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PART 1/4

COMMISSION STAFF WORKING DOCUMENT

Analytical underpinning for a New Skills Agenda for Europe

Accompanying the document

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions

A NEW SKILLS AGENDA FOR EUROPE:
Working together to strengthen human capital, employability and competitiveness

{COM(2016) 381 final}

Analytical underpinning for a New Skills Agenda for Europe

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Introduction

The purpose of this Staff Working Document is to accompany the Communication "A New Skills Agenda for Europe" and its three annexes "Tackling low skills: the skills guarantee", "Results of the public consultation on the EU's modernisation agenda for higher education", "Enhancing the transparency of qualifications and the European Qualification Framework (EQF)" and to present a general overview of the issues and the available evidence basis for this initiative.

In line with Better regulation principles, the evaluation evidence and the ex-ante assessment take account of the nature and type of the policy initiatives. Preparing an analytical document, instead of a fully-fledged impact assessment, was considered a proportionate approach on this agenda.

This Staff Working Document looks at the main problems and issues facing the EU with regard to human capital and skills needs which are addressed by the actions in the Communication and explains why Europe's economic and social success is and will be to a large extent based on the skills of its population. However, in the vast literature on skills, different definitions and concepts are used by different authors. For the purpose of this document, the term "skills" is used in a broad sense and refers to what a person knows, understands and is capable of doing.

Chapter 1 analyses why skills are important for employability and productivity and how demographic change, globalisation, technological progress, especially digitalisation and automation, impact on the changing nature of work and skills needs. Europe's ageing population and the decline in the working age population mean that economic growth will increasingly depend on higher employment rates through improved employability and on higher productivity growth through a better-skilled workforce. Equipping people with relevant skills[1] and qualifications, maintaining and making full use of the skills available drives innovation and competitiveness and provides the basis for high productivity and sustained competitiveness and growth. At the same time, a high level of skills reduces significantly the risk of individuals becoming unemployed, the risk of poverty and social exclusion and is associated with increasing engagement in society[2]. This is especially urgent as there are circa 21.7 million unemployed people across Europe – half of whom have been so for more than a

[1] In this document the term "skills" is used in a broad sense and refers to what a person knows, understands and is capable of doing, this encompasses knowledge and competences. In the **Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning" competences are defined in this sense: "**Competences are defined here as a combination of knowledge, skills and attitudes appropriate to the context.

[2] European Commission, Annual Growth Survey 2016, COM (2015) 690 final.

year. 4.4[3] million are young unemployed. Low-skilled individuals are also often vulnerable consumers, especially in increasingly complex markets.

Globalisation, technological progress, digitalisation, the move towards a greener, low carbon and resource efficient economy, demographic ageing and the call for better work-life balance are changing the nature of work, job profiles and the skills required. Disruptive changes will continue to alter economic structures and create new types of jobs that are unknown today. A sound basis of knowledge and skills is the best way to boost people's ability to adapt to unforeseen changes. New ways of working, including the collaborative economy, increased independent and contract-based work, more frequent job changes (for necessity and opportunity), and changes in work organisation all have an impact on the types of skills needed. These changes and the resulting impact on increased job and wage polarisation call for the need to re-skill and up-skill the European labour force. Higher- level and broader sets of skills and qualifications are increasingly required across the economy and are key to Europe's growth potential. By 2025[4], 48.7% of all job openings (including both new and replacement jobs) in the EU will require high qualifications, 39.8% will be for medium qualified and only 11.5% will require low or no qualifications. There is a need for a broader set and higher levels of skills. Already in 2014[5], seven in ten EU workers needed to have at least a moderate level of ICT skills (use a PC for word-processing, creating documents and/or spreadsheets) to perform their jobs. About half of adult workers considered problem-solving, teamwork and communication skills as very important for doing their jobs.

Chapter 1 also looks at how intra-EU mobility and third country migration can have a positive impact on resource allocation, productivity and growth, if managed through effective policies that make the most out of the available human capital. It also considers the risk of brain drain.

Chapter 2 looks at the state of play with regard to educational attainment and the skills stock in Europe as well as skills gaps and the macro-economic cost of skills gaps and skills mismatches, for instance through the misallocation of resources in the economy as well as the cost of not using the available skills (e.g. those of migrants, women, educated but unemployed youth and those in employment who do not fully use their skills).

Chapter 2 also looks at skills-related policy implementation in the EU. An important conclusion is that a worryingly high percentage of the adult population do not have the basic skills level required for full participation in the labour market and society. Possessing these skills at a level equivalent to EQF 4 (upper secondary education) is seen as the minimum requirement for people to be able to live and work in today's society, and in many cases is the minimum requirement for access to vocational and other further training. This is addressed by the Skills Guarantee proposal **(Annex 1)**.

To be effective, education, training as well as research need to provide quality outputs and respond to the fast-changing needs of the economy and society. Research shows that the skills

[3] Eurostat, http://ec.europa.eu/eurostat/statistics-explained/index.php/Unemployment_statistics#Unemployment_trends
[4] Cedefop, 2016 (forthcoming).
[5] Cedefop, European skills and jobs (ESJ) survey, 2014.

most in demand in advanced economies are "non-routine and interpersonal"[6] while many Europeans are still trained in more traditional "routine and manual" skills. Evidence shows that in advanced economies such as the US, the employment share of non-routine jobs, such as design-related occupations, grew from 28% to 38% between 1995 and 2010, whereas traditional routine jobs fell from 53% to 41%[7]. This is further evidence that a targeted policy response is particularly needed for low-skilled workers who have been most strongly affected by the crisis and generally would require retraining to become employable again.

Skills are acquired at all stages of education and also through non-formal and informal learning, long before people enter the labour market and continue throughout the career path. Formal education, training systems including Vocational Education and Training (VET) remain the essential providers of skills and qualifications, although new developments are transforming the way people learn within these systems. Because of the privileged status of VET for the labour market, the Commission will make proposals to support the modernisation of VET in late 2017. The modularisation of education and training, the combination of study and work periods (including mobility), and the emergence of new providers and innovative models have further contributed to diversify the supply of learning opportunities. The role of teachers is central to ensure the quality of learning and to respond to evolving skills needs. The same is true of trainers at all levels.

High-level skills are developed primarily in higher education institutions and to some extent also in research institutions: Europe's universities, universities of applied sciences and colleges as well as research performing institutions. While enrolment and attainment in Higher Education in Europe has grown steadily during the past decade and higher education graduates continue to enjoy persistent advantages in both finding employment and earning, higher education systems still face important challenges in adapting to changing skills requirements in the real economy and preparing their students for a fast-changing world. These issues are being explored as part of the review of the EU's Modernisation of Higher Education. The main findings of a wide-ranging public consultation on the future of the modernisation agenda have fed into the Skills Agenda and are summarised in **Annex II**. To better understand the output of Higher Education and performance of graduates, the Commission will propose an initiative on Graduate Tracking in late 2017**.**

Chapter 2 also looks at the skills situation and skills in some of the key sectors in Europe, providing supporting evidence for a Blueprint for Sectoral Cooperation on Skills to support stakeholders from each economic sector to understand their skill needs and to develop European skills strategies**.**

After looking at the challenges related to the acquisition of the different kinds of skills, Chapter 2 also focuses on issues related to transparency and recognition of skills, the state of play of labour market and skills intelligence across the EU, including on sectoral and cross-sectoral skills challenges, and presents a snapshot of the current EU funding for skills. While developing the relevant skills is crucial, it is equally important that the skills already available are made visible and are used optimally. This includes the recognition of knowledge,

[6] OECD, OECD Skills Outlook: First Results from the Survey of Adult Skills, OECD Publishing, 2013.
[7] OECD, ibid

competences and skills acquired outside formal education and training through non-formal and informal learning which poses significant challenges. The issues of visibility of skills are addressed in the specific proposal on enhancing the transparency of qualifications **(Annex III)**. In the Skills agenda, there is a concrete proposal for the revision of the European Qualification Framework which aims at improving the transparency and comparability of qualifications. With regard to enhancing the comparability of migrant's skills and qualifications, the Commission is proposing a "Skills Profile Tool for Third Country Nationals" to support early profiling of asylum seekers, refugees and other migrants**.**

In addition, to bridge the skills supply with the changing demand on the labour market it is essential to improve our understanding of and capacity to forecast skills needs and to improve the way this intelligence is disseminated and used by individuals, education and training providers and policy makers. Better skills intelligence also helps to tackle skills mismatch and the macroeconomic costs associated with it. These issues will be addressed in the proposals on Europass to be presented later in 2016 on better tools and services for skills and qualifications. The Commission is also proposing to further analyse and share best practice to tackle the brain drain. The Commission will also propose a simplification of the current governance structure to support a more coordinated implementation of some of the initiatives of the Agenda.

