (SQA) recognises also the certification of “Workplace Core Skills”, which are broad, transferable skills specifically developed to assess core skills in a work environment²⁸. They contribute to employability and are a component of Modern Apprenticeships in Scotland. The five Workplace Core Skills are: communication; numeracy; ICT; problem solving; working with others. Each Workplace Core Skill is available from SCQF level 3 to 6.

The British Department for Education is currently working on the development of new technical study programmes in England, T levels (EQF 4), with the aim 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.

T Levels will be based on the same standards as apprenticeships, designed by employers and approved by the Institute for Apprenticeships and Technical Education and will include the following compulsory elements:

- a technical qualification, which will include core theory, concepts and skills for an industry area alongside with specialist skills and knowledge for an occupation or career
- an industry placement with an employer
- a minimum standard in maths and English

Table 15 – T Levels prospective steel-related subject areas

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

Source: Department for Education

²⁸ <https://accreditation.sqa.org.uk/accreditation/Qualifications>

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It should be pointed out, however, that some have reported doubts²⁹ about the capacity of T Levels to engage employers on a large scale and to usher in equality between vocational training and higher education, considering them as the umpteenth attempt to systematise and relaunch vocational training offer in England. Another concern regards the number of enrolments necessary to sustain the programme, as it is questioned whether there will be enough students (particularly at colleges outside large urban areas) to make some of the pathways viable.

As regards VET in Wales, the qualification regulatory body in Wales (Qualifications Wales) is currently reviewing and reforming vocational qualifications in each major economic sector in order to find out whether current qualifications are effective in meeting the needs of learners as well as addressing the needs of companies.

At EQF 5 level VET is mostly delivered through non-degree higher education qualification, usually under the requirement of the completion of a EQF 4 programme in school or VET college. These programmes are addressed to learners starting from 18 years old but may be also completed by people already employed looking for a career progression.

The entry in such programmes is at the discretion of the college, guided by the awarding body and provides qualifications such as BTEC Higher Certificates and Diplomas, and NVQs in England, Wales and Northern Ireland, and National Progression Awards, National Certificates, Professional Development Awards and SVQs in Scotland.

In England, a review of post-18 education in England was launched in February 2018 in order to identify mechanisms to help people make more effective choices between the different options available after the age of 18.

VET programmes available at EQF level 5 usually require the possession of an academic degree or of a non-degree higher qualification. Previous work experience in the specific field of the qualification is also taken into account and entry is allowed by the discretion of the college guided by the awarding organization. These programmes usually involve people already employed looking for career progression. The qualifications delivered at this level, include BTEC Professional qualifications, such as Extended Level 7 Diplomas along with NVQs and SVQs.

Table 16 – List of most common Qualifications in England, Wales and Northern Ireland

Qualification	Description
BTEC – Business and Technology Education Council	<p>Specialist work-related qualifications that combine practical learning with subject and theory content. BTEC qualifications are available from entry level through to professional qualifications at level 7 (equivalent to postgraduate study). BTECs are designed for young people interested in a particular sector or industry but who are not yet sure what job they'd like to do.</p> <p>It is possible to study a BTEC at Level 2 or 3, either alongside academic qualifications or as part of a wider programme (such as an apprenticeship) or as a standalone course. Relevant sectors: applied science,</p>

²⁹ See the following articles: <https://feweek.co.uk/2018/05/15/what-are-the-biggest-problems-with-t-levels>; <https://www.prospectmagazine.co.uk/politics/a-top-education-official-has-warned-that-t-levels-are-a-problem-he-is-right>; <https://www.theguardian.com/education/2018/jun/12/t-levels-vocational-qualifications-forgotten-delayed>.

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	business, construction, engineering, ICT, land-based ³⁰ .
Apprenticeship	<p>All apprenticeships include elements of on the job and off the job training, leading to industry recognised standards or qualifications. Some apprenticeships also require an assessment at the end of the programme to assess the apprentice's ability and competence in their job role. Apprenticeships are available to anyone over the age of 16, living in England and have no upper age limit.</p> <p>There are different entry requirements depending on the industry, job role and apprenticeship level³¹.</p>
Foundation degree	<p>Foundation degrees focus on a particular job or profession and are ideal for who is unsure about taking a full degree or study while work. Opportunity to gain professional and technical skills within a shorter time frame than a full degree.</p> <p>They usually take two years full-time to complete. It is possible to continue for a further year to gain a full honours degree³².</p>
HNC – Higher National Certificate & HND – Higher National Diplomas	Higher National Certificates (HNCs) and Higher National Diplomas (HNDs) are work-related, or vocational, higher education qualifications. They are Level 4 and Level 5 qualifications respectively. Relevant areas: computing and IT, construction and civil engineering, engineering, business and management ³³ .
AS level & A level	<p>An 'advanced level' or A-level is a qualification offered across a range of subjects to school-leavers (usually aged 16-18 years old).</p> <p>A-levels are studied across two years: AS year (Year 12) and A2 year (Year 13).</p> <p>Usually, students study four subjects in their AS year; drop one, which they achieve an AS-level in; continue with the other three in their A2 year to achieve full A-levels in these³⁴.</p>
Applied general	Applied general qualifications are level 3 qualifications for post-16 students who want to continue their education through applied learning ³⁵ .
GCSE – General Certificate of Secondary Education	A General Certificate of Secondary Education (GCSE) is a qualification normally taken by most UK students at the end of compulsory education. It takes

³⁰ <https://www.ucas.com/further-education/post-16-qualifications/qualifications-you-can-take/btec-diplomas>

³¹ <https://www.gov.uk/government/publications/a-guide-to-apprenticeships>

³² <https://www.ucas.com/undergraduate/what-and-where-study/choosing-course/foundation-degrees>

³³ <https://www.nidirect.gov.uk/articles/higher-national-certificates-and-higher-national-diplomas>

³⁴ <https://university.which.co.uk/advice/a-level-choices/how-are-my-as-and-a-level-studies-structured>

³⁵ <https://www.gov.uk/government/publications/2019-performance-tables-technical-and-vocational-qualifications/applied-general-qualifications>

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	two years (final exams when at 16). The equivalent in Scotland is Standard Grade. GCSEs are an important stepping stone for both getting a job or continuing studying. Except for compulsory subjects, the subjects available to study at GCSE level depend on the school. Relevant examples: business studies, engineering, manufacturing ³⁶ .
NVQ – National Vocational Qualification	The NVQ is a work-based qualification which recognises the skills and knowledge a person needs to do a job. The candidate needs to demonstrate and prove competency in the chosen role or career path. NVQ's cover a wide range of subjects for almost every occupational area in every business sector ³⁷ .
VRQ - Vocationally Related Qualifications	These are nationally-recognised, vocationally-related qualifications (VRQs) which provide the essential knowledge to do a job. Many Level 2/3 VRQs are an essential component of the Sector Skills Council's Apprenticeship framework. ³⁸
Key Skills	<p>Key Skills are transferable skills that can be studied as part of a full-time or part-time course at school or an FE college. There are no minimum entry requirements and can be studied alongside other types of qualifications such as GCSEs.</p> <p>Subjects: communication, application of number, information and communications technology (ICT), working with others, improving own learning and performance, problem solving. Each Key Skill is assessed separately³⁹.</p>

As for apprenticeships, these are available in the UK from secondary to tertiary level, from basic to advance and higher apprenticeship schemes.

Table 17 – UK Apprenticeship schemes

EQF	England	Wales	Scotland	Northern Ireland
8	Higher Apprenticeships	Higher Apprenticeships	Professional Apprenticeships	Higher Level Apprenticeships
7	Degree/Higher Apprenticeships		Professional/Graduate Apprenticeships	
6			Professional/Graduate Apprenticeships	
			Technical/Graduate Apprenticeships	

³⁶ <https://www.brightknowledge.org/education/gcses-explained>

³⁷ <https://www.vocationaltraining.org.uk/nvq-overview>

³⁸ <http://www.imiawards.org.uk/Qualifications/Information/VRQs>

³⁹ <https://www.nidirect.gov.uk/articles/key-skills-qualifications>

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5	Higher Apprenticeships		Technical/Higher Apprenticeships	
			Modern Apprenticeships	
4	Advanced Apprenticeships	Apprenticeships	Modern/Foundation Apprenticeships	Apprenticeships
3	Intermediate Apprenticeships	Foundation Apprenticeships	Modern Apprenticeships	Apprenticeships/ Traineeships

Source: Cedefop ReferNet UK

Apprenticeships are typically structured in 80% on-the-job training and 20% classroom learning and is 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 competences and Welsh language.

In Northern Ireland apprenticeships are also being reformed. Traineeships at EQF3 and apprenticeships from EQF4 to 8 are currently being piloted. These new apprenticeships will last at least two years and training will be increased in terms of occupational range and introduced at higher education level.

Apprenticeship schemes from EQF 2 to 4 are usually addressed to young people, but apprentices may also be adult learners, who may also be already employed. Entrance requirements to apprenticeships usually vary depending on the specific field and the competition for some apprenticeship places can be strong.

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.

As for apprenticeships at level EQF 4, these may be completed at age 18, but many apprentices are adult learners who may already be employed before starting the programme. VET Entrance requirements to apprenticeships may vary depending on the occupational area and the level of the apprenticeship scheme. Competition for some apprenticeships is strong and good secondary qualifications at EQF 3 level in English and mathematics may be required.

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EQF 5 level higher apprenticeships are addressed to adult people (above 18), many of whom may already be employed. Entry requirement for these non-degree higher education qualifications is usually the possession of an EQF 4 qualification from school or college in either vocational or academic subject areas. Entry is allowed at the discretion of the college guided by the awarding body.

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).

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 an HND qualification (EQF 5), or a bachelor's degree (EQF 6) leading to professionally recognised qualifications.

Higher apprenticeships at EQF 7 display the same requirements and characteristics of other degree apprenticeships at EQF level 6. At the completion of these programmes, an apprenticeship certificate may be awarded along with a master's degree.

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.

In England, the current apprenticeship schemes related to steelworks mainly fall under the broad area of “engineering and manufacturing”⁴⁰ and are mainly regulated by three authorities: Instructus, ProSkills and SEMTA⁴¹.

Instructus is an issuing authority for occupations in air conditioning, building services engineering, business and administration, cleaning, customer service, digital/information technology, electro technical, electrical and electronic servicing, enterprise and business support, facilities management, heating and ventilating, housing, human resources and recruitment, industrial relations, leadership and management, marketing and sales (also includes contact centres and third sector), plumbing, property and refrigeration.

Proskills is the issuing authority for for occupations in printing, mineral extraction and processing, health and safety and process and manufacturing of furniture, glass, ceramics, coatings and paper (also includes glazing, building products, wood and mining).

⁴⁰ <https://www.gov.uk/government/publications/a-guide-to-apprenticeships>

⁴¹ <http://www.afo.sscalliance.org/frameworks-library/index.cfm>

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SEMTA is the issuing authority for occupations in science, engineering and manufacturing technologies.

Below a list of apprenticeship frameworks that could serve the steel sector (table 14):

Table 18 – Steel sector related apprenticeship frameworks

Framework	Issuing authority	Level
Metal Processing and Allied Operations (Operator and Semi-skilled) (Wales)	SEMTA	2
Mineral Products Technology (Wales)	Proskills	4
Extractives and Mineral Processing Occupations (Wales)	Proskills	2, 3
Composite Engineering (England)	SEMTA	2, 3
Composite Engineering (Operator and Semi-skilled) (Wales)	SEMTA	2
Advanced Manufacturing (Wales)	SEMTA	6
Metal Processing and Allied Operations (Wales)	SEMTA	2, 3
Operations and Quality Improvement (England)	SEMTA	3
Composite Engineering (Craft and Technician) (Wales)	SEMTA	3
Engineering Environmental Technologies (Wales)	SEMTA	4
Data Analytics (Wales)	Instructus	4
Combined Manufacturing Processes (Wales)	ProSkills	2, 3
Operations and Quality Improvement (Wales)	SEMTA	3
Information Technology Solutions Development & Support (Wales)	Instructus	5
IT Users - non-statutory (Wales)	Instructus	2, 3
Electrotechnical (Wales)	Instructus	3
Improving Operational Performance (England)	SEMTA	2
Improving Operational Performance (Wales)	SEMTA	2
Digital Application Support (Wales)	Instructus	2, 3
Energy Assessment and Advice - non statutory (Wales)	Instructus	3

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IT, Software, Web & Telecoms Professionals (Wales)	Instructus	2, 3, 4
IT Infrastructure (Wales)	Instructus	3, 4
IT Solutions Development & Support (Wales)	Instructus	3, 4
Building Services Engineering Technology and Project Management (England)	Instructus	3
Heating and Ventilating (England)	Instructus	2, 3
Plumbing and Heating (England)	Instructus	2, 3
Heating & Ventilating Systems (Wales)	Instructus	2, 3
Higher Apprenticeship in Mineral Products Technology (England)	ProSkills	4, 5
Building Services Engineering Technology and Project Management (Wales)	Instructus	3
Master Craftsperson Recognition Scheme (Wales)	SEMTA	4
Engineering Manufacture (England)	SEMTA	2, 3
Plumbing and Heating (Wales)	Instructus	2, 3
Digital Degree Apprenticeship (Wales)	Instructus	6
Information Security (Wales)	Instructus	3, 4
IT Application Specialist (England)	Instructus	2, 3
IT, Software, Web & Telecoms Professionals (England)	Instructus	2, 3
Higher Apprenticeship in Information Security (England)	Instructus	4
Higher Apprenticeship for IT, Software, Web & Telecoms Professionals (England)	Instructus	4
Advanced Manufacturing Engineering (Wales)	SEMTA	4
Engineering Manufacture (Wales)	SEMTA	2, 3
Higher Apprenticeship in Advanced Manufacturing Engineering (England)	SEMTA	4
Engineering and Advanced Manufacturing Degree Apprenticeship (Wales)	SEMTA	6