To reinforce the evidence presented in Chapters 1 and 2, **Chapter 3** summarises the views of a range of stakeholders both on the Skills Agenda as a whole and on the specific proposals.

In the annexes, the evidence collected to support the concrete initiatives proposed by the Commission is presented. Each annex presents the challenges and then propose~~s~~ a number of policy options for which the envisaged impacts are analysed. The analysis builds on the available evaluations and on stakeholders views that have been collected during the preparation of these policy initiatives.

Detailed evidence supporting specific proposals by the Commission is presented in Annexes I- III:

Annex I - Tackling low skills: the Skills Guarantee

Annex II - Results of the public consultation on the EU's modernisation agenda for higher education

Annex III - Enhancing the transparency of qualifications: the European Qualifications Framework (EQF).

1. Why do skills matter?

Europe's economic and social success is to a large extent based on the skills of its population.

Equipping people with relevant skills[8] and qualifications, making full use of the skills available drives innovation and competitiveness and provides the basis for high productivity and sustained competitiveness and growth. At the same time, a high level of skills reduces significantly the risk of individuals becoming unemployed, the risk of poverty and social exclusion and is associated with increasing engagement in society[9]. This is especially urgent

[8] In this document the term "skills" is used in a broad sense and refers to what a person knows, understands and is capable of doing.
[9] European Commission, Annual Growth Survey 2016, COM (2015) 690 final.

as there are circa 22 million unemployed people across Europe – half of whom have been so for more than a year. 4.4 million are young unemployed. Low-skilled individuals are also often vulnerable consumers, especially in increasingly complex markets[10].

Globalisation, technological progress, digitalisation, the move towards a greener economy, demographic ageing and the call for better work-life balance are changing the nature of work, job profiles and the skills required. New ways of working, including the collaborative economy, increased independent and project-based work, more frequent job changes (for necessity and opportunity), and changes in work organisation all have an impact on the types of skills needed.

1.1. Employability and active engagement in the labour market

Education levels and skills have been shown to be strongly correlated with the probability of being employed as well as with wage levels. Eurostat analysis shows that the employment rate of those aged 25-64, who had completed a tertiary (short-cycle tertiary, bachelor's, master's or doctoral levels or equivalents) education was 83.7 % across the EU-28 in 2014, compared to 73.4 % for persons with at most an upper secondary or post-secondary non-tertiary education and 52.6 % for those who had attained no more than primary or lower secondary education. The largest falls in employment rates since the beginning of the financial and economic crisis (comparing 2008 with 2014) were witnessed for persons with at most a primary or lower secondary education (down 3.9 percentage points), while notably smaller falls were observed for persons with a tertiary education (down 1.4 percentage points) and persons with at most an upper secondary or post-secondary non-tertiary education (down 1.3 percentage points).[11]

Analysis of the current levels and distribution of skills for seventeen Member States which participated in PIAAC Survey[12] also shows a positive association between education, skills, training, and employment opportunities, suggesting that part of the positive effect of education may pass through the level of skills possessed by the individual. The level of skills seems to be positively associated not only with employment opportunities, but also with the type of occupation in which individuals are employed and significantly to a number of social outcomes.[13] Thus, upgrading skills in the sense of actual abilities, not only in terms of educational attainment, is crucial to improving labour market performance and beyond.

Another way of looking at the link between labour-market outcomes and skills is to analyse the effect of different proficiency levels on the probability of being employed, unemployed or inactive. It has been found[14] that both unemployment and inactivity are more common among

[10] see study on consumer vulnerability at: http://ec.europa.eu/consumers/consumer_evidence/market_studies/docs/vulnerable_consumers_approved_27_01_2016_en.pdf) and the 2014 Consumer Scoreboard , page 15, at http://ec.europa.eu/consumers/consumer_evidence/consumer_scoreboards/10_edition/index_en.htm

[11] Eurostat, Employment Statistics, 2015

[12] Flisi S. et al., Skills Beyond Education, An analysis of cognitive skill evolution and its implications for employment chances, JRC Science and Policy Report, 2015

[13] Costa P., Caetano Rodrigues Jorge Rodrigues Ferro M., Vera-Toscano E. and Weber A., Education, Adult Skills and Social Outcomes: Empirical evidence from the Survey on Adult Skills (PIAAC 2013), Publications Office of the European Union, JRC89591, 2014

[14] Quintini G., Skills at Work: How Skills and their Use Matter in the Labour Market, OECD Social, Employment and Migration Working Papers, OECD Publishing, 2014

the least skilled (Level 1 and below). On average, about 57% of those individuals who score at Level 1 or below the PIAAC literacy proficiency scale are employed, 7% are unemployed, and the remaining 36% are inactive. The picture drastically changes when high skilled are considered. For individuals who score at Level 4 or 5, 79% are employed, about 4% are unemployed, and 17% are inactive.

Moreover, employees with a low level of education are almost five times more likely to be low-wage earners than those with a high level. In 2010, the proportion of low-wage earners among employees with a high level of education was 5.8 % in the EU which points to a problem with regard to use of their skills. This proportion increases to 19.3 % for a medium level of education and to 29.0 % for a low level.[15]

The relationship between literacy proficiency and labour market participations, employment and wages varies considerably among countries. This is likely to reflect differences in institutional arrangements (such as wage setting) as well as the relative weight given to educational qualifications and other factors in employers' hiring, promotion and wage-setting decisions.

Hourly wages are strongly correlated with proficiency levels. The OECD found that on average across countries, the median hourly wage of workers scoring at Level 4 or 5 on the literacy scale is 60% higher than that of workers scoring at Level 1 or below. Differences in returns as proficiency increases vary across countries[16].

Proficiency in literacy, numeracy and problem solving in technology-rich environments is positively associated with the probability of participating in the labour market (Figure 1) and being employed and with higher wages.

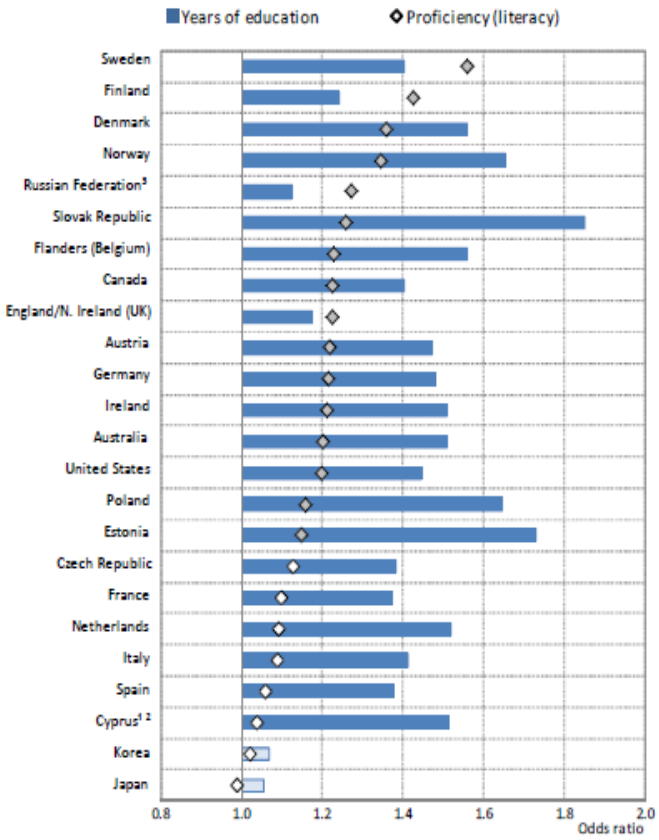
After the effects of educational attainment are taken into account, an increase of one standard deviation in an individual's literacy proficiency (46 score points) is associated with a 20% increase in the probability of participating in the labour market and a 10% increase in the probability of being employed as opposed to being unemployed. An increase of one standard deviation in literacy proficiency is also associated with an 8% increase in hourly wages, on average across countries. The link between literacy proficiency and labour force participation is strongest in Sweden and Finland, where an increase of 46 points on the literacy scale raises the probability of being employed or looking for work by 56% and 43%, respectively. On the other hand, it is weakest in Estonia and Poland, where the likelihood of labour-force participation increases by 15% and 16%, respectively, following a 46-point rise in the literacy score[17].