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Source: Federation for Industry Sector Skills and Standards

Table 19 – Examples of steel-related certificates and qualifications in England and Northern Ireland

Source	Title
RQF	City & Guilds Level 1 Award in Introductory Manual Metal Arc (MMA) Welding
RQF	City & Guilds Level 1 Award in Introductory Metal Fabrication (QCF)
RQF	City & Guilds Level 1 Award in Introductory Metal Inert Gas (MIG) Welding
RQF	City & Guilds Level 2 Award in Metal Fabrication (QCF)
RQF	EAL Level 1 Award in Introductory Manual Metal Arc Welding Skills
RQF	EAL Level 1 Award in Introductory Metal Inert Gas Welding Skills
RQF	EAL Level 2 Certificate in Metals Industries Processes
RQF	EAL Level 2 NVQ Diploma in Metal Processing and Allied Operations (QCF)
RQF	EAL Level 2 NVQ in Metal Processing and Allied Operations
RQF	EAL Level 3 Diploma in Manual Metal-Arc (MMA) Welding Process
RQF	EAL Level 3 Diploma in Metal Inert Gas/Metal Active Gas (MIG/MAG) Welding Process
RQF	EAL Level 3 NVQ Diploma in Metal Processing and Allied Operations (QCF)
RQF	EAL Level 3 NVQ Extended Diploma in Metal Processing and Allied Operations
RQF	EAL Level 3 NVQ in Metal Processing and Allied Operations
RQF	ECITB Level 2 Diploma in Erecting Steelwork Components (RQF)
RQF	ECITB Level 2 NVQ in Constructional Steelwork Site Operations
RQF	EMP Level 2 Award in An introduction to Extraction and Mineral Processing
RQF	EMP Level 2 Certificate in Extraction and Mineral Processing
RQF	EMPI Level 2 EPA for Mineral Processing Mobile and Static Plant Operator
RQF	EMPI Level 2 EPA for Mineral Processing Mobile and Static Plant Operator
RQF	GQA Level 2 NVQ Diploma in Cold Formed Steel Frame (Construction)
RQF	MPQC Level 2 Award In An Introduction to Mineral Processing in the Extractive and Minerals Processing Industries (QCF)
RQF	MPQC Level 2 Certificate in Laboratory and Associated Technical Activities for Mineral Products Operations
RQF	MPQC Level 2 Certificate in Locomotive Activities for Mineral Products Operations
RQF	MPQC Level 2 Certificate in Quarry and Mineral Processing Maintenance Operations (QCF)
RQF	MPQC Level 2 Diploma in Maintenance for Mineral Products Operations
RQF	MPQC Level 2 Diploma in Mineral Products Mobile Plant Operations
RQF	MPQC Level 2 EPA for Mineral Processing Mobile and Static Plant Operator
RQF	MPQC Level 3 Award in the Principles of Managing Health and Safety in the Extractive and Mineral Processing Industries (QCF)

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RQF	MPQC Level 3 Certificate in Extraction and Mineral Processing
RQF	MPQC Level 3 Certificate in the Extractives and Mineral Processing Industries (QCF)
RQF	MPQC Level 3 Diploma in Laboratory and Associated Technical Activities for Mineral Products Operations
RQF	MPQC Level 3 Diploma in Maintenance Supervision for Mineral Products Operations
RQF	MPQC Level 3 Diploma in Quarry and Mineral Processing Maintenance Operations (QCF)
RQF	MPQC Level 3 Diploma in the Extractives and Mineral Processing Industries (QCF)
RQF	MPQC Level 4 Diploma in Managing Laboratory and Associated Technical Activities for Mineral Products Operations
RQF	MPQC Level 4 Diploma in Safety, Health and Environmental Management in Mineral Products Operations
RQF	MPQC Level 6 Diploma in Safety, Health and Environmental Management in Mineral Products Operations
RQF	MPQC Level 7 Diploma in Safety, Health and Environmental Management in Mineral Products Operations
RQF	OCR Level 2 NVQ in Fabricating Constructional Steelwork
RQF	OCR Level 2 NVQ in Metal Processing and Allied Operations
RQF	OCR Level 3 NVQ in Fabricating Constructional Steelwork
RQF	ProQual Level 2 Diploma in Steel Erecting
RQF	ProQual Level 3 Diploma in Fabricating Steel Structures in Construction
RQF	ProQual Level 3 Diploma in Steel Erecting

Table 20 – Examples of steel-related qualifications in Scotland

Source	Title
SCQF	Modern Apprenticeship in Mineral Extraction and Processing SCQF level 5
SCQF	Modern Apprenticeship in Mineral Extraction and Processing SCQF level 6
SCQF	National 4 Practical Metalworking
SCQF	National 5 Practical Metalworking
SCQF	SVQ 2 in Processing Operations for the Extractive and Minerals Processing Industries at SCQF level 5
SCQF	SVQ 3 in Processing Operations for the Extractive and Minerals Processing Industries at SCQF level 6
SQA	SVQ Fabrication and Welding Engineering (Sheet Metalworking 3mm or less)
SQA	SVQ Fabrication and Welding Engineering (Structural Steelwork)
SQA	SVQ Heritage Skills (Construction) (Fully Supported Lead and Hard Metal Roofing and Cladding)
SCQF	SVQ in Innovative Modern Methods of Construction (Construction): Cold Formed Steel Frame at SCQF Level 5
SQA	SVQ in Steelfixing Occupations (Construction)

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SCQF	SVQ in Steelfixing Occupations (Construction) at SCQF Level 5
SQA	SVQ Innovative Modern Methods of Construction (Construction): Cold Formed Steel Frame at SCQF Level 5
SQA	SVQ Processing Operations for the Extractive and Minerals Processing Industries

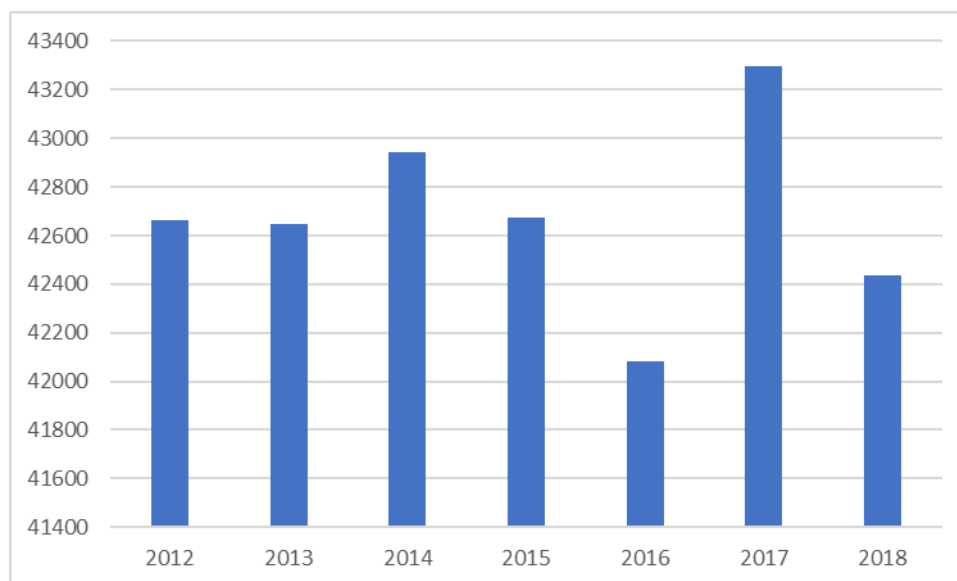
Table 21 – Examples of steel-related qualifications in Wales

Source	Title
QiW	City & Guilds Level 1 Award in Introductory Manual Metal Arc (MMA) Welding
QiW	City & Guilds Level 1 Award in Introductory Metal Inert Gas (MIG) Welding
QiW	EAL Level 1 Award in Introductory Manual Metal Arc Welding Skills
QiW	EAL Level 1 Award in Introductory Metal Inert Gas Welding Skills
QiW	EAL Level 3 NVQ Diploma in Metal Processing and Allied Operations
QiW	EAL Level 3 NVQ Extended Diploma in Metal Processing and Allied Operations
QiW	ECITB Level 2 Diploma in Steel Erecting
QiW	ECITB Level 2 Diploma in Supporting the Fabricating of Engineering Construction Steel Structures - Plating
QiW	ECITB Level 3 Diploma in Erecting Engineering Construction Capital Plant Steel Structures
QiW	ECITB Level 3 Diploma in Fabricating Engineering Construction Steel Structures - Plating
QiW	MPQC Level 2 Diploma in Processing Operations for the Extractive and Minerals Processing Industries
QiW	MPQC Level 3 NVQ Diploma in Shotfiring for the Extractive and Minerals Processing Industries
QiW	MPQC Level 4 Diploma in Health, Safety and Environmental Management for the Extractive and Minerals Processing Industries
QiW	MPQC Level 4 Diploma in Managing Processing Operations for the Extractive and Minerals Processing Industries
QiW	MPQC Level 5 NVQ Certificate in Blast Design for the Extractive and Minerals Processing Industries
QiW	NOCN Level 2 Diploma in Steelfixing Occupations (Construction)
QiW	NOCN Level 2 NVQ Diploma in Steelfixing Occupations (Construction)
QiW	NOCN_Cskills Awards Level 2 NVQ Certificate in Innovative/Modern Methods of Construction – Cold Formed Steel Frame Assembly (Construction)
QiW	NOCN_Cskills Awards Level 2 NVQ Diploma in Steelfixing Occupations (Construction)
QiW	Pearson BTEC Level 2 Extended Certificate in Blacksmithing and Metalworking
QiW	Pearson BTEC Level 3 Certificate in Blacksmithing and Metalworking
QiW	Pearson BTEC Level 3 Diploma in Blacksmithing and Metalworking
QiW	Pearson BTEC Level 3 Extended Diploma in Blacksmithing and Metalworking
QiW	Pearson BTEC Level 3 Subsidiary Diploma in Blacksmithing and Metalworking

3.3 Germany

3.3.1 German Steel Sector

Figure 7 – Germany total crude steel production (all qualities) in metric tonnes



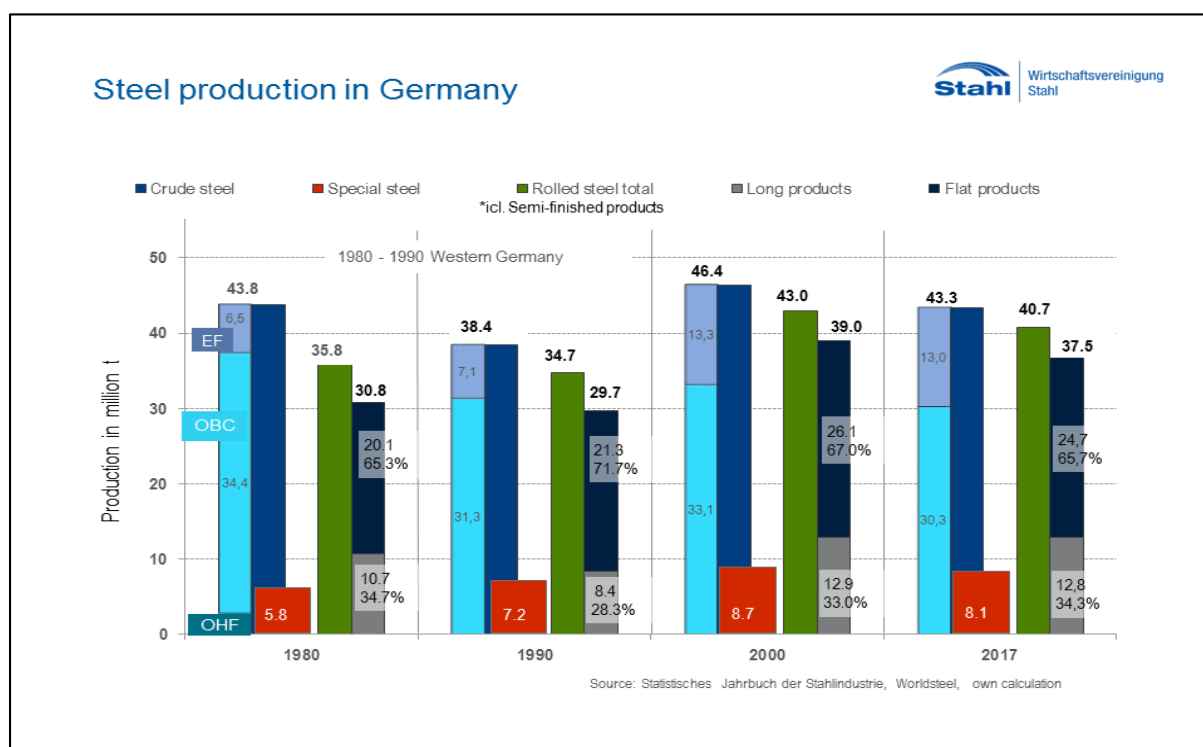
Source: Eurofer

More than a century of steady growth of crude steel production in Germany ended in the mid-1970s when Germany's annual output peaked in 1974 at around 54m tonnes. Linked to the wider economic upheaval in Europe in the 1970s and 1980s that followed the 1973 oil crisis, the German steel sector experienced a decade of gradual decline, before, since the mid-1980s crude steel production has more or less remained stable and has fluctuated in a relatively narrow corridor between 38m and 46m tons annual output. The stabilisation of German steel production after a decade of crisis between mid1970s and mid-1980s was aided by a combination of concentration with regard to the ownership of steel production sites as well as modernisation of facilities and a turn towards higher quality steel products (Tony's report on German steel sector⁴²).

While overall output figures of crude steel have remained stable, the industry has undergone a shift away from mass products towards more specialised, higher quality and higher value products. Significant investment in new products, especially over the last decade, means that more than 50% of German steel is high-quality steel and more than half of the more than 2,500 currently available steel types have been (Bein 2016, Tony's report). The relative proportions of stainless steel and of rolled products have also increased over the last 40 years.

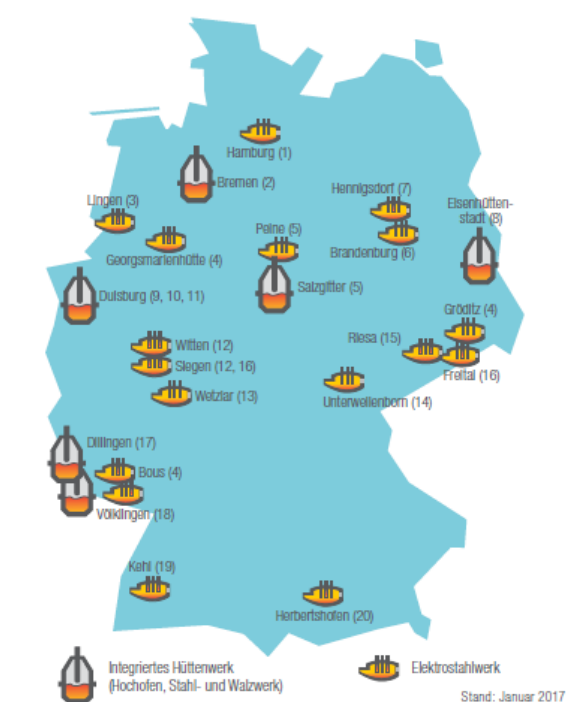
⁴² Bein, H.-W. (2016). Stahlmarkt in ständigem Wandel: Wie sich die Lage der Branche in den letzten 65 Jahren verändert hat. Stahlmarkt. (7), 12–13. Retrieved from <https://www.stahleisen.de/stahlmarkt/wp-content/uploads/sites/3/2016/10/Stahlmarkt-in-st%C3%A4ndigem-Wandel.pdf>

Figure 8 - WV Stahl_Stahlerzeugung nach Kategorien



In 2017, steel was produced in 20 sites in Germany, with steel works mainly concentrated in the West and the East of the country. Around 70% of total German steel production is based on the Blast Furnace route, while the remaining 30% is produced through the Electric Arc Furnace route, even though there were almost twice as many electric arc furnaces sites (13) than blast furnaces sites (7) in operation in 2017 (WV Stahl – Stahlfakten).

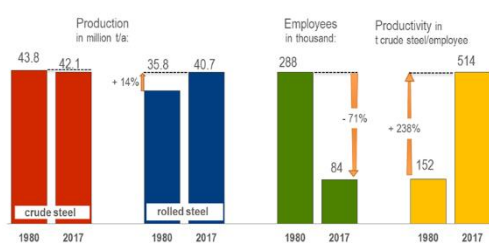
Figure 9 - Locations of steel production in Germany, 2017



Rohstahlerzeugung 2016 in Mio. t
Gesamterzeugung Deutschland 2016: 42,1 Mio. t

(1) ArcelorMittal Hamburg.....	1,0	(10) HKM.....	3,8
(2) ArcelorMittal Bremen.....	3,6	(11) ArcelorMittal Ruhrort.....	1,3
(3) Benteler.....	0,6	(12) Deutsche Edelstahlwerke.....	0,8
(4) Georgsmarienhütte Holding.....	1,3	(13) Buderus Edelstahl.....	0,3
(5) Salzgitter.....	5,7	(14) Stahlwerk Thüringen.....	0,8
(6) Brandenburg.....		(15) ESF Elbe-Stahlwerke Feralpi.....	1,0
Elektrostahlwerk.....	1,1	(16) BGH Edelstahl.....	0,2
(7) Hennigsdorfer.....		(17) Dillinger Hüttenwerke.....	2,2
Elektrostahlwerk.....	0,7	(18) Saarstahl.....	2,5
(8) ArcelorMittal.....		(19) Badische Stahlwerke.....	2,4
Eisenhüttenstadt.....	1,9	(20) Lech-Stahlwerke.....	1,2
(9) thyssenkrupp Steel Europe.....	9,7		

Production, Employment and Productivity in Germany
(Share of steel industry)



Source: Statistisches Bundesamt, IWF Stahl

Like in other steel producing countries, increased concentration of ownership has been regarded as the appropriate response to global over-production and cost pressures. Of the 42.6m tonnes of steel produced in Germany in 2016, the biggest steel producer in Germany, thyssenkrupp Steel Europe, accounts for more than a quarter of the annual production, while the biggest three German steel producers - Arcelor Mittal is the second largest and Salzgitter AG third – account for more than half of German steel production.

A significant side-effect of concentration and modernisation efforts has been the massive reduction of the steel workforce in Germany. While there were around 288,000 people directly employed in the German steel industry in 1980, almost 4 decades later, in 2016, only 85,000 people were directly employed in the industry. Consequently, productivity in the steel sector has increased significantly over the last 40 years. In 1980, the industry produced 152 tonnes crude steel per year per worker; by 2016 this figure has increased to almost 500 tonnes crude steel per year per worker. (WV Stahl: Fakten zur Stahlindustrie, 6).

From a skill needs perspective, the German steel industry is in a delicate situation. On the one hand, expected technological development, especially with regard to digitalization (which to some extent means automation), as well as global competition and global overcapacity will likely lead to a further reduction in the overall size of the steel industry workforce in the coming years (Cedefop 2018; Dengler and Matthes 2015; Lehmer and Matthes 2017). Cedefop estimates that the industrial workforce in Germany is going to shrink by

0.2 percent during the next decade.

While these trends also point towards a reduced pressure to fill positions in the steel industry other structural developments, however, point in the opposite direction, i.e. the increasing pressure to recruit sufficiently qualified apprentices and skilled workers (*Fachkräfte*). Despite the expected steady reduction of the overall size of the workforce, the steel industry, like other

industries in Germany, increasingly struggles to find enough school leavers to fill their apprenticeships (Acemyan-Steffens and Neuhäuser 2011; Interview TKSE AL). The situation in German apprenticeship market has changed markedly over the last few years, finally reaching a tipping point in 2017/18 when apprenticeships have begun to outnumber potential apprentices⁴³. One crucial cause is demographic change that affects many European countries, including Germany. In general, these societies, mainly driven by consistently low birthrates over several decades as well as extended life expectancy, have witnessed dramatic changes in their age profiles. Another factor contributing to the difficulties of finding suitable apprentices is the increasing attractiveness for pupils to stay in school longer to obtain higher secondary qualifications (*Abitur* or general qualification for university entrance). While this has been a long-term trend, it has recently resulted in University starters outnumbering those beginning an apprenticeship (Interview TKSE AL).

For the steel industry, these developments have at least two interrelated consequences. First, as Schroeder et al. 2019 point out: '[m]any companies have age-centred workforces, which means that 35-50-year-olds as well as employees older than 50 are disproportional often represented. In 2006, 31.3 % of the worker and 37.1 % of the employees in the German steel industry were older than 50 years, while in the overall economy only 22.7% of the workers respectively 21.2% of the employees were that old' (Tony's EASME report, p. XXX). This means that despite the expected future reduction of the steel workforce in Germany, many of the existing workers will have to be replaced in the coming decade or so. Second, the smaller pool of potential apprentices will make it harder – and therefore likely more costly – for steel companies to find suitable apprentices.

3.3.2 German VET system and steel sector related qualifications

Steel Sector Relevant Qualifications

Generally, young professionals can find their way into the German steel industry by studying or by doing an apprenticeship. Within the German VET system, apprenticeships are organized in a dual system combining practical experience in a company and theoretical experience in vocational school, mostly within 3 years. In total, there are 17 apprenticeships, 11 technical and 6 commercial, which are relevant for the steel sector:

Additionally, there are 17 different branches of study relevant for the steel sector as well:

Technical training

- Chemical laboratory technician
- Electronics technician for automation technology
- Electronics technician for industrial engineering
- Industrial mechanic
- Design technician

Commercial training

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

⁴³<https://statistik.arbeitsagentur.de/Navigation/Statistik/Statistik-nach-Themen/Ausbildungsstellenmarkt/Ausbildungsstellenmarkt-Nav.html>).

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- Mechatronics technician
- IT systems electronics technician
- Process mechanic in the metallurgical and semi-finished products industries
- Materials tester
- Toolmaker
- Cutting machine mechanic

Currently, there are 4,620 apprentices in the German steel industry. The apprenticeships quota, which refers to the share of apprentices compared to the total number of all employees, was 5,2 percent in 2012.

- | | |
|---|---------------------------------------|
| • Metallurgy & material technology / material engineering | • Civil engineering |
| • Mechanical engineering | • Production technology |
| • Electrical engineering or electronics | • Safety systems |
| • Physics, chemistry, process technology | • Supply and disposal technology |
| • Industrial engineering with business studies | • Agricultural sciences |
| • IT | • Geology |
| • Mathematics | • Industrial environmental protection |
| | • Infrastructure management |
| | • Medicine |
| | • Logistic |

Due to “industry 4.0” developments, in vocational education, occupational profiles may change, be combined or new occupational profiles concerning “Industry 4.0” demands may be developed. Currently the trend indicates the first option, as 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. Spöttl et al. also assess, whether certain apprenticeships relevant for the metal and electricity industry will change in the future due to developments of Industry 4.0.

Those entering the German ‘training market’ (*Ausbildungsmarkt*) have a broad choice between 4 pathways or routes:

Table 22 - Overview of Educational Pathways in Germany (2018 figures)

Pathways		n (%) in 2018	Programmes
Integrative/ Training	Transitional	270,000 (14%)	A: Partial Qualifying Courses A: Courses to obtain lower-secondary school degrees A: Obligatory pre-VET internships/ courses

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Vocational Education and Training (at Secondary Level)	722,700 (36%)	B: Dual system (494,500; 68%) C: School-based training (178,700; 24.7%) Other (including Training for Civil Servants) (49,400; 6.8%)
D: Qualifying for Higher Education	484,100 (24%)	2: Education programmes at general schools D (E): Education programmes at vocational schools
Higher Education	514,000 (26%)	3-7: University F-J: Vocational Colleges
TOTAL	1,999,800 (100%)	

The quantitatively most significant pathway is the Vocational Education and Training one, which accounts for more than a third of the German Training market and has attracted more than 720,000 people in 2018. Within this pathway, dual system apprenticeships have been chosen by two thirds of participants in 2018, while purely school-based vocational training and education offers have been taken up by a quarter of participants. Other vocational-oriented training options have been pursued by just under 50,000 people.

For the purposes of this report, the main focus will be on the vocational education and training pathway in the German training market. We can furthermore narrow the focus by only considering VET offers that are relevant for the steel sector. [In Germany, steel sector employers are represented by the Association of the Metal and Electrical Industry (Verband der Metall- und Elektro-Industrie).

Options for pupils after 9 years of compulsory education:

Table 23 - Academic and vocational qualification programmes in Germany⁴⁴

Academic Programmes		Vocational Programmes	
		School-based	Dual
Secondary Level	1. Secondary School (General Certificate of Secondary Education)	A: Transition programmes (1 year)	
		B: School-based VET programmes (1-3 years)	C: Dual System Apprenticeship programmes (2-3.5 years)
	2. General Educational Programmes	D. General Education Programmes with vocational orientation	
Post-Secondary Level		E: Specialised Programmes at Senior Vocational School (Berufsoberschule) or at Specialised Upper Secondary School	
Tertiary Level	3. Bachelor Programme at University (3-4 years)	F: Technician other professional qualifications	G: Meister, technician etc. qualifications/ examinations

⁴⁴ Based on Hippach-Schneider and Huismann (2016: 13).

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	4. Bachelor Programme at Applied University (3-4 years)	H: Bachelor Programme at Occupational Academy (Berufsakademie) (3-4 years)	I: Bachelor Programme at Dual College (Duale Hochschule) (3-4 years)
	5. Master programmes at University (2 years)		J: Master programmes at Dual College (2 years)
	6. Master programmes at Applied University (2 years)		K: IT-Professional (2 years)
	7. PhD programmes (3+ years)		

Table 23 summarises the major academic and vocational options for pupils in Germany after completing the required 9 years of compulsory education. In general, the German system offers variety and flexibility. As the main interest is on the Vocational System, the academic options detailed in the second column of the table will not be described in any detail. The focus of the following section is on VET provisions. Not all VET provisions highlighted are, however, relevant for the area of steel production. Those that have been highlighted in light orange will be described in greater detail than the remaining vocational options. This report follows the structure of Cedefop reports that consider VET programmes at three different levels: secondary, post-secondary and tertiary.