[15] Eurostat, Earnings by Level of Education, 2010

[16] In several countries, such as the Czech Republic, Estonia, Poland, the Slovak Republic, Sweden and the Russian Federation, the distribution of wages appears to be rather compressed; at the other extreme, returns to greater proficiency appear to be extremely large in the United States, Korea, Ireland, Canada and Germany

[17] Quintini G., Skills at Work: How Skills and their Use Matter in the Labour Market, OECD Social, Employment and Migration Working Papers, OECD Publishing, 2014

Figure 1: Effect of education and literacy proficiency on labour market participation



Countries are ranked in descending order of the odds ratios of proficiency.

1.2.3. See footnotes 1, 2 and 3 of Figure 1.

Notes: Results are adjusted for gender, age, marital and foreign-born status. The odds ratios correspond to a one-standard-deviation increase in proficiency/years of education. Statistically significant values are shown in darker tones. Years of education have a standard deviation of 3.05, literacy has a standard deviation of 45.76.

Source: Survey of Adults Skills (PIAAC) (2012).

Odds ratio showing education and literacy proficiency on the likelihood of participating in the labour market among adults not in formal education
Source: Quintini, G.; 2014, OECD

As argued above, investing in skills, education and research has a crucial role for labour market participation. But skills are also associated with wider social and economic benefits. EU average estimates of proficiency in literacy, numeracy and problem solving in technology-rich environments[18] and of adults' participation in learning programmes are positively and significantly associated with the probability of reporting high social trust, belief in having

[18] While in the future, a more complex operationalization of skills' dimensions will be needed to better match individuals, performances, and jobs , as argued by OECD (2013) literacy, numeracy and problem solving as key information-processing competences, refers to the ability to understand, evaluate, use and engage with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential. Thus, there is growing recognition of its critical role for personal success workwise and beyond.

some impact on the political process, participating in volunteer activities and reporting good health. These effects are independent from those of educational attainment indicating that not only formal education per se is important; other individuals' competences understood as the ability to successfully meet complex demands in the current global economy[19] are key for an effective and fruitful participation in the social and economic life of advanced and innovative economies.

1.2. Productivity

Economic growth is increasingly driven by labour productivity and share of employed people. As working-age population declines, greater participation of women on the labour market and additional human resources from international migration (both EU and third-country) as well as bringing the unemployed back into the labour market would help to compensate in part, the impact of ageing on the labour market and growth. However, productivity growth will eventually become the most important source of potential economic growth as employment starts declining. A more skilled workforce, capable of contributing and adjusting to technological change and new patterns of work organisation, can help to tackle disruptive developments.

Investment in education and training systems, anticipation of skills needs and matching and guidance services are thus fundamental in order to raise productivity, competitiveness, economic growth and ultimately employment[20].

Economic growth theories generally consider the accumulation of human capital and productive knowledge to be of similar importance to the accumulation of physical capital. Human capital accumulation is an investment in the upskilling of individuals which is rewarded through increased employability as well as higher productivity, wages and salaries in the future. Higher levels of skills, including flexibility and problem-solving, enable workers and employers to develop or adopt new ideas and processes[21]. It also fosters the circulation of ideas and the absorption of technologies from leading countries which increases the productivity of capital and labour and results in higher GDP growth. In addition, there is a strong complementarity between investments in physical and human capital, as the investment decisions of companies and people influence each other triggering a virtuous circle: companies investing in more sophisticated technology attract well-qualified staff while at the same time people willing to improve their competences encourage companies to innovate and invest in new equipment.

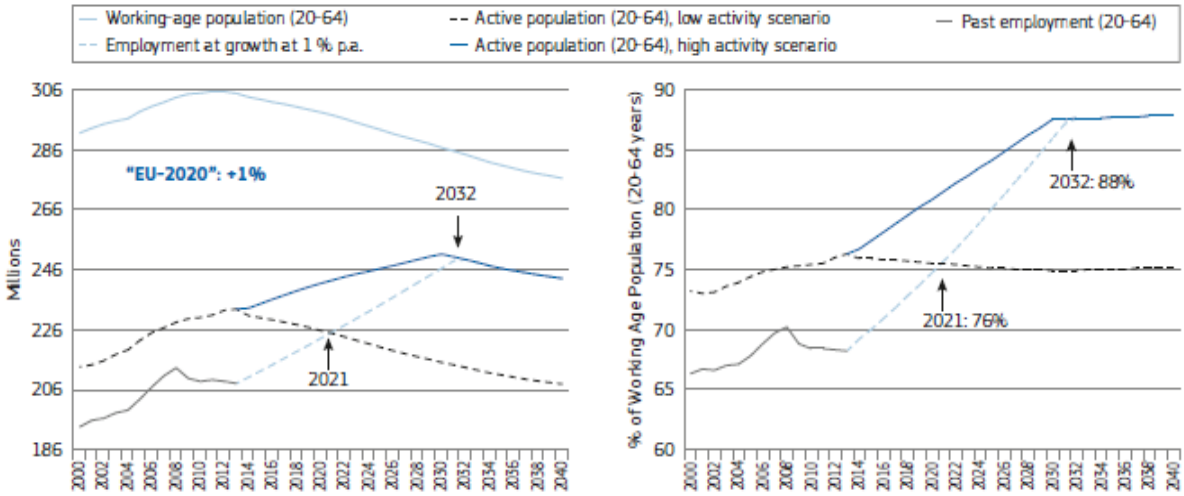
1.2.1. The demographic challenge and the productivity imperative

For decades, economic growth across Europe has been pushed by increases in both labour productivity and the share of employed people: an increasing workforce went hand in hand with the increase in their productivity, in turn driven by capital investment, technological

[19] These skills are indicated in the Recommendation on Key competences for lifelong learning. The Commission is developing framework including learning outcomes and proficiency levels for foreign languages, digital competences and sense of initiative and entrepreneurship. Two of them can be already self-assessed by citizens in their Europass, and the Commission is promoting them extensively.
[20] DG RTD "New Skills and Jobs in Europe: Pathways Towards Full Employment", Policy Review, p. 29.
[21] Burgess S., "Human Capital and Education: The State of the Art in the Economics of Education", FP7 Project COEURE, 2015

change and the continuous reallocation of the labour force towards more productive industries. However, the challenges brought by demographic ageing may bring this scenario to an end. The EU is projected to move from having four working-age people for every person aged over 65 years to about two working-age persons by 2060. The population of working age (20-65) is projected to decrease from 306 million to 269 million by 2060.[22]

Figure 2: Potential employment path assuming different activity scenarios, EU-28



Source: Update of Peschner and Fotakis (2013), p. 13–15.

As shown in Figure 2[23], in a context of demographic decline, there are limits to increases in the labour force. According to scenario analysis, starting from today's EU activity rate of around 76%, the EU would approach activity rates of around 88% by 2032 under a high activity scenario. With no further progress in activation (low activity scenario) the EU will see employment growth turn negative relatively soon - around 2021. Even using very optimistic assumptions, EU employment growth will be unable to maintain a steady annual growth rate of 1% sustainable growth path for more than ten years. At the latest, it would turn negative around 2032.

Before the crisis, the EU's economy grew by an average of around 2% each year: the sum of 1% employment growth and 1% productivity growth on average. In order to continue growing at this pace in times of declining employment, the EU would have to more than double the rate of annual productivity gains.

[22] European Commission, "Economic and budgetary projections for the 28 EU Member States (2013-2060), The 2015 Ageing Report, 2015
[23] Taken from the Employment and Social Developments in Europe Review (ESDE) 2014

In the medium term, it is thus evident that the workforce decline will leave productivity growth as one of the most important leverages to sustain economic growth and to maintain current welfare levels.

1.2.2. Skills as a Driver of Productivity

Skilled workers are more likely to be employed and are more productive than unskilled ones. Besides the direct impact that knowledge (know what) and competences (know how) has on the work output: skills can affect productivity growth also by promoting the transfer of knowledge and the mobility between universities, research institutes, firms, industries and countries[24]; by developing absorptive capacity so that firms can better innovate or adopt best practices[25]; and by promoting mobility of skilled workers to disseminate innovative ideas and knowledge of processes[26].

High level skills contribute more to productivity[27] the closer a country is to the technological frontier[28]. Research suggests that a 1% increase in skills is associated with a 0.3% increase in average labour productivity and with a 0.365 % increase when the model is extended to take account of the potential role of skills in assisting productivity follower countries catch up with countries on or near the frontier. As companies approach the frontier they are more likely to innovate as opposed to imitate. One-year increase in average education is associated with a 3 to 6% increase in the level of GDP per capita and a 1% increase in school enrolment is associated to an increase in GDP per capita growth of between 1% and 3%. [29]

In addition to its direct contribution to growth, human capital has indirect effects as well, by stimulating the accumulation of other productive inputs (e.g. physical capital, technology or health) which in turn foster growth. Nevertheless, all adults of working age need a necessary foundation of basic and digital skills in order to upskill according to labour market needs. This is very important when taking into account that low-skilled employees often do jobs that offer no on-the-job learning, receive less training organised by employers, and compared with high-skilled people miss out on the benefits of continued learning. The empirical analysis based on the European Skills and Jobs Survey[30] highlights the close relationship between the degree to which adult employees improve their skills in their jobs and the skill intensity and job complexity of such jobs. The net result is that low-skilled adults get stuck in a 'low skills-poor jobs trap', in unskilled work, with few opportunities to improve their skills.

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[24] Lundvall B.-A., National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning, Pinter Publishers, 1992

[25] Benhabib J., Spiegel M., "The Role of Human Capital in Economic Development Evidence from Aggregate Cross-Country Data", Journal of Monetary Economics, 1994; Greffith R., Redding S.,Van Reenen J., "Mapping the two faces of R&D: Productivity growth in a panel of OECD industries", Review of economics and statistics, 2004

[26] Mason et al., "External knowledge sourcing in different national settings: a comparison of electronics establishments in Britain and France", Research Policy, 2004

27 Vandenbussche et al., "Growth, distance to frontier and composition of human capital", Journal of Economic Growth, 2006

[28] The process of economic development is influenced by a country's income gap with the advanced economies that define the global technological frontier (Aghion and Howitt, 2006, 2009). The main growth driver for economies farther away from the technological frontier is the adoption of existing technologies; this process can also be more broadly defined as the implementation of more efficient production techniques. The closer a country gets to the global technological frontier the higher is the relative importance of innovation instead of imitation for sustaining productivity and output growth (Acemoglu, Aghion, and Zilibotti, 2006).

[29] Sianesi B.,Van Reenen J., "The Returns to Education: Macroeconomics", Journal of Economic Surveys, 2003

[30] Matching Skills and Jobs in Europe, insights from CEDEFOP's European Skills and Jobs Survey, CEDEFOP 2015

The most significant skills contribution to labour productivity growth for seven Member States[31] between 1980 and 2007 came through total factor productivity growth and capital accumulation followed by build-up of skills, most importantly higher-level skills (bachelor degree and above, ISCED 5a to 6). However, in six of the seven countries, upper-intermediate (technician level, ISCED 4 and 5b) and lower-intermediate (craft level, ISCED 3A and 3B with vocational orientation) vocational skills also made positive contributions to labour productivity growth[32].

Skill accumulation appears to improve productivity not only of individuals directly concerned, but also other members of the workforce, who benefit from 'spillovers', for example, knowledge passing between colleagues. There is significant complementarity between high- and intermediate-level vocational qualifications. Such a complementarity between intermediate vocational skills and high-level skills seems higher in manufacturing sectors of countries with apprenticeship-based systems[33]. According to one CEDEFOP study, productivity performance is augmented by developing a mix of both intermediate-level and high-level skills[34].

1.2.3. Skills obsolescence

Lower-skilled workers, together with older workers and those without an opportunity to develop their skills throughout their careers, are most at risk of skills obsolescence and this can transfer into decrease of productivity. [35]

For lower-skilled workers, particularly those in precarious jobs, the threat of skills depreciation is greatest. Some 33% of the lower-skilled workers experience a lack of skills development in their present career, compared to around 19% of highly-educated people. Skills obsolescence may also restrict the chances of people being able to move to more suitable (or better matched) jobs either with their current or a new employer.

Unemployment adds to their skills' difficulties since by not exercising the skills they have attained they are losing them. Skills obsolescence could be counteracted by access to learning during periods of unemployment, but only limited numbers of low-qualified unemployed people participate in education or training.[36]

1.3. Digitalisation and automation

Innovations in digital technologies are having a huge impact on the economy and society in Europe; delivering substantial benefits to the lives of people in Europe but also bringing challenges and the need to adapt. In particular, they are leading to structural change in the

[31] Denmark, Germany, Spain, France, the Netherlands, Sweden and the UK
[32] CEDEFOP, Benefits of vocational education and training in Europe for people, organisations and countries, Publications Office of the European Union, 2013
[33] CEDEFOP, Benefits of vocational education and training in Europe for people, organisations and countries, Publications Office of the European Union, 2013
[34] CEDEFOP, Macroeconomic benefits of vocational education and training, Publications Office of the European Union, 2014
[35] CEDEFOP, Preventing skills obsolescence, Briefing Note, 2012
[36] Ibid.

labour market and the need for new skills sets. Future growth and jobs will depend on the re- and up-skilling of Europe's citizens and labour force in the face of the digital transformation.

Already over the past two decades around a third of GDP growth can be attributed to the production, investment and use of digital technologies in the EU. However, in the US the growth contribution has been higher and academic work suggests that making complementary investments in human capital and other intangible assesses is key to achieving the economic gains from ICT.

Digital technologies have also contributed to employment. Over the last decade, an extra 2 million ICT specialist jobs have been created, one million in the last three years alone. Increasing demand for skilled ICT professionals is already outstripping the supply. 40% of firms looking to hire ICT specialists report significant difficulties in finding adequately skilled people. Latest estimates suggest that by 2020 there could be around 800 000 unfilled vacancies for ICT specialists in the EU. Increasingly these jobs are created outside the ICT sector, in other sectors such as automotive. As such, over half of ICT professional jobs are now outside the ICT sector as the whole economy becomes digital. Furthermore, it has been estimated that 4-5 extra jobs are created in the economy for each new ICT job[37]. The growth of the internet and a constant stream of new innovative services have also resulted in huge benefits for consumers.

While the computer and internet revolution of the past two decades has largely impacted on services and consumers, the latest wave of innovations is revolutionising industry and thus the production side. Developments in robotics, the Internet of Things, big data and cloud technologies are causing a fourth industrial revolution. There are significant gains to be made for competitiveness, innovation and growth if we embrace these changes in Europe.

Achieving future gains from ICT requires tackling skills challenges related to digitalisation. Digitalisation is leading to the automation of routine tasks and there are concerns by many that this will lead to the net destruction of jobs and that this will result in high rates of unemployment. Evidence from a recent Eurobarometer poll, for example, shows that while most European citizens (72%) feel that robots are a good thing for society, they believe that robots steal people's jobs (70%).[38] However, there is no real clarity yet with regard to the overall effects of automation and therefore it is difficult to have a balanced assessment.