VET at Secondary Level

Table 24 adapts an overview provided by Hippach-Schneider and Huisman (2016) that summarises the VET options at secondary level. The letters used to number the options (A, B, C and D) in Table 23 above are used again for continuity and the orange shading indicates again which options are relevant for the steel industry.

Table 24 - VET programmes at upper-secondary level (adapted from Hippach-Schneider and Huisman, 2016)

Type of educational programme	Main economic sectors	ISCED level	Balance between school- and work-based training	Average duration of studies	Transfer to other pathways	Admission requirement
A: Pre-vocational training year	For orientation	254	Entirely school-based	1 or 2 years	Vocational training	No access requirements
A: Basic vocational training year	For orientation i.e. economic and technical sector	351	School based or cooperative school and practice based	1 year	Vocational training, full-time vocational school	Completion of the general full-time compulsory education (9 years of compulsory schooling) and transfer to Class 10
B: Programmes at full-time vocational school	Commercial, languages, craft, house-	354	School based	At least 1 year mostly 3 years	Trade and technical school, vocational academy, specialised upper secondary school, senior	Lower secondary school leaving certificate, leaving certificate

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(<i>Berufsfach-schule</i>)	hold and caring, artistic, health care				vocational school, school of health care	from intermediate secondary school
C: Dual system of vocational education and training	In every sector	354	School and work based	Mostly 3 years	Trade and technical school, vocational academy, specialised upper secondary school, senior vocational school, school of health care	Completion of full-time compulsory education, no further requirements for access (but companies select their apprentices)
D: Programmes providing general upper secondary and vocationally oriented education	Economics, technology, nutrition, agriculture, IKT technology,	344	School based	2 or 3 years	University, University of applied science, University of Co-operative Education, Dual University	Leaving certificate from intermediate secondary school

Those leaving the German school system after 9 years, have three main vocational options at the secondary level.

A: The most basic of these is to attend a Transition programme. These programmes are designed to allow those with some educational gaps to either obtain a qualification equivalent to the General Certificate of Secondary Education or provide them with some basic vocational skills so that they can continue their qualification on an academic or vocational route. The programmes normally last 1 year (2 years at the most) and are either provided by schools or jointly by a (vocational) school and a company. Attendees obtain, upon successful completion, a qualification at EQF level 1 or 2, depending on the specific programme.

While numerically the least chosen option at secondary level (see Table XX above), these programmes might offer sectors like the German steel sector that face difficulties of attracting suitably qualified school leavers or those lacking recognised credentials, for example refugees and immigrants, into their apprenticeship programmes. These programmes offer the opportunity to develop those who do not quite reach the educational standards required so that they can eventually start apprenticeships.

B: 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, these programmes are not really relevant for the steel sector.

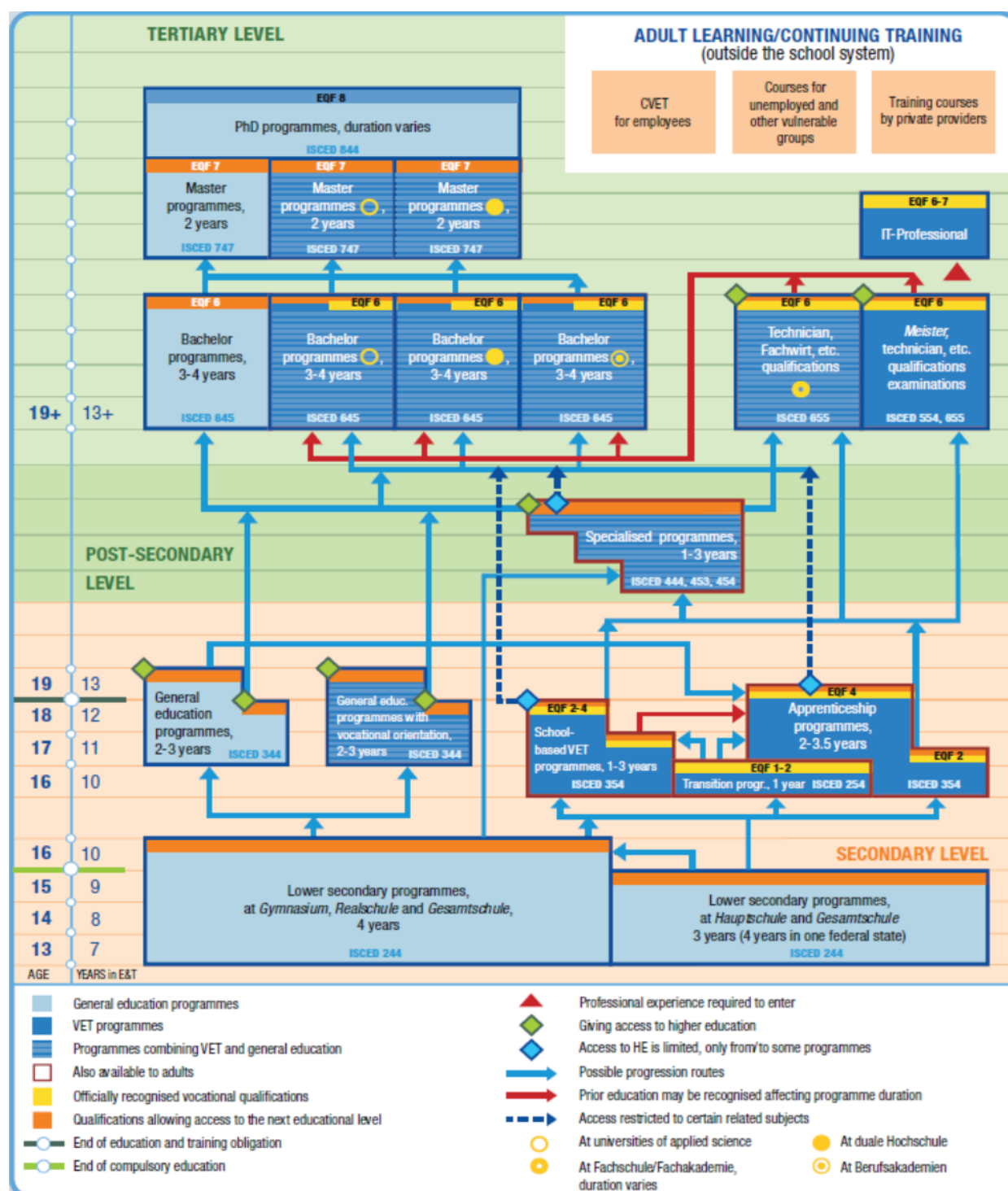
C: The dual system apprenticeships are the backbone of the German VET system and until very recently constituted the most popular VET pathway in Germany. Programmes usually last 3 or 3.5 years albeit some shorter options are available and those with higher educational attainment such as A-Levels (*Abitur*) 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).

D: 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

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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.

Figure 10 – General Education and VET in Germany



Source: Cedefop ReferNet Germany

Governance of the German VET System

In the German VET system two broad types of vocational education can be recognised and 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 so-called ‘dual system’. The most obvious difference between the two forms centre around the way education and training is delivered: while school-based VET provisions are exclusively delivered in schools (class-room centred), 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 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. A third significant difference relates to the relative importance of the two forms within the German VET system. Of the approximately 522,000 vocational training contracts concluded in 2014 in Germany, only about 20,000 were school based, which means that the dual system is the dominant form of VET provision in Germany. For this reason and for the fact that the steel-sector occupations relevant for the ESSA project require ‘dual’ education and training, the focus of what follows will be mainly on the dual system.

Governance of Recognized VET provisions in the Dual System

In the German dual system, responsibility for governance is shared between central government, federal states as well as organisations representing employers (professional chambers) and employees (trade unions, worker councils). The system operates at three administrative levels:

a) National level

The overall responsibility for VET policy and regulation lies with the Federal Ministry for Education and Research (*Bundesministerium für Bildung und Forschung*, BMBF). As such, the Ministry has overall responsibility for the design of dual training content for all state-recognised occupations. The national recognition of VET provisions ensures that VET provisions – with regard to the ‘school-component’ in the form of a ‘framework curriculum’ (*Rahmenlehrplan*) and the ‘technical/practical component’ in the form of ‘training regulations’ (*Ausbildungsordnung*) – follows the regulations adopted by the federal government.⁴⁵ It also has some responsibility to promote dual VET provisions and to support dual system provisions financially through subsidies for apprentices (*Bafög*), subsidies for providers to fund additional training capacity and funding of research to keep VET system up to date.

The Ministry has also important monitoring functions as it is also responsible for the publication of Annual VET Reports (*Berufsbildungsberichte*), which provide an overview of the annual developments concerning the German VET system.

Crucially, the Ministry is responsible for the main legal text regulating vocational education and training, the Vocational Training Act (*Berufsbildungsgesetz*), which was introduced in 1969 and has been substantially amended in 2005.⁴⁶ The Act defines the scope of dual VET provisions and the roles and responsibilities of the three main parties (government, employers, trade unions) involved in VET provision at different levels (national, state, regional). Im-

⁴⁵Hippach-Schneider and Huismann, 2016: 14.

⁴⁶ A new amended version appears to have been introduced in January 2020.

portantly, the act also specifies which institutions and organisations are recognised as ‘competent bodies’ (*Zuständige Stellen*)⁴⁷ which, at a regional level, have important oversight functions (see further below).

Moreover, it is also responsible for the implementation of programmes intended to improve VET provisions and for the legal supervision and funding of the Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung, BiBB).

The BBiB is the core institution for consensus building between all parties – state, federal state, and social partners (institutions representing employers and employees) involved in VET at national level. This is reflected in the make-up of its ‘Main Committee’ (*Hauptausschuss*) which is central decision-making body within the BiBB as well as the main advisory institution in relation to vocational matters to the relevant government ministries. It represents, in equal numbers, the four main parties involved in vocational education policies. This means there are 8 representatives of the Federal Government, the Länder, Employers and Employees. Additionally, there are two advisers admitted into the committee, one representing the Federal Agency for Work (*Bundesarbeitsagentur*) and the other is representing the umbrella organisation of local communities (*kommunale Spitzenverbände*).

Its main tasks that are prescribed by the Vocational Training Act are:

- To support vocational education and training through annual VET-oriented scientific research programmes and the publication of results
- *Under direction from the Federal Ministry*, it is also supposed to:
 - i. participate in the preparations of training regulations and other VET-related regulations
 - ii. participate in the preparation of the Annual VET Report
 - iii. participate in the release of VET-relevant statistics
 - iv. support VET pilot schemes including their scientific evaluation
 - v. participate in the international cooperation around vocational education and training
 - vi. execute other additional administrative tasks on behalf of the Federal Ministry
- *According to general administrative guidelines*, the BiBB is also supposed to support industry-wide (*überbetriebliche*) institutions that provide VET and to help with the planning, formation and development of these institutions.
- Run and maintain the database of all recognised occupations requiring formal training (*Ausbildungsberufe*).

Additionally, the BiBB is also involved in the training of healthcare workers and it is free to take on additional tasks outside the statutory functions provided the Federal Ministry agrees.

⁴⁷ The English-speaking literature tends to translate *Zuständige Stellen* as ‘competent bodies’ even though the alternative – ‘relevant authorities’ – appears to capture the meaning more accurately. We will use both terms interchangeably.

Implication for ESSA Strategy

Any attempts to adapt or change steel-sector relevant dual system I-VET provisions require the involvement of the BiBB as it is the coordinating institution.

Given that the BiBB itself is representing the various parties with distinct interests related to vocational education and training, these parties – state, Länder, and Employees need to be engaged if any changes to dual system I-VET are envisaged.

b) Federal State (Länder) Level

Education, including responsibility for vocational schools and Universities, is a devolved matter in the German federal system. This, inevitably, gives the 16 federal states of Germany an important role in the German VET system.

The most important institution is the ‘Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic’ (*Kultusministerkonferenz* or KMK), which is a body that represents all Ministers of Cultural Affairs of the 16 Länder as they have political responsibility for educational provisions in Germany. One important function of the Standing Conference is to ensure the coherence and compatibility of educational provisions across the 16 Länder. For KMK decisions to become legally binding, however, all individual Länder parliaments respectively have to approve them.

Just like at the national level, where state, employers and employees are institutionally bound together in decision-making processes, each Land has Vocational Training Committees, with equal representation of employers, employees and the highest state authorities. They advise the state governments on vocational training issues in schools and also contribute to designing schemes that support disadvantaged youths and provide opportunities for additional qualifications that require school-based training.

Implications for ESSA Strategy

Any measures that require country-wide changes to curriculums at schools in general and vocational schools in particular will inevitably involve the KMK and the Vocational Training Committees of the Länder.

c) Regional Level

As indicated further above, the Vocational Training Act also defines ‘competent bodies’ (or relevant authorities) which are institutions who are in charge of supervising or monitoring VET provisions ‘on the ground’, i.e. in the regions of Germany. The function is usually fulfilled by occupational associations, some of which have existed for centuries in the form of guilds. Different sectors are supervised by different competent bodies:

Table 25 – Competent bodies for monitoring VET provision

Occupations in:	Competent Body according to Vocational Training Act
Crafts and Trades	Chambers of Craft and Trades
Industries and Commerce	Chambers of Industry and Commerce
Agriculture	Chambers of Agriculture
Judicial Administration	Chambers of Lawyers, Attorneys and Notaries
Auditing and Tax Consultancy	Chambers of Public Accountants and Chambers of Tax Advisers
Health care	Chambers of Physicians, Dentists, Veterinarians and Pharmacists
Areas not represented by dedicated Occupational Chambers	Länder can appoint representative competent bodies

The competent bodies are compelled by law to fulfil a range of important functions and tasks:

- Training advisers from the Chambers verify companies' capacity to train people,
- check ability of trainers
- advise companies and apprentices
- receive, check and register training contracts and provide counselling services
- oversee overall organisation of exams: setting dates and establish exam boards

d) Local (Company) Level

At the lowest level in the VET system operate companies that are licensed to train apprentices.