These concerns have been fuelled among other things by a number of academic papers trying to estimate the potential of technologies in development to replace certain job tasks carried out by people i.e. looking purely at the negative side of the equation.[39] A different approach to analysing the number of jobs at risk of automation, based on the analysis of task content in individual jobs rather than average task content in occupations, leads to a much lower effect

[37] Moretti, 2010; Goos, Konings and Vandemeyer, 2015

[38] European Commission, Autonomous Systems Report, Special Barometer 427, 2015

[39] Frey C. B., Osborne M. A., "The future of employment: how susceptible are jobs to computerisation", Study for the Oxford Martin Programme on the Impacts of Future Technology, 2013; Bowles J., 'The Computerisation of European Jobs", Bruegel Online, 2014.

i.e. – just 9% of jobs risk being automated (as opposed to 50%)[40]. A balanced assessment needs also to take into account job creation through technology. For instance, Bessen shows that technology tends to have a positive net employment effect for many occupations affected by automation, also because new technologies create new product and consumer demand. [41]Digitalisation is also leading to an increasing demand for job roles involving work with technology. Whatever the balance, the existing workforce will have to undergo quick and effective re-training in order to be able to respond to new requirements as traditional sectors diminish and new markets develop. This requires a more responsive education system and improved coordination and cooperation among academia, research and business environments.

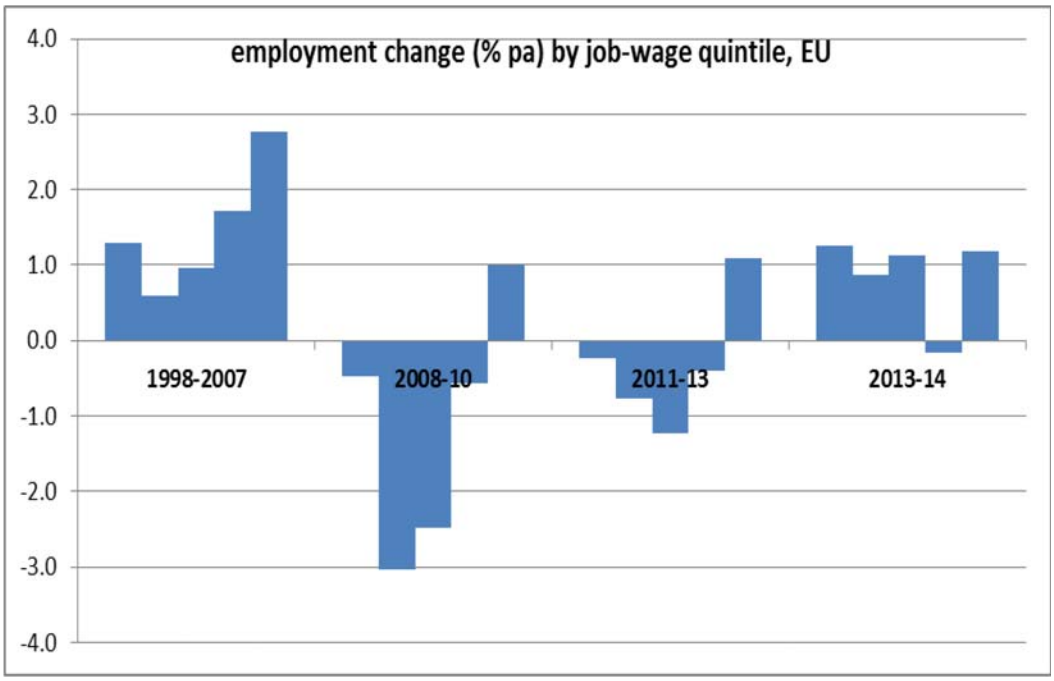
Nevertheless digitalisation is impacting on the structure of employment. Many so-called "routine" tasks and the jobs associated with them are being automated. At the same time, many existing jobs are being increasingly supported or complemented by digital technologies and new jobs are also being created for people operating, repairing and programming the new robots, machines and other digital tools. Furthermore, completely new jobs are being created throughout the economy.

As the tasks and jobs being automated largely require low/medium level skills and those being created more often than not require higher levels of skill, digitalisation is contributing to so-called job "polarisation"; that is, an increase in the employment share of higher-skill and lower-skill jobs and a decline in middle-skilled work (Figure 3).

Figure 3: Employment change (% per annum), EU, by job–wage quintile

[40] OECD calculations besed on the Survey of Adult Skills (PIAAC) (2012) and Arntz, M.T. Gregory and U.Zierahn (2016), "The Risk of Automation for Jobs in OECD Countires: Comparative Analysis", OECD Social, Employment and Migration Working Paper No. 189, OECD Publishing, Paris.

[41] J. Bessen (2015) Learning by doing: The Real Connection between Innovation, Wages and Wealth.



Reading note: The changes do not add up to zero.
Notes: EU-27 for 2008-2014 (HR not included), EU-23 for 1998-2007 (PL, RO, MT, BG missing). Quarter two employment data used for each year post-2008, annual data for 1998-2007.
Sources: ESDE 2015 - EU-LFS, SES (own calculations).

The issue of job polarisation could greatly affect the relationship between skills and economic growth. While it is not fully clear how the effects of polarisation will play out, there will continue to be a high premium on having cognitive skills to solve non-standard problems[42]. Global transformations and technological change pose new skills requirements. On the one hand, transversal skills such as learning to learn, communication, problem-solving, linguistic capacity[43] become more prominent since they allow citizens and the workforce to keep up with the pace of job-task transformations. On the other hand, basic skills allow adults to confidently and critically use information for work, leisure, learning and communication[44]. Technological progress which tends to make skills obsolete may end up increasing inequalities thus directing attention to the need to keep skills up to date with changing demand.

But it is not just about training more engineers who design the new digital equipment. In fact, every employee in the future will need to be digitally literate. While most jobs already require a basic level of digital skills, around one third of the European labour force is still digitally illiterate. Fully benefiting from the digital transformation will require a massive effort to up-skill and re-skill the European labour force.

[42] OECD Policy brief on the future of work: Automation and independent Work in a Digital Economy, May 2016.
[43] Belton M. F., Haizheng L., Bo L., "Language skills are critical for workers' human capital transferability among labor markets" Policy Brief FP7 project LLLight'in'Europe, 2015
[44] European Commission, "Measuring Digital Skills across the EU: EU wide indicators of Digital Competence", 2014

1.4. Migration and intra-EU mobility

Intra-EU mobility and third country migration can have a positive impact on resource allocation, productivity and growth, if managed through effective policies that make the most out of the available human capital. In particular, intra-EU mobility and migration play an important role in bringing labour supply in line with labour demand and steer workers towards those places where their skills can be used most efficiently. Effective policies can facilitate the matching process between workers and their jobs, for example by increasing transparency on skills and qualification acquired abroad, or by helping migrants and mobile workers to fill remaining skills gaps.

1.4.1. Migration

Simulations with the European Commission's Labour Market Model (LMM)[45] suggest that the impact of international migration on the host economy depends on the specific skill set[46] of migrants. According to these simulations, low qualified international migrants tend to lower average labour productivity and hence wages while high qualified migrants tend to increase average labour productivity and wages. In addition, higher skilled migrants tend to have stronger positive effects on total employment and GDP in countries where the share of high-skilled in employment is relatively low.

However, host economies are not always successful in exploiting the full potential of migrants, even of high-qualified ones. In particular, migrants (and especially those with foreign qualifications) face a large *discount* of their qualifications in the labour market[47]. Recent evidence shows that foreign qualifications have a much lower value in the labour market than domestic ones, and their returns are lower than those of the native-born and of immigrants with host-country qualifications both in terms of employment and job quality[48]. Moreover, in Europe, foreign degrees from non-EU countries are more strongly discounted in the labour market than those from EU countries.

As a result, there remains a large untapped potential among third-country nationals residing in the EU where, even among those with high education, around two thirds are either inactive or unemployed, or over-qualified for their jobs[49]. Over-qualification rates for third-country nationals residing in the EU are largely above average, especially for those having qualifications acquired abroad[50]. Migrant women are worse off than men in almost every country, with an over-qualification rate of 11 pp higher than that of their male peers and 13 pp higher than that of EU female citizens[51].

[45] LMM is a general equilibrium model with a particular focus on labour market institutions. See Berger et al. (2009)
[46] In the simulation the terms 'skills' and 'qualifications' are used synonymously. They refer to the educational attainment level according to the ISCED classification.
[47] OECD/European Union, Matching economic migration with labour market needs, OECD Publishing, 2014, see in particular chapter 8, "Migrants' skills: Use, mismatch and labour market outcomes. A first exploration of the International Survey of Adult Skills (PIAAC)"
[48] OECD, International migration division, "Migrants qualifications and skills and their links to labour larket outcomes", presented at EU-OECD Dialogue on migration and viability, Brussels 2014."
[49] Eurostat, EU Labour force survey, 2015
[50] OECD/European Union, Matching economic migration with labour market needs, OECD Publishing, 2014
[51] Indicators of Immigrant Integration 2015, Settling In, © OECD/European Union 2015.

To tackle this challenge, a swift assessment and recognition of migrants' foreign qualifications and skills is key. Skilled migrants also require faster-paced, more challenging integration programmes which equip them rapidly with the advanced language and professional skills required for higher–skilled employment. These programmes should be particularly tailored to women's needs.

EU countries also need to have effective policies in place to retain and attract skilled workers. While future trends of skilled labour migration are difficult to forecast, the demand for highly skilled workers in "knowledge economy" fields is expected to continue to grow, not only in high-income countries but also, increasingly, in medium-income countries[52]. As a result, highly skilled workers are expected to be more and more sought after and, due to the growing internationalisation of the highly skilled labour market, Europe will enter in an increasingly fierce global competition with a growing number of other economies to attract the talent it needs[53].

The recent influx of migrants in search of international protection has added weight to the need to improve policies in the field of migration.[54] In 2015 alone, around 1.26 million persons applied for asylum in the EU, compared to 550 000 in 2014. Around 70% of the asylum seekers is of working age, in other words between 18 and 64 years' old. Around 29% are younger than 18. Relatively little information is available on their education and skills. Some preliminary evidence suggests that qualification levels are relatively low compared to the host country population,[55] although there are differences according to the countries of origin.[56]

Besides meeting these refugees' most urgent needs such as accommodation and food, there is a need to help improve their long-term situation, including by helping them to quickly improve their skills in the language of their host countries, in order to integrate into society, and to find employment.[57] Their integration in the labour market is further complicated, however, by the fact that most of these have no evidence of their qualifications that could enable them to start a process of validation and recognition of their qualifications. In this context, the European Commission is developing a "Skills and Qualifications Kit" to support Member States in early profiling of asylum seekers, refugees, and other migrants.

1.4.2. Mobility and risk of brain drain

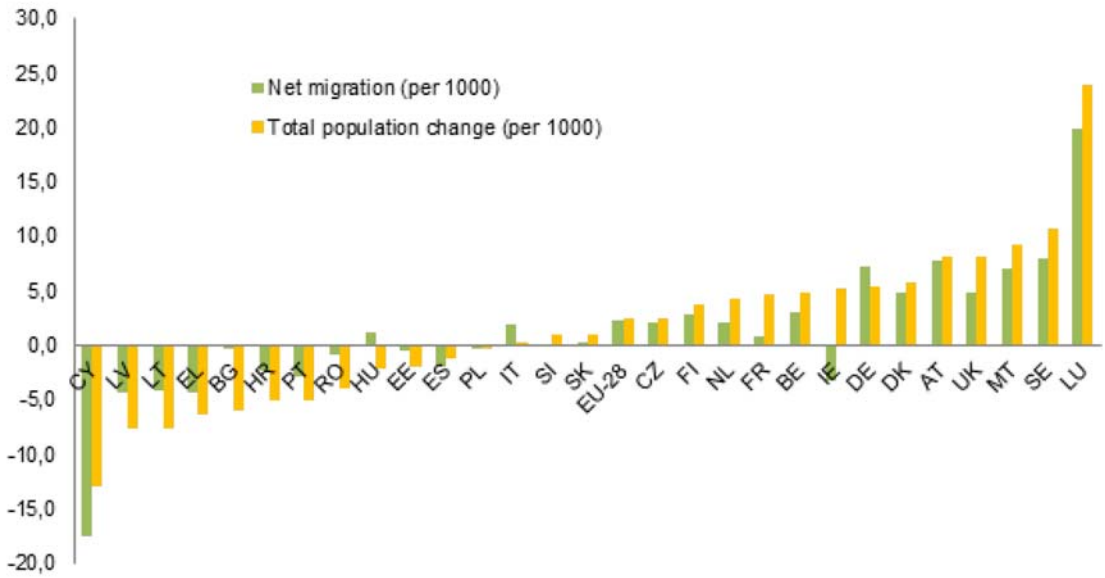
In the context of the single market and free movement of persons, intra-EU mobility can enable those with required skills to move to areas where there are skills gaps. However, intra-EU mobility and mobility in general can also be associated with brain drain.

[52] OECD, The Global Competition for Talent. Mobility of the Highly Skilled, OECD Publishing, 2008.
[53] Rinne U., "The Evaluation of Immigration Policies"', IZA Discussion Paper, 2012.
[54] European Commission, An economic take on the refugee crisis, Staff Working Document, 2016
[55] See, for example, Institut für Arbeitsmarkt- und Berufsforschung (IAB), Aktuelle Berichte 8/2015, and IAB, Aktuelle Berichte, 14/2015.
[56] For instance, in Germany, those coming from Syria seem to have higher level of education than from other source countries, though they still have considerably lower educational attainment than host-country nationals. In Sweden, according to Statistics Sweden, more than 40% of Syrians have at least upper secondary education, compared to 20% of those from Afghanistan and 10% for those coming from Eritrea, while the share of Sweden-born with at least upper secondary education was above 68% in 2014.
[57] European Commission website, "EU launches the Science4Refugees initiative", EURAXESS Researchers in Motion

Brain drain in the European Union: Facts and Figures

Emigration is high in some European countries, in particular Cyprus and Greece and the Baltic states (see Figure 4). This may have impacts on potential GDP growth: a declining population may result in a shrinking economy. How living standards (GDP per capita) is affected by strong net emigration, depends on the composition of net emigration.

Figure 4: Rates of population change and net migration in the EU, 2014

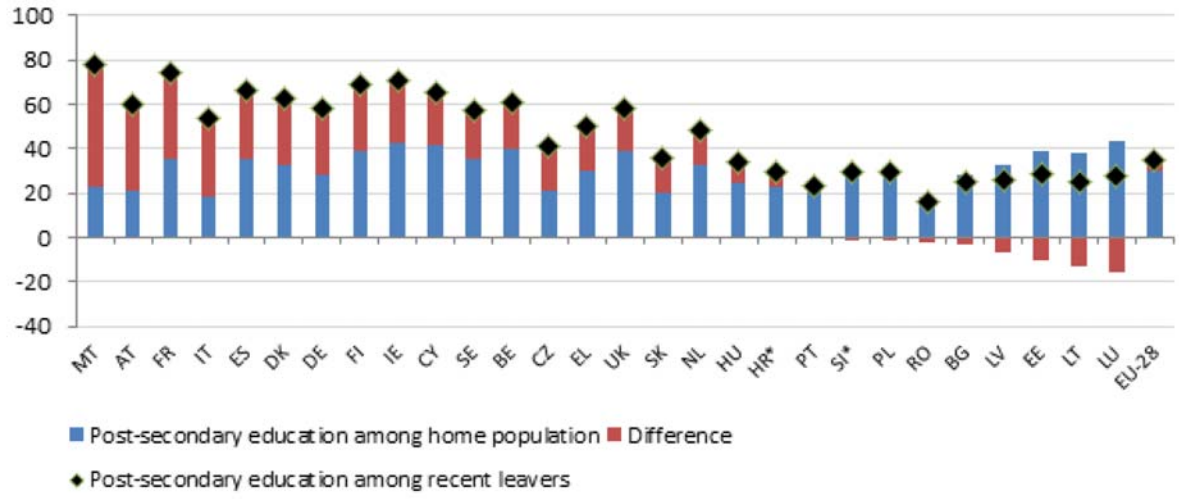


Source: Eurostat

The trends in brain drain are however not so clear-cut. In Greece and Cyprus, the share of high-skilled among emigrants is higher than among stayers. This implies that Greece and Cyprus could be considered as suffering from a particular "brain drain" challenge, as the stayers are on average less educated than the leavers hence emigration reduces the average human capital level of the country. On the other hand, emigration from the Baltic countries

seems to be more biased towards less-skilled emigration;[58] and in Portugal, emigrants are on average similarly skilled as stayers. In these cases, emigration is not biased towards higher-skilled individuals. In the case of the Baltics, emigration even seems to raise the average skills level of the population that remains behind (see Figure 5).