3.4 Spain

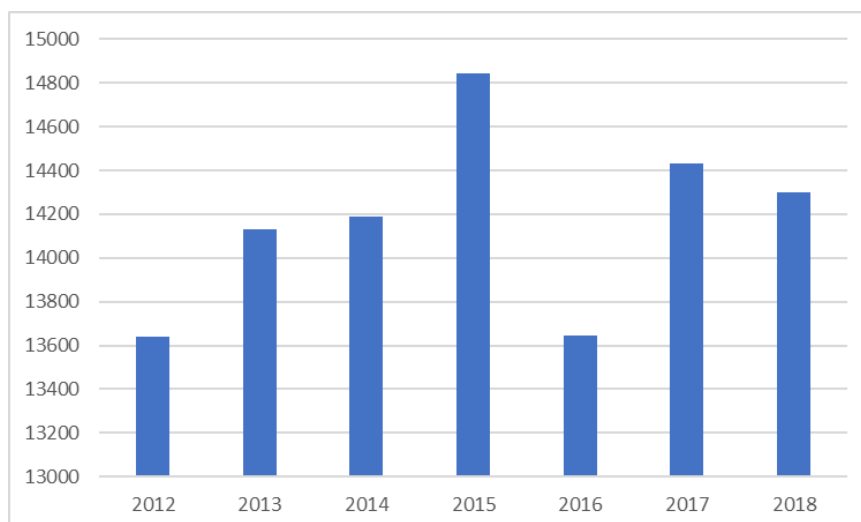
3.4.1 Spanish steel sector

Eurofer data for 2018 show Spain at the fourth position in the EU ranking for crude steel production, with a share of 8.5% and an output of 14.3 million tonnes (Eurofer 2019b). In the same year, the steel industry displayed a direct employment of 17,352 workers (Ibidem). Data also show a sensible increase from the output of 2012 (about 13.6 million tonnes) to the peak of production in 2015 (14.8 million tonnes). The Spanish steel industry has a strong export orientation, with about the 60% of steel exports destined for the EU market⁴⁸. The downturn in manufacturing activities has impacted on the Spanish steel industry, with a decrease of demand from all the main buyers of Spanish steel, infrastructure, mechanical equipment and automotive sectors. Lower demand, combined with decreasing product prices and increasing prices for iron ore have reduced the margins of companies. Further contraction is expected for the years 2019-2020. Another crucial issue that limits the competitiveness of the industry is energy cost (about

⁴⁸ <https://atradius.it/publicazioni/publicationsmarket-monitor-metals-steel-spain-2019.html>

30-50% higher than France or Germany) which negatively impacts especially on electric arc furnaces (which make up about 75% of the steelmaking in Spain).

Figure 11 – Spain total crude steel production (all qualities) in ‘000 metric tonnes



Source: Eurofer

3.4.2 Spanish VET system and steel sector related qualifications⁴⁹

Spanish VET system entails two different paths, one developed by the education authority and one developed by the labour authority (Cedefop 2016b).

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 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. Specifically, VET for employment in Spain 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).

⁴⁹ This paragraph is mainly based on Sancha and Gutiérrez (2019), Vocational education and training in Europe: Spain.

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School-based VET qualifications are typically composed of a set of occupational standards (Cualificaciones Profesionales) included in the CNCP, while qualifications issued by the employment authorities are normally associated to a single professional standard.

Table 26 - Sectoral branches in the Spanish National Catalogue of Occupational Standards

Code	Sectorial Branch (EN)	Sectorial Branch (ES)
ADG	Administration and management	Administración y gestión
AFD	Physical and sports activities	Actividades físicas y deportivas
AGA	Agriculture	Agraria
ARG	Graphic arts	Artes gráficas
ART	Arts and crafts	Artes y artesanías
COM	Trade and marketing	Comercio y marketing
EOC	Construction and civil work	Edificación y obra civil
ELE	Electricity and electronics	Electricidad y electrónica
ENA	Energy and water	Energía y agua
FME	Mechanics production	Fabricación mecánica
HOT	Hospitality and tourism	Hostelería y turismo
IEX	Extraction industry	Industrias extractivas
IFC	Information and communications technology	Informática y comunicaciones
IMA	Installation and maintenance	Instalación y mantenimiento
IMP	Personal image	Imagen personal
IMS	Image and sound	Imagen y sonido
INA	Food industry	Industrias alimentarias
MAM	Wood, furniture and cork	Madera, mueble y corcho
MAP	Maritime and fishing industry	Marítimo pesquera
QUI	Chemistry	Química
SAN	Health	Sanidad
SEA	Security and environment	Seguridad y medio ambiente
SSC	Sociocultural and community services	Servicios socioculturales y a la comunidad
TCP	Textile, clothing industry and leather	Textil, confección y piel
TMV	Transport and vehicles maintenance	Transporte y mantenimiento de vehículos
VIC	Glass and ceramics	Vidrio y cerámica

Source: Sancha and Gutiérrez (2019)

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Table 27 – Occupational standards for mechanics production included in the CNCP

Code	Title of the qualification (ES)	Title of the qualification (EN)	Level
FME	Operaciones auxiliares de fabricación mecánica	Auxiliary mechanical manufacturing operations	1
FME	Mecanizado por arranque de viruta	Chip start machining	2
FME	Mecanizado por abrasión, electroerosión y procedimientos especiales	Machining by abrasion, EDM and special procedures	2
FME	Mecanizado por corte y conformado	Machining by cutting and forming	2
FME	Tratamientos superficiales	Superficial treatments	2
FME	Fusión y colada	Fusion and casting	2
FME	Moldeo y machería	Molding and machinery	2
FME	Calderería, carpintería y montaje de construcciones metálicas	Boilermaking, carpentry and assembly of metal constructions	2
FME	Fabricación y montaje de instalaciones de tubería industrial	Manufacturing and assembly of industrial pipe installations	2
FME	Montaje y puesta en marcha de bienes de equipo y maquinaria industrial	Assembly and commissioning of equipment and industrial machinery	2
FME	Tratamientos térmicos en fabricación mecánica	Heat treatments in mechanical manufacturing	2
FME	Fabricación de elementos aeroespaciales con materiales compuestos	Manufacture of aerospace elements with composite materials	2
FME	Montaje de estructuras e instalación de sistemas y equipos de aeronaves	Assembly of structures and installation of aircraft systems and equipment	2
FME	Soldadura por arco bajo gas protector con electrodo consumible, soldeo "MIG/MAG"	Arc welding under protective gas with consumable electrode, "MIG / MAG" welding	2
FME	Soldadura por arco bajo gas protector con electrodo no consumible, soldeo "TIG"	Arc welding under protective gas with non-consumable electrode, "TIG" welding	2
FME	Soldadura por arco con electrodo revestido	Arc welding with coated electrode	2
FME	Diseño de productos de fabricación mecánica	Design of mechanical manufacturing products	3
FME	Diseño de útiles de procesamiento de chapa	Design of sheet metal processing tools	3
FME	Diseño de moldes y modelos	Design of molds and models	3
FME	Producción en fundición y pulvimetalurgia	Foundry and powder metallurgy production	3
FME	Producción en mecanizado, conformado y montaje mecánico	Production in machining, forming and mechanical assembly	3
FME	Diseño en la industria naval	Design in the naval industry	3

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FME	Diseño de calderería y estructuras metálicas	Boilermaking and metal structures design	3
FME	Diseño de tubería industrial	Industrial Pipe Design	3
FME	Gestión de la producción en fabricación mecánica	Production management in mechanical manufacturing	3
FME	Producción en construcciones metálicas	Production in metal constructions	3
FME	Fabricación de moldes para la producción de piezas poliméricas y de aleaciones ligeras	Manufacture of molds for the production of polymer parts and light alloys	3
FME	Fabricación de troqueles para la producción de piezas de chapa metálica	Manufacture of dies for the production of sheet metal parts	3
FME	Fabricación por decoletaje	Manufacturing by decoletaje	3
FME	Fabricación por mecanizado a alta velocidad y alto rendimiento	High speed and high performance machining manufacturing	3

Source: incual.mecd.es/mecanica_descripcion

As for initial VET in the education system, compulsory general education ends at age 16, with the completion of lower secondary education (*Educación Secundaria Obligatoria*) that lasts 4 years and the award of the relevant certificate (*título de Educación Secundaria Obligatoria*).

In 2013, a reform of VET paths introduced basic VET programmes (*Formación Profesional Básica*) for those aged 15 who met certain requirements (age, completion of the first cycle of secondary compulsory education, recommendation by teaching staff) 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 (*bachillerato*).

The *Bachillerato* is a high school programme that lasts usually from 16 to 18 and award successful students with the relevant certificate (*título de Bachiller*). This gives access to higher VET (*Formación Profesional de Grado Superior*) and to university programmes.

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*).

All IVET programmes and qualifications are based on the principle of learning outcomes and so are compatible with ECVET guidelines. The three levels of VET are all structured in 2-years courses, for a total amount of 2000 hours of study and training, take place in the same education centres, and entail a compulsory work placement module.

School-based VET diplomas, as stated above, 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. Currently, 170 diplomas are available under the VET in education system.

Table 28 - VET diplomas in education in mechanics production

Code	Title of the diploma (ES)	Title of the diploma (EN)	Level
FME	Título Profesional Básico en Fabricación de Elementos Metálicos	Basic Professional Degree in Metal Fabrication	Basic
FME	Título Profesional Básico en Fabricación y Montaje	Basic Professional Degree in Manufacturing and Assembly	Basic
FME	Título Profesional Básico en Instalaciones Electrotécnicas y Mecánica	Basic Professional Degree in Electrotechnical and Mechanical Installations	Basic
FME	Técnico en Conformado por Moldeo de Metales y Polímeros	Technician in Forming by Metal and Polymer Molding	Intermediate
FME	Técnico en Mecanizado	Machining Technician	Intermediate
FME	Técnico en Montaje de Estructuras e Instalación de Sistemas Aeronáuticos	Technician in Assembly of Structures and Installation of Aeronautical Systems	Intermediate
FME	Técnico en Soldadura y Calderería	Welding and Boiler Technician	Intermediate
FME	Técnico Superior en Construcciones Metálicas	Senior Technician in Metallic Constructions	Advanced
FME	Técnico Superior en Diseño en Fabricación Mecánica	Higher Technician in Mechanical Manufacturing Design	Advanced
FME	Técnico Superior en Programación de la Producción en Fabricación Mecánica	Senior Technician in Production Programming in Mechanical Manufacturing	Advanced
FME	Técnico Superior en Programación de la Producción en Moldeo de Metales y Polímeros	Senior Technician in Production Programming in Metal and Polymer Molding	Advanced

Source: <http://www.todofp.es/que-como-y-donde-estudiar/que-estudiar/ciclos.html>

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. In the second case, a training and apprenticeship contract is not mandatory and regional institutions can instead make use of learning agreements to ensure participation of learning institutions and companies in the programmes.

As for adults, VET in the education system provides basic education for those adults who haven't been awarded the *título de Educación Secundaria Obligatoria*. There are also set routes to obtain the *Bachillerato* and to acquire VET qualifications at all the available levels. Thanks to the modular and learning outcomes-oriented nature of Spanish qualifications, partial exemptions of modules included in VET diplomas is possible if requirements are met by the candidate.

Spanish VET providers can be grouped in the three categories:

- public and private institutions recognised by the competent education authority;

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- integrated training centres (public) which represent a bridge between the education and the employment VET system, providing both IVET under education VET and further training under employment VET;
- national reference centres (public) specialised in different professional areas, in charge of carrying out innovation and experimentation within vocational training. They serve both the VET in education and in employment with the aim of enhancing the quality and competitiveness of training. National reference centres analyse new training trends, pilot their implementation and establish benchmarks at national level. They are located in each *comunidad autónoma* and cover all the 26 branches in which the Spanish VET is organised.

The National Education Council (*Consejo Escolar del Estado*) is the main advisory body under this system. It represents all the stakeholders within the education sector and publishes an annual report on the state of VET in the education system (*Informe sobre el estado del sistema educativo*) which includes also proposals for improving the system.

The General Council for Vocational Training (*Consejo General de la Formación Profesional*) is another relevant advisory body, both for VET in education and employment. The General Council gathers education and labour authorities responsible for VET together with social partners.

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 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.

The system was partially reformed in 2015 and 2017 through the Act 30/2015 and the Royal Decree 694/2017. The 2015 act introduced the right to a 20-hours training leave for workers with above a year of seniority.

Some of the funding schemes currently in place under the VET for employment are the following:

- a) training organised by companies (*formación programada por la empresa*) which is funded by discounts on what companies pay to social security;
- b) sectoral and cross-sectoral training programmes for the employed (*planes de formación intersectoriales, sectoriales, autónomos, y economía social*);
- c) training schemes for the unemployed (*planes de formación*);
- d) other training such as individual leaves (*permisos individuales de formación*) and alternance training (*formación en alternancia*).

Spanish employment authorities set targets related training initiatives on annual basis in order to respond in a timely manner to the challenges set by the labour market. In this perspective, the ministry promoted a call, published in May 2018, to fund training programmes in digital skills for employed workers.

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.

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

CdP provide evidence of a specific professional profile, associated with a set of skills and competences, that is recognised and valued within the labour market. These certificates are organised in three progressive levels, (based on the complexity of tasks and on autonomy and responsibility necessary to carry out the relevant working activities). Since the reform of 2015, CdP programmes can be delivered in different ways (online-offline), in order to meet the needs of learners. The regulation specifies however, which programmes can be delivered online, the balance of online and face to face teaching, quality standards, and the requirements for the accreditation of e-learning platforms. The certificates are issued by the state public employment service (*Servicio Público de Empleo Estatal* – SEPE) and by regional employment services. Partial certifications can also be issued (units of competence), thanks to the modularity of the Spanish VET system. A CdP can also be earned through a training and apprenticeship contract under the dual VET scheme.

Public and private training centres, as well as organizations created by social partners can offer training programmes leading to the acquisition of CdP but need to be accredited by SEPE or by the regional labour authorities.

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.

Some regulated professions set out specific requirements. Electrical and gas technicians need to hold a certificate of professional competence (*certificado de aptitude profesional*), which can be obtained by accrediting a school-based VET qualification, a CdP or certain units of competence. The certificates of professional competence are issued by regional authorities.

Besides the General Council for Vocational Training (*Consejo General de la Formación Profesional*), other organisations are involved in the VET for employment system. The most relevant are:

- the General Council for the National Employment System (*Consejo General del Sistema Nacional de Empleo*), which is the main consultative body for public authorities;
- the Sectoral conference on Labour Affairs (*Conferencia Sectorial de Empleo y Asuntos Laborales*), which provides a coordination structure between the central government and the 17 regions (*comunidades autónomas*);
- the State Foundation for Training in Employment (*Fundación Estatal para la Formación en el Empleo*), which provides technical support to SEPE and to the Ministry of Labour in developing VET for employment;
- the Joint Sectoral Structures (*Comisiones Paritarias Sectoriales*), which are made up of representatives of businesses and unions in each relevant economic sector. They have the specific task to anticipate training needs on the basis of their first hand knowledge of the sectors and propose consequent training.

The Spanish VET system provides also well-established routes for the recognition of non-formal and informal learning since 2009 which are shared between the education and the labour authorities. The general framework for the validation procedure is outlined in the CNCP, including quality standards requirements. The ministries of education and employment publish (jointly or not) yearly public calls for validation of informal and non-formal learnings, which are implemented at regional level. The calls make clear which specific units of learning outcomes can be validated, and which formal qualifications and economic sectors are involved.

The procedure usually entails a phase of advisory, in which candidates are helped to assess their own skills and to put together a portfolio of their professional experience. After this, candidates'

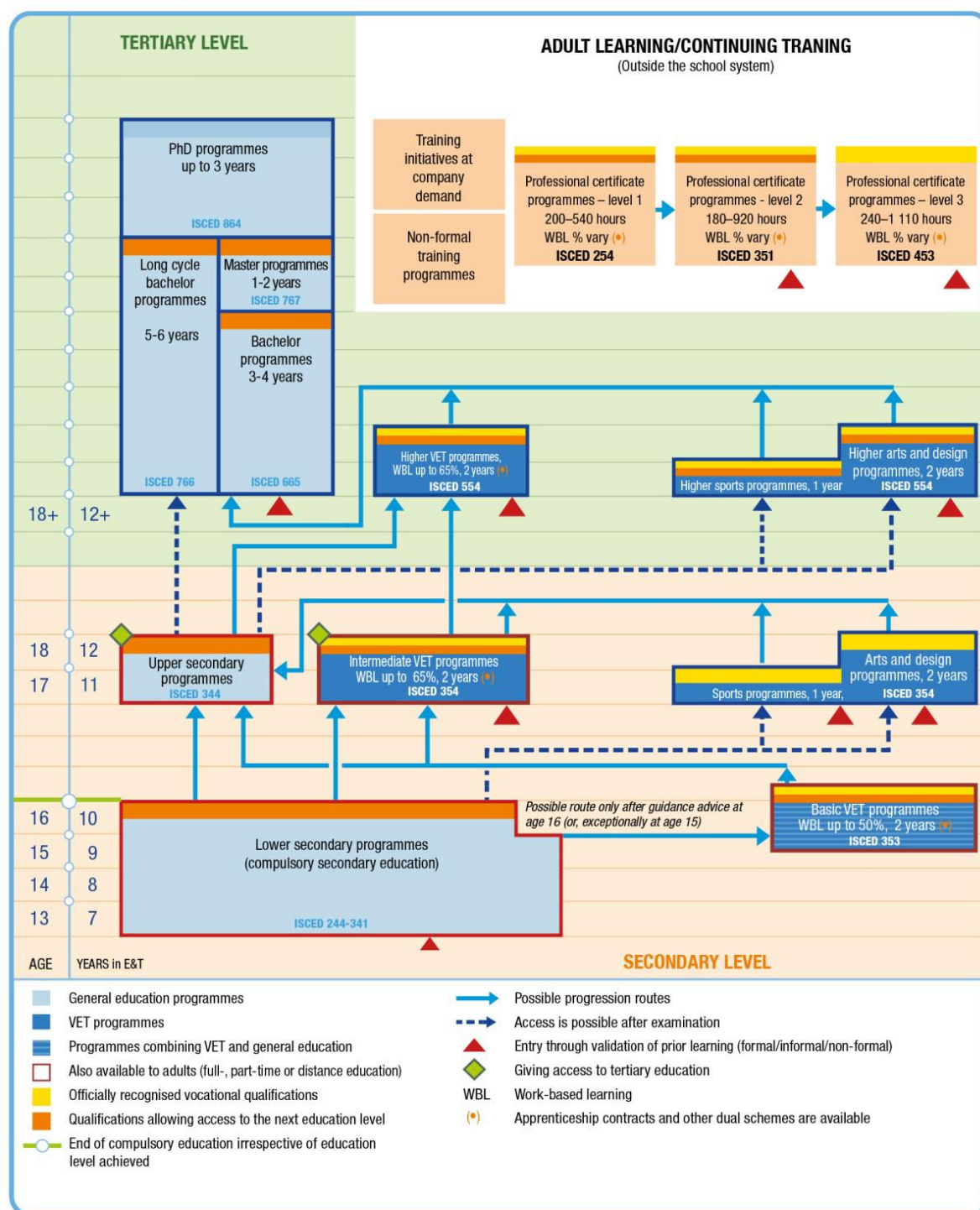
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experiences are assessed on the basis of the evidences shown and through practical examinations, and finally they receive a certification for each unite of competence they have been successful in. Candidates must be able to prove at least three years of work experience relevant to the specific unit of competence they are applying for recognition, with a minimum of 2000 working hours in the ten previous years, or, in case of non-formal training, they must prove that they have received at least 300 hours of training in the ten previous years.

The Spanish VET system has put in place a multilevel strategy for anticipating skill needs, recognised as a crucial competitive advantage. At regional level, graduate tracking measures are taken on regular basis by competent employment authorities. At national level, SEPE has established an Observatory of Occupations (*Observatorio de las Ocupaciones*) and the national institute for statistics (*Instituto Nacional de Estadística* - INE) systematically collects data about education and training, and employment. The National Institute of Qualifications (*Instituto Nacional de Qualificaciones* – INCUAL), which is responsible for defining and updating the CNCP, builds in also its own Observatory.

In order to keep the CNCP up to date, INCUAL cooperates actively with stakeholders and collects quantitative and qualitative data through various channels. It is important to note that in this process of developing and updating qualifications some regions have an important role in relation to their specific productive context, as for the case of the Basque Country (*País Vasco*) in metal working. The update of qualifications is an ongoing process that applies to all professional standards older than 5 years.

Figure 12 - General education and VET in Spain



NB: ISCED-P 2011. The Spanish education system is not referenced to EQF levels.

Source: Cedefop and ReferNet Spain.

3.5 Poland

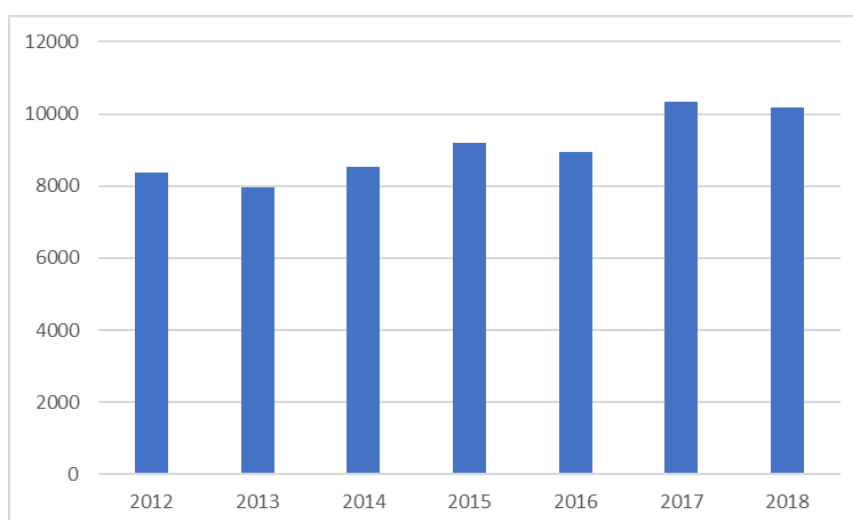
3.5.1 Polish Steel Sector

The Polish steel sector is one of the largest in the EU. In 2018, Poland among European producers was classified in the 5th place with a production of crude steel in 10.2 million tonnes (Eurofer 2019b). In the last few years, this production has changed from the lowest level of 8.5 million tonnes in 2014, to the highest of 10.3 million tonnes in 2017. In 2018, 24.700 people worked in the Polish steel sector (Polish Steel Industry 2019, Polish Steel Association). Steel produced in Poland at the integrated steel mill ArcelorMittal Poland in two locations in the south of Poland (Kraków and Dąbrowa Górnicza) accounts for 53.1% of crude national steel production (Worldsteel Association, World Steel in Figures 2019). The remaining part is produced in 6 steel mills through the EAF process. Electric steel mills are mainly located in Silesia (south of Poland) and in central Poland. In addition, the steel sector in Poland consists of 12 metallurgical enterprises that deal with metallurgical processing based on external batch (so called re-rollers).

In the years 2003–2006, the steel industry in Poland was deeply restructured in consultation with the EC to match European standards. As part of this process, employment in metallurgy was reduced, production capacity (over capacity) was reduced, and mechanisms preventing the state aid were introduced. All steel mills subjected to restructuring met the requirements of the viability test used by the EC to assess the effectiveness of the restructuring processes.

In Poland, the steel industry belongs to the top ten largest industrial sectors. The value of sold production of this sector in 2018 amounted to PLN 37.5 billion (about € 0.85 billion), which represents 3% of industrial production.

Figure 13 – Poland total crude steel production (all qualities) in metric tonnes



Source: Eurofer

3.5.2 Polish VET systems and steel sector related qualifications⁵⁰

The directions of vocational education, its range and organizational forms are related to the level of economic development, they also depend on the socio-professional structure of the population of the given country and on political conditions, traditions and educational aspirations of the society. The development of vocational education and training at all levels is a response to the needs of the economy and is one of the tools for its development.

The historical development of the VET system in Poland can be split into three stages:

- the development during the post-war period: the expansion and predominance of VET education during the times of the state-run economy;
- the collapse and diminishing role of VET after the economic transition in the 1990s;
- the recent reforms aimed at a revival of VET education.

Years 1945-1989⁵¹

In the first years after World War II, vocational education experienced significant difficulties resulting from war damage. After the war, various levels of pre-1939 schools resumed their activities spontaneously. Vocational education was to prepare employees for the emerging industry and other developing areas of the economy. In 1951, a new school-based vocational education system was introduced: a basic vocational school, vocational upper secondary school, evening basic vocational schools and vocational upper secondary school, as well as specialized vocational courses.

Table 29 - Development of vocational education (at the secondary level) in the years 1946-1990

	1946	1950	1960	1970	1980	1985	1990
Szkoły zawodowe ogółem (średnie)	2 830	5 606	5 709	8 704	10 864	9 413	9 673
Uczniowie, tys.	286,7	634,7	784,2	1 710,7	1 851,0	1 543,5	1 785,3

Source: *Kontynuacja przemian, Raport o stanie edukacji 2011, Instytut Badań Edukacyjnych, Warszawa 2012*

Although the dissemination of secondary education was one of the aims of education policy, the most common type of school was a basic vocational school (about 55% of primary school graduates went to it), preparing qualified workers who received jobs after graduation. This school of unequal opportunities became the final level of education for the vast majority of young people, mainly from working class and peasant families. Its main disadvantage was narrowly understood specialized education and a very modest general education program, which

⁵⁰ This chapter is mainly based on the following sources: : *Kontynuacja przemian, Raport o stanie edukacji 2011, Instytut Badań Edukacyjnych, Warszawa 2012* (Continuation of changes, Report on the state of education 2011, Educational Research Institute, Warsaw 2012) - in the historical part; *Vocational Education and Training in Europe, Poland, CEDEFOP ReferNet Polska, VET in Europe Reports, 2018*; other sources are mentioned in the text. As the reform is being implemented, this text will be updated during the course of the project in line with the progress of the reform implementation and the availability of data in this regard.