Figure 5: Share of population with a post-secondary degree, by country and among their citizens who recently settled abroad (living for less than 10 years in another EU MS), 2013



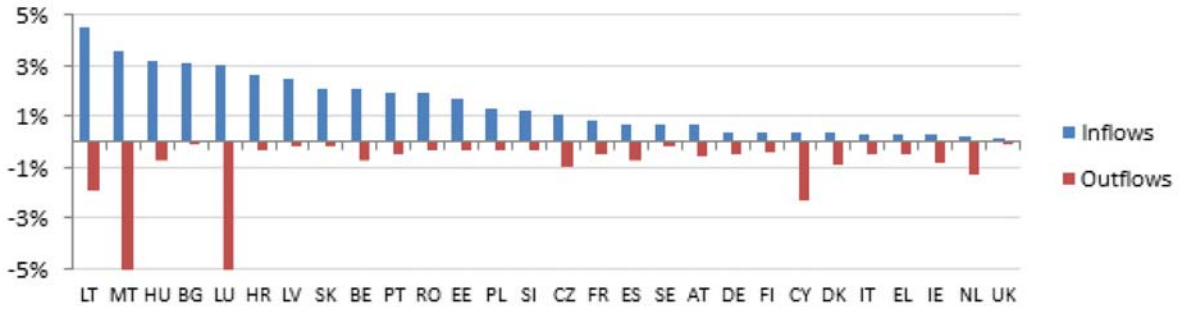
Source: ESDE 2015

Is emigration a problem?

If emigration occurs in large numbers, the shrinking population can reduce potential growth. Especially if young generations are strongly overrepresented among the emigrants, this may accelerate ageing of the population and worsen the sustainability of pension and social security systems. On the other hand, emigration may also be a source of remittances. These may contribute to growth in home countries. Especially in the Baltics, a positive impact of remittances on GDP is likely. For Greece and Cyprus this is less the case (see Figure 6).

[58] See also Durán J. et al. (2015) 'Emigration of the less-skilled: the role of incentives to work in Estonia', Country Focus, Volume 12, Issue 3, ECFIN, European Commission, March 2015.

Figure 6: Remittance inflows and outflows, as a share of GDP



Source: ESDE 2015

Brain drain and the possible negative effects of high emigration is a matter of concern within the EU, however as mentioned above the effects vary markedly between countries. More evidence is therefore required and the Commission will propose to analyse further and exchange best practices on effective ways to address brain drain.

1.5. Signals of skills deficits in Europe and the cost of skills mismatch

1.5.1. Skills mismatches

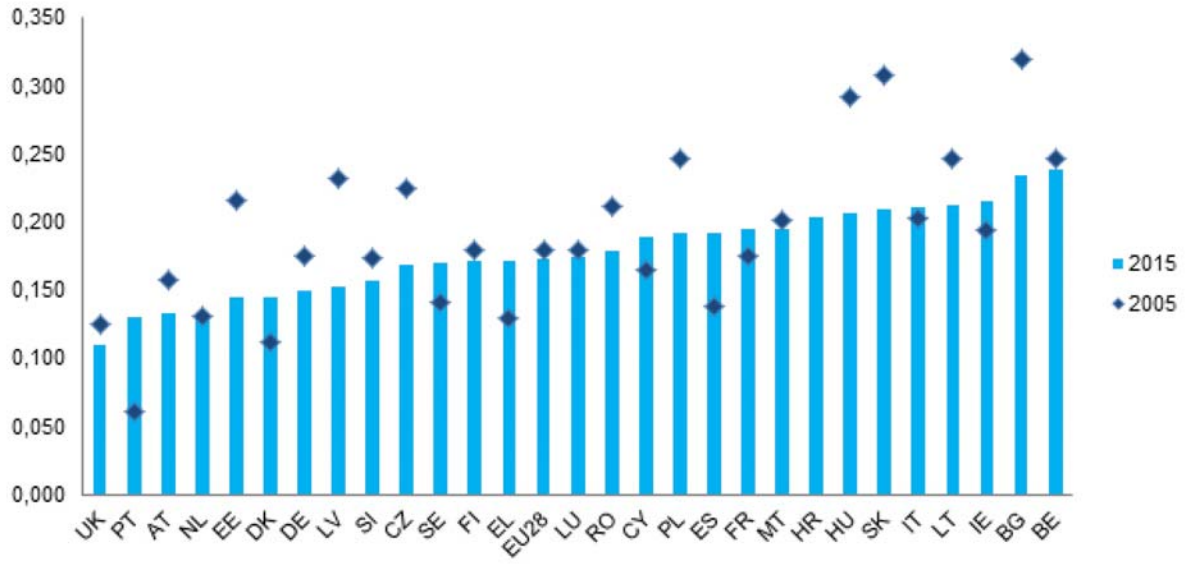
In many EU Member States, the efficient use of human capital is complicated by the incidence of skills mismatches, reflecting imbalances between the supply of certain skills and the demand for those skills. Skills mismatch can be studied from various perspectives. Macro-economic skills mismatch compares the skills sets of individuals available for work with the skills demanded by the labour market at an aggregate level. On-the-job mismatch, on the other hand, looks at whether the skills sets of those individuals who are working corresponds to the skills needs of their job.[59]

Macro-economic skills mismatch can be measured through the relative dispersion of employment rates across education groups, which quantifies the differences in employment rates between low-qualified, medium-qualified, and high-qualified individuals of working age. Countries with large disparities in employment rates between low-qualified and high-qualified individuals have a high relative dispersion or macroeconomic skills mismatch, pointing at a potential need for policy intervention in labour markets and/or education systems to mitigate problems of structural unemployment. In some cases, mobility and migration can also help alleviate the consequences of skills mismatch, e.g. by steering lower-skilled workers towards regions with a higher demand for them, or by supplying high-skilled workers to those regions that face specific skills shortages.

[59] For more details, see Kiss, A., Vandeplas, A. (2016) Measuring skills mismatch. DG EMPL Analytical Web Note 7/2015.

While most EU Member States have made substantial improvements over the past decade at the level of macroeconomic skills mismatch, including through upskilling of their population, some countries (including Spain, Portugal and Greece) saw a strong deterioration in labour market outcomes for low-skilled individuals as a result of the crisis and therefor a worsening skills mismatch. Although some improvement was observed since 2005 in most cases, macro-economic skills mismatch remains alarmingly high in Belgium, Bulgaria, Ireland and Lithuania (see Figure 7).

Figure 7: Macroeconomic skills mismatch across EU countries (2005, 2015)



Note: Macroeconomic skills mismatch is measured as the relative dispersion of employment rates by education level. Annual average based on the average of four quarters.
Source: EC own calculations based on Eurostat data.