⁵¹ (Chłoń-Domińczak et al., *Edukacja zawodowa w Polsce* (Vocational education in Poland), in: M. Federowicz and A. Wojciuk (eds.), *Kontynuacja przemian. Raport o stanie edukacji 2011* (The changes continue. Report on the State of Education 2011) [pp. 169–249], Instytut Badań Edukacyjnych. Warszawa 2012).

in consequence meant poor preparation for continuing higher education. Over 60% of young people studying in vocational schools acquired technical professions.

Until the 1980s, the participation of students in VET education was very high, many VET schools were managed in co-operation with companies, predominantly in the manufacturing sector. More than half of the students leaving primary schools chose basic vocational schools, which prepared workers for their future jobs in specific companies. At the same time, these schools offered very narrow training and limited general education, which did not prepare them to pursue education at higher levels. The resources of vocational schools and their financing were also inadequate.

Years 1989-2016⁵²

Political and socio-economic changes that took place after 1989 made it necessary to prepare people for the participation in a new political, social and economic reality. Special tasks faced the area of vocational education. Discussions on a reform of education, including vocational education, have continued since the beginning of the transition period, but no binding decisions have been taken in this area. Meanwhile, the number of vocational schools and students interested in such education decreased, and material resources did not guarantee the implementation of appropriate quality vocational training.

During the economic transition, the role of vocational education and training diminished and a model of general education was pursued. This was caused by two main factors. First, the economic transition led to the closing of many state-owned enterprises that were operating as VET schools. Second, the educational aspirations of young people increased and more frequently they began to choose a general education path. As a result, VET education turned into a negative selection, the infrastructure of VET schools became outdated, and there were few links between VET and labour market needs. Teaching practices were also quite rigid.

In 1998, a reform of education was introduced, which was successful in the sense that the announced changes were adopted in the form of legal acts providing the basis for changes in the school system and introducing fundamental changes in the area of ensuring the quality of education. A Central Examination Board was established and external exams were introduced, including ones confirming vocational qualifications, called vocational examinations. This reform devoted little space to the vocational segment. The reform assumed abandoning the dual path of upper secondary education (general versus vocational) and leaving only two-year basic vocational schools in the system, whose completion would enable graduates to obtain the qualification of skilled worker. The objectives of vocational training were to be continued by profiled general upper secondary schools with vocational profiles, post-secondary vocational schools and two-year vocational schools. Anyway, the concept of vocational education proposed in the reform has not been implemented. Among the upper secondary schools there was again a four-

⁵² (Chłóń-Domińczak et al., *Edukacja zawodowa w Polsce (Vocational education in Poland)*, in: M. Federowicz and A. Wojciuk (eds.), *Kontynuacja przemian. Raport o stanie edukacji 2011 (The changes continue. Report on the State of Education 2011)* (pp. 169–249), Instytut Badań Edukacyjnych. Warszawa 2012; Kwiatkowski, S. M., *Kształcenie zawodowe w szkołach ponadgimnazjalnych a oczekiwania pracodawców wobec absolwentów. Świat – Europa – Polska (Vocational education in post-secondary schools and employers' expectations of its graduates. The world – Europe – Poland)*, *Edukacja* 1(27), 20–31, Warszawa 2013; Lis, M., and Miazga, A., *Ocena jakości polskiego systemu kształcenia zawodowego z perspektywy potrzeb rynku pracy (Labour market perspective on the quality of vocational education in Poland)*, *Edukacja* 1(136), 5–22, Warszawa 2016; Magda, I., *Wykształcenie zawodowe, elastyczne zatrudnienie a podnoszenie swoich kwalifikacji (Vocational education, flexible employment and lifelong learning)*, *Edukacja* 1(136), 44–57, Warszawa 2016; Mazik-Gorzelańczyk, M., *Kształcenie zawodowe w Polsce w perspektywie zmian i potrzeb gospodarki (Vocational education in Poland in the perspective of economic changes and needs)*, Warszawa 2016).

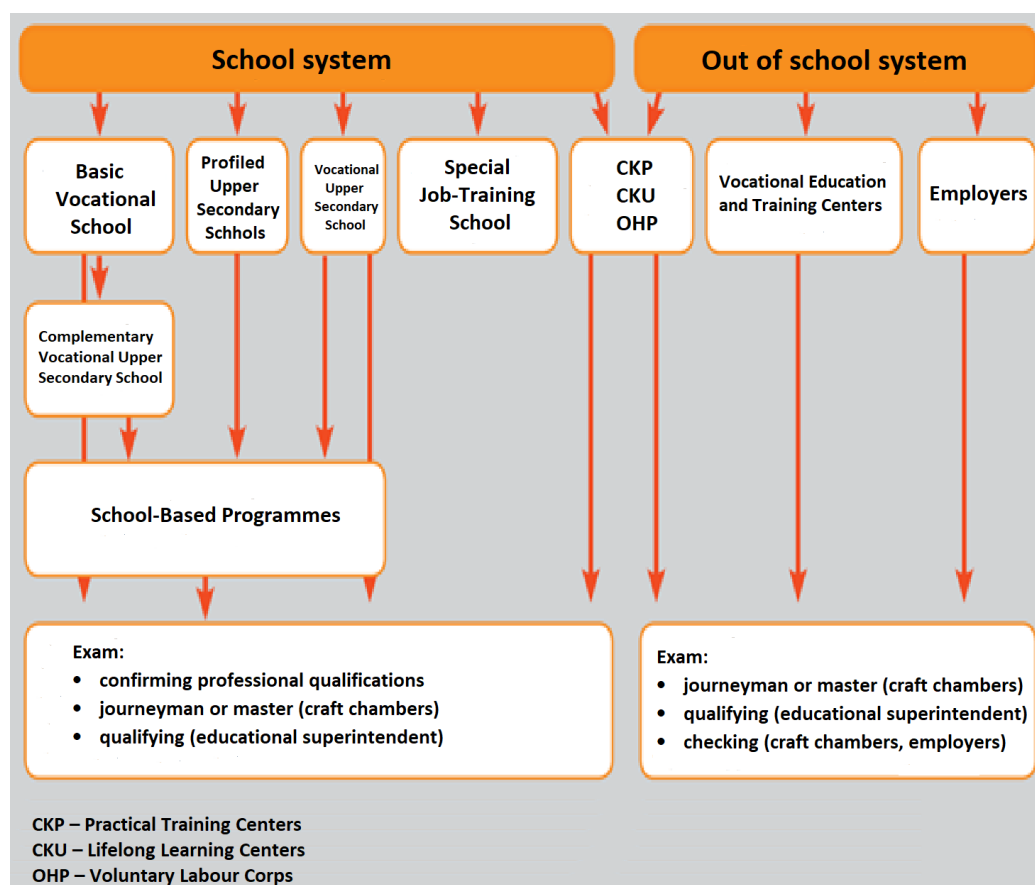
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year vocational upper secondary school. In order to ensure patency of education after finishing primary school, two-year high schools (general upper secondary schools) and a three-year supplementary vocational upper secondary programme was introduced.

The next reform of IVET was introduced in 2012. The main goal was to adjust the learning outcomes in the VET system to the needs of the labour market and the economy. The most important part of this change was developing separate qualifications within occupations, modifying the core curriculum, introducing learning outcomes, and making the validation of VET qualifications more flexible. VET schools also reorganised their functioning and introduced new solutions. Additionally, due to the improving labour market situation, there was increased demand for qualified workers with technical VET education as well as craftsperson's. This led to a growth of interest in VET education⁵³.

The VET system in Poland shaped by the reform of 2012 is shown in Fig. 1 and 2.

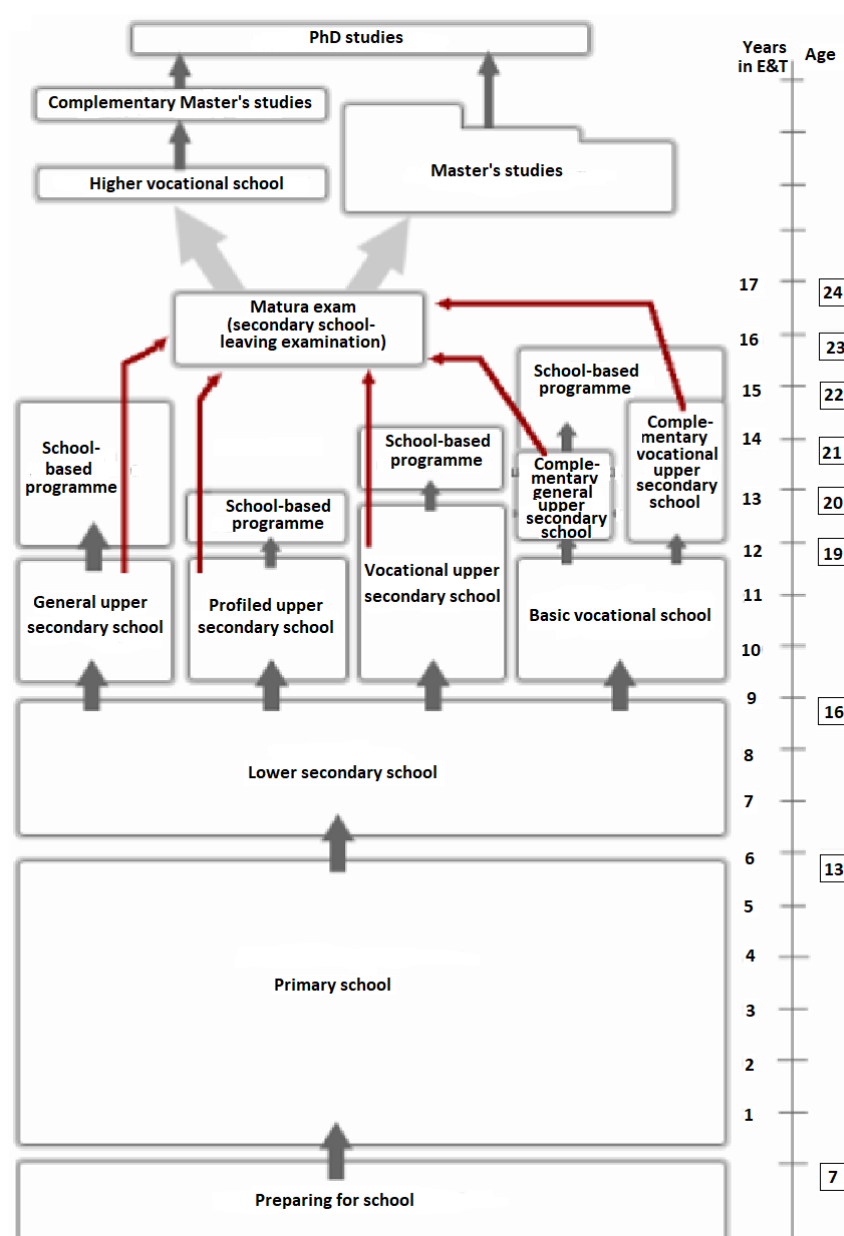
Figure 14 - Elements of VET system in Poland after the 2012 reform



Source: *Kontynuacja przemian, Raport o stanie edukacji 2011*, Instytut Badań Edukacyjnych, Warszawa 2012

⁵³ (Mazik-Gorzelańczyk, M., *Kształcenie zawodowe w Polsce w perspektywie zmian i potrzeb gospodarki* (Vocational education in Poland in the perspective of economic changes and needs), Warszawa 2016).

Figure 15 - The education system before the reform of 2016



Source: Marzena Kletke – Milejska, praca doktorska „Zreformowany system edukacji i jego wpływ na kształcenie i wychowanie dzieci w publicznych szkołach podstawowych. Studium politologiczne”

Over the past three decades, the Polish education system has undergone several profound changes in its structure, forms of organisation and management, as well as of the core curricula. As a result of these changes, distinctive VET features were developed:

- a flexible VET system allows changing pathways at any point;
- a register classifying occupations (COVE), each comprising one to three qualifications that can be acquired in IVET and CVET. The register is consistent with the classification of occupations in the labour market. A VET qualification diploma can be issued only when all qualifications required for an occupation have been acquired (on passing State vocational examinations);

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- VET schools are autonomous in choosing optional curricula for VET: either subject-centred or modular curricula, which can be easily modified, depending on labour market needs;
- one VET core curriculum for all occupations. Separate VET qualifications within specific occupations are described in the core curriculum as a set of expected learning outcomes: knowledge, occupational skills, and personal and social competences allowing learners to handle their occupational tasks independently;
- vocational qualification courses allow adults to acquire qualifications faster than IVET learners;
- possibility to validate qualifications acquired in different learning contexts, including professional experience, by taking external examinations.

As indicated by qualitative research, both among employers' representatives and experts, vocational training programs were implemented in isolation and sometimes despite real market and employer requirements. In their opinion, students involved in a system isolated from market reality, were not fully aware of their needs. The clash with the real requirements of employers was for them a source of disappointment and frustration. Many practical classes took place mainly in schools. This model of practical education was typical of vocational upper secondary schools, especially if they were also examination centres. The situation was different when it came to the implementation of apprenticeships.

Years 2016–2020

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;
- 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;
- the Ministry of National Education, together with the Centre for Education Development (ORE), continues working on the development of new core curricula to be introduced in 2019;
- 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.

The reform of 2016 largely concerns vocational education. According to the assumptions, the target structure of schools includes: 8-year primary school, 4-year general high school, 5-year vocational upper secondary school, 3-year first stage sectoral school, 3-year special job-training school, 2-year second stage sectoral school, and post-secondary VET schools.

Basic vocational schools will be replaced by two-stage sectoral vocational schools (3 + 2 years). The first year of the first stage sectoral school started in September the 1st 2017. Its graduates will be able to continue their education at the second stage sectoral school, which will end with a professional secondary school diploma (certificate).

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As for upper secondary schools and vocational upper secondary schools, the reform will be introduced in the years 2019/2020 - 2023/2024.

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 2019/20⁵⁴. The main aim is to restore the prestige of vocational education by improving its quality and effectiveness. 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; it also changes the form of exams, the process of preparing examination tasks, and the requirements set for examiners;
- introduces, in cooperation with employers, apprenticeship as a new form of vocational learning for learners in upper secondary VET and first-stage sectoral programmes;
- introduces new options for VET learners to obtain additional vocational skills or qualifications beyond the core curriculum;
- 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 take into account 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;
- introduces the functioning regulation of the newly established second-stage sectoral programmes;
- introduces changes in the accreditation system for institutions providing continuing education in out-of-school forms, aimed at greater quality control.

According to the new law, the introduction of a new occupation in the classification of occupations will simultaneously determine its core curriculum, speeding-up the reaction to labour market developments. Changes in the occupational classification structure will be also introduced.

The management and administration of the education system (including vocational training system) has a four-level 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

⁵⁴ <https://www.cedefop.europa.eu/en/news-and-press/news/poland-vet-reform-continues>.

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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.

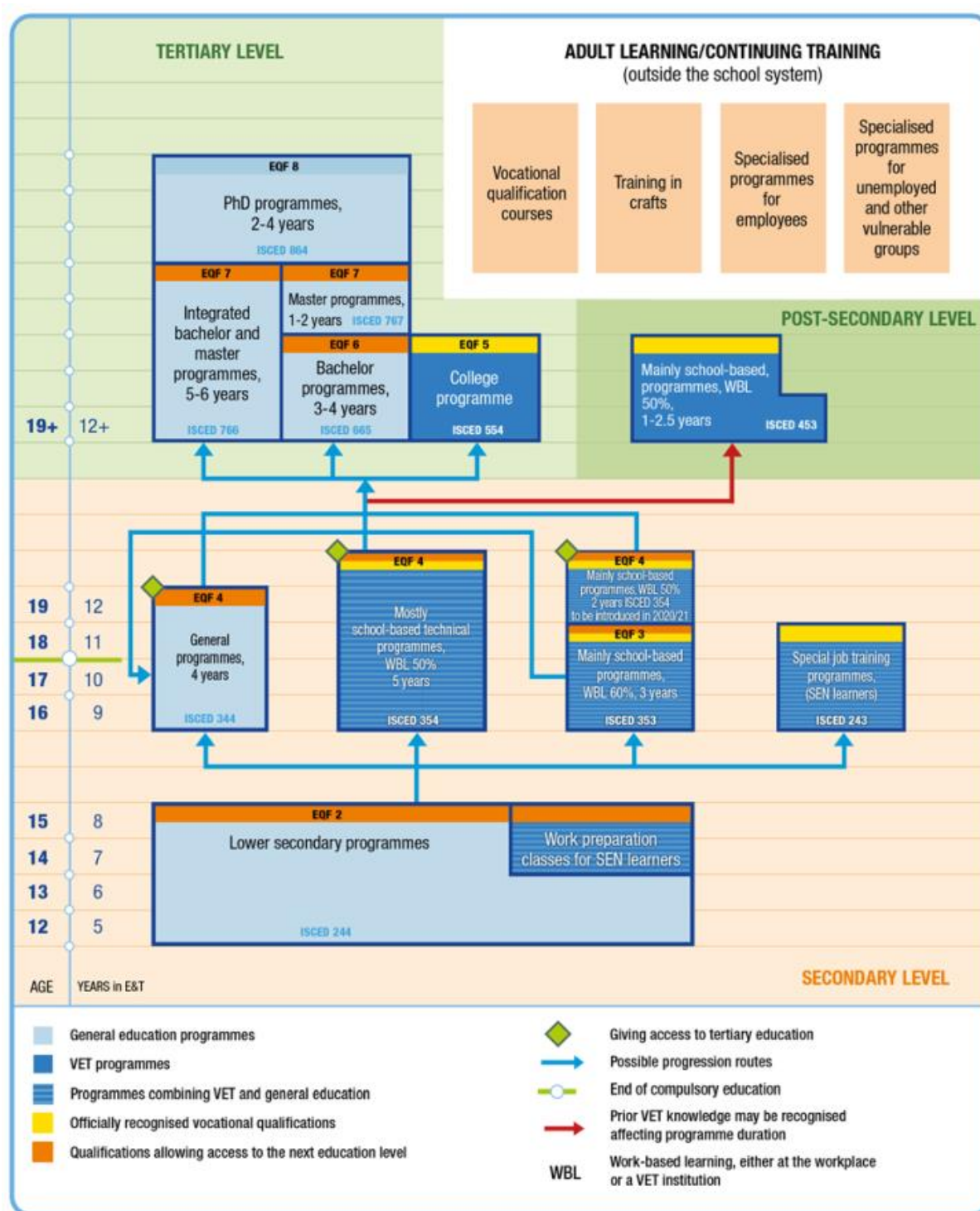
- Voivodship level (province): Voivodship authorities primarily play a coordinating role: they supervise the implementation of national policy and provide pedagogical supervision. At this level, the representative of the education authorities is the school superintendent, appointed by the voivode.
- Powiat level (county): 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.
- Commune level: Commune self-governments are leading bodies for kindergartens and primary schools (formerly lower secondary schools also).

Key elements of the reform include:

- a) phasing out lower secondary school (*gimnazjum*);
- b) restructuring six-year primary education (*szkoła 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.

Figure 16 – General education and VET in Poland in 2018



Source: Cedefop and ReferNet Poland

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.

VET at 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.

The first-stage sectoral programme was introduced in the 2017/2018 school year replacing the basic vocational programme. However, for the next two school years, students of the previous basic vocational programme will be finishing their education under the old system.

- (b) two-year second stage sectoral programme (*branżowe szkoły II stopnia – BSII*, ISCED 354, 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. BSII will operate without division into schools for youth and adults. 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*, ISCED 354, EQF 4) are 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.

The four-year vocational upper secondary programme will be transformed into a five-year programme starting from the 2019/2020 school year. Graduates of the old programmes continue their education based on the previous arrangements.

- (d) three-year special job-training programme (*szkoły specjalne przysposabiające do pracy*, ISCED 243) for learners with special education needs (SEN) leads to a job-readiness

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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 a half of the hours foreseen for the educational activities.

- (e) work preparation classes are available for SEN learners in seventh and eighth grade of primary school (lower secondary level) for pupils aged 15 years and older (*oddziały przysposabiające do pracy*, ISCED 244, EQF 2). Classes combine general education and work preparation – both adapted to the individual learner's needs and capabilities.

From September the 1st 2019, an obligation was introduced for students of vocational schools to take a vocational examination carried out by the regional examination boards or an apprentice examination carried out by the examination boards of craft chambers. Taking the professional exam in all qualifications identified in the profession will be a condition for graduating from school or promotion to the next class.

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

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 (*kwalifikacyjne 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.

Adults, including the unemployed, may also undertake vocational training through courses provided by training companies and other non-formal education institutions. Since 2016, the qualifications based on the curricula of such courses can be included in the National Qualifications Framework.

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

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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.

VET in higher education

The law on higher education in Poland distinguishes different types of higher education institutions: academic, vocational and others, such as medical or military. The second type of school offers first (Licentiate degree) and second (Master's degree) cycle study programmes as well as uniform master's studies, but not doctoral programmes.

VET system for steel sector

On May 16, 2019, the Minister of National Education issued a regulation on the core curricula for vocational education in vocational education and additional professional skills in the field of selected vocational education professions. Annex 16 to the regulation contains the core curricula for 5 vocational education professions assigned to the metallurgy industry:

- 1) foundry modeler,
- 2) operator of foundry machines and devices,
- 3) operator of machinery and equipment for the metallurgical industry,
- 4) foundry technician,
- 5) technician of the metallurgical industry.

Some technicians continue their education in the profession of metallurgical technician. Education in this field enables the acquisition of knowledge and skills in the use of machinery and equipment used in metal and powder metallurgy processes; making products by means of plastic deformation and powder metallurgy; conducting quality control; supervising the work of employees and machines and devices. Preparation for work includes wide employment opportunities, including in iron and steel works, powder metallurgy plants, plastic deformation, metallurgy design offices, and scientific and research institutes. A graduate of the metallurgy technician is a specialist in the field of technology, technology and production process management. A student may acquire the following qualifications while studying:

- 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.

The main reference for national vocational qualifications is the Integrated Registry of Qualifications (*Zintegrowany Rejestr Kwalifikacji*), in which is possible to find information about the programmes and curricula.

There are several national HE providers/universities, which offer courses related to steel and non-ferrous metals. These are:

- AGH University of Science and Technology, Krakow at the Faculty of Metals Engineering and Industrial Computer Science conducts the following fields of study:
 - metallurgy,
 - materials engineering,
 - IT education,
 - applied computer science,

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- computational engineering,
 - heat engineering;
- Silesian University of Technology, Gliwice at the Faculty of Materials Science and Engineering conducts the following fields of study:
 - industrial computer science,
 - materials engineering,
 - production engineering,
 - metal technologies,
 - management and production engineering;
- Częstochowa University of Technology, Częstochowa at the Faculty of Production Engineering and Materials Technology conducts the following fields of study:
 - metallurgy,
 - materials engineering,
 - technical physics,
 - management and production engineering,
 - glass and ceramics technology;
- Warsaw University of Science and Technology, Warsaw, which focuses on:
 - materials engineering,
 - automation and robotization of production processes;
- Wrocław University of Science and Technology, Wrocław, which focuses on:
 - industrial informatics.

SECTION IV – Concluding remarks

4.1 Where are national VET policies heading?

As a summary and conclusion of this report, it is important to point out what are the main trends that is possible to identify from a general comparative overview of the VET systems under study.

A common feature of the reviewed VET systems is that, to different extents, all the 5 countries have recently undergone (or are still undergoing) partial reforms of their VET system. The reforms were addressed at overcoming some recognised limits of the VET systems, in particular, in their capacity to connect with the labour market and with the actual company requirements. The initiatives undertaken can be summarised in the following points:

- The problem of skills mismatches and skills shortages has been addressed in all the countries through a more direct engagement of the sectoral employers' associations in the process of updating the qualifications (except for Germany, in which was already in place a solid and long-lasting consultation mechanism). This often results in a more complex governance of the field that attempts to shift the whole system towards a more collective type of skills formation. Anyway, it has also to be noted that such shift can cause a critical expansion of the time needed to complete the whole process (definition of new qualifications, updating of existing qualifications), in the case of highly fragmented systems.
In Germany, the problem of skills mismatches has been addressed through an “occupations screening” with the aim to understand the impact of technological innovation on some industrial key sectors, including metalworking. One of the outcomes of this review process was 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.
- The gap between formal training and practical working skills was another shortcoming of most of the systems (again, except for the German system, which has historically mainly relied on the apprenticeship route). Recent reforms in Italy, Spain and Poland have 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 working skills acquired in a practical manner.
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, tend to 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.
- The competence of new VET trainers is considered another major strategic leverage to relaunch the attractiveness of vocational education and training. In different systems new programmes and curricula have been 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

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trainers was, for instance, stressed also in the 2016 reform of the Polish education and training system.

- 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 has been enhanced through better connecting VET with higher education programmes (though these routes are still not popular). This aims also at reducing the divide between IVET and CVET, allowing for more flexible and adaptive paths (also in consideration of a higher need for re-training mechanisms).
- All the considered countries have developed their own National Qualifications Repertoires and have undergone the process of referencing it to the EQF (except Spain, formally). This increases transparency and cross-national comparability of qualifications through referring them to common and understandable descriptors.
- 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.

Some considerations can also be made about the overall functioning of the different systems. Based on the type of governance and on the actors involved, we can place the different VET systems along a spectrum that goes from a highly centralised system, to a highly fragmented one (where none of the considered cases correspond to any of the two poles).

While more de-centralised VET systems, as the UK, seem to better respond to local requirements, they might lack of the capacity to implement overarching long-term national strategies. Also, fragmented VET systems might be less effective in responding in a timely and strategic manner to threats and opportunities coming from exogenous inputs (the most important of which nowadays is technological innovation).

Where the system is more fragmented, policy structures are both more complex and more unstable, and this can inhibit employers' engagement. England, for instance, has been blamed in the past years for inhibiting employers' engagement in the development of qualifications, though recent reforms are trying to overcome the issue.

A highly centralised system, on the other side, might not be capable of responding in an effective way to the local labour market needs, but it enhances the capacity to devise long-term strategies and more coherent paths from secondary to tertiary level. Transparency, consistency and recognisability of qualifications across the whole country is guaranteed in a more centralised system, along with a certain degree of rationalisation of the VET provision. At the same time, such characteristics imply less flexible employment arrangements, making it challenging for VET institutes to be flexible and timely adaptive.

On the contrary, in countries as the UK, the needs of different groups of learners are met through a highly diversified offer. Part-time and distance learning options are also available for the different programmes. Though considering a vaster training offer as a positive feature, the overlapping of many qualifications in a highly fragmented system, may cause confusion among learners.

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