There is also some evidence that for a substantial share of employees, their skills set is not well-suited for the job they occupy. According to the OECD Survey of Adult Skills (PIAAC), roughly one-third of workers in OECD countries are over- or under-qualified for their job. When going beyond qualifications and looking at specific skills used on the job, one-sixth report a mismatch between their own skills and those required for their job. More detailed analysis of skills and qualification mismatch on-the-job however points at challenges in the correct measurement of such mismatch, as the correlation between different measures is not always as strong as expected.[60]

[60] Flisi S., et al., Occupational mismatch in Europe: Understanding overeducation and overskilling for policy making Publication Office of the European Union, JRC89712, 2014

From the perspective of a given firm, hiring an over-skilled or over-qualified worker may be beneficial for individual productivity, assuming that there are no adverse effects on job satisfaction and that the wage premium paid to over-qualified individuals does not offset any associated productivity gains. However, from an economy-wide perspective, over-skilling and over-qualification could point at the inefficient allocation of resources, as some workers could possibly be employed more productively in other jobs. Recent research suggests that on-the-job mismatch may contribute to explaining cross-country differences in labour productivity[61], which underscores the need for further analysis in this field.

1.5.2. Gender difference in the use of skills

The analysis in section 1.2 on the relationship between skills and productivity calls point to the importance of designing a comprehensive approach to the development and requalification of skills and for better use to be made of existing human resources. For instance, although women now form the majority of students and university graduates in most Member States, they are more likely to be inactive or in part-time employment than men: 26% of women are inactive and a third of employed women are in part-time employment. Moreover, women earn less than men, and they rarely make it to the top[62]. GDP per capita losses due to gender gaps in the labour market have been estimated at up to 10 percent in Europe[63]. Raising the employment rate of women is therefore a key policy option to boost growth and counteract the shrinking of the working age population in the EU. In addition, given that returns to education differ widely for men and women, reducing the wage gap of women to men is also essential to putting in place incentives that will lead to higher returns on investment in skills[64].

Similarly, the employment rate of persons with disabilities is 22.9 percentage points lower compared to people without disabilities (48.5% versus 71.4%). In addition, 40.2% people with disabilities are inactive compared to 19% of persons without disabilities[65]. Insufficient skills are one of the reasons of the high employment rate gap. Indeed, in the majority of countries the early school leaving rate is more than twice as high for persons with disabilities. There is a gap of more than 10 percentage points between people with and without disabilities when it comes to tertiary education attainment[66]. Regarding non-formal education and training, in 2011 the participation of people with disabilities was 10 times lower (1.9 million) than that of people without disabilities (19.9 million)[67]. There is evidence that supporting the participation of people with disabilities in life-long learning and career counselling helps to reduce the employment gap, boost growth and facilitate their inclusion in the society. As there are around 80 million people with a disability in the EU, increasing their integration in the labour market would bring about significant benefits.

[61] McGowan M. A., Andrews D., "Labour Market Mismatch and Labour Productivity, Evidence from PIAAC Data", OECD Economics Department Working Paper, 2015
[62] European Commission, 2015 Report on Equality Between Women and Men, 2016
[63] Cuberes D.,Teignier M. , "Aggregate Costs of Gender Gaps in the Labor Market: A Quantitative Estimate", UB Economics Working Papers, 2014
[64] OECD, Tax and Skill Tax Policy Study, 2015
[65] EU-SILC 2013
[66] Ibid.
[67] According to 2011 LFS ad-hoc module on employment of persons with disabilities

The lack of adequate work-life balance policies also constitutes an obstacle to employment, especially for women. Moreover, men and women tend to work in different sectors. Women are overrepresented in sectors such as health (77% women), education (67% women), and the service sector (80%), while men constitute the majority of workers in construction (91%), transport (80%), industry (69%) and agriculture (65%). The gender segregation on the labour market reflects gender inequalities in education: women remain underrepresented in fields of studies such as mathematics, engineering, ICT, etc. Even when they graduate in this field, they are less likely to seek and find employment in these sectors. [68]

Evidence shows that educational and occupational segregation is detrimental to the economy, and appears to be associated with bottlenecks on the labour market[69]: skills shortages and bottlenecks are experienced in occupations that are either female-dominated occupations (personal care workers, for instance) or male-dominated (science and engineering professional and associate professionals, etc.). The shortages could be addressed by enlarging the pool of available workforce and reaching the under-represented sex. This means tackling gender stereotypes early on at school, throughout the educational path, and during the school-to-work transition.

[68] OECD, Closing the Gender Gap: Act Now, OECD Publishing, 2012

[69] Attström K. et al., Mapping and analysing bottleneck vacancies on the EU labour markets, Overview Report, European Commission, 2014

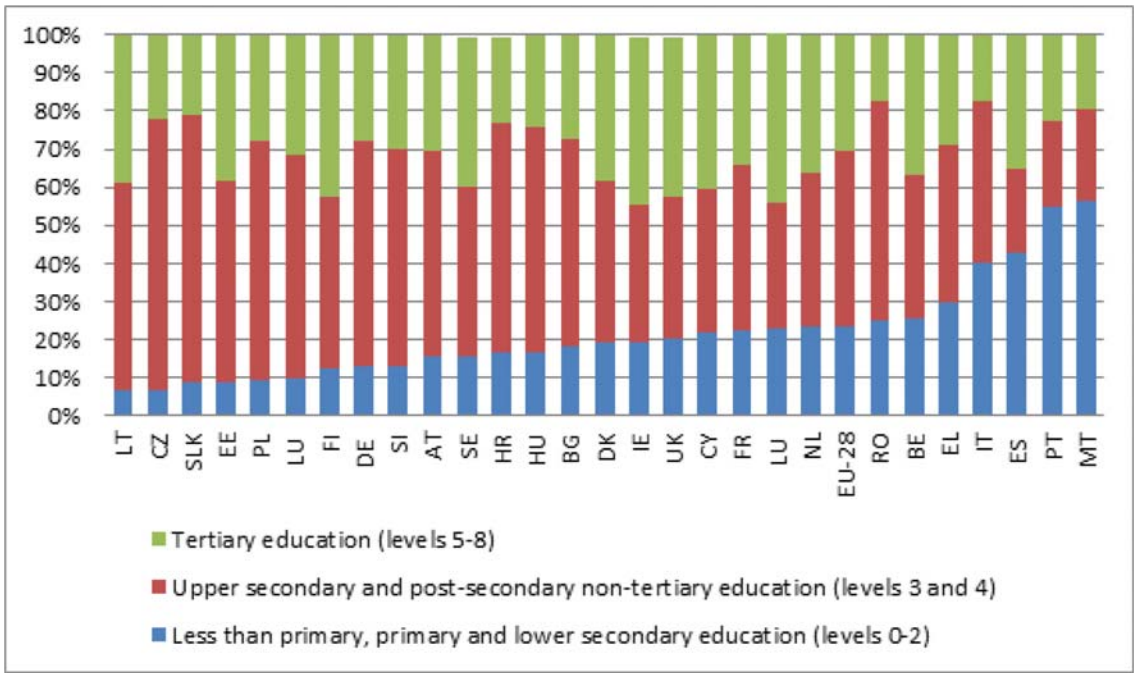
2. What is the state of play in Europe?

Having focused on why skills are so central to Europe's economic and social success in chapter 1, this chapter now looks at the main challenges regarding the acquisition and use of skills in Europe and the state of policy implementation in achieving these. It also looks at the issue of better use of skills and their transparency and recognition, as well as addressing the issue of skills intelligence in Europe. Pointers are given to the annexes supporting specific policy proposals in the New Skills Agenda to address these main challenges. For the purpose of this document, the term "skills" is used in a broad sense and refers to what a person knows, understands and is capable of doing. However, in the considerable literature on skills, different definitions and concepts are used by different authors. For a glossary of different kinds of skills and some conceptual considerations please see appendix 1.

2.1. Educational attainment in Europe

In the EU, 23.4% (64 million) of the population aged 25-64 do not have upper secondary education, and only 29.9% hold a tertiary degree. These figures hide a broad variation among EU Member States in terms of educational attainment (see figure 8). Notably, the share of the population aged 25-64 having attained at most lower secondary education ranges from less than 10% in Lithuania, the Czech Republic, Estonia, Slovakia, Poland and Latvia to more than 40% in Malta, Portugal, Spain and Italy. At the other end of the spectrum, the share of the population with a tertiary degree ranges from less than 20% in Romania, Italy and Malta to more than 40% in Sweden, Luxemburg, Finland, Ireland, United Kingdom and Cyprus.

Figure 8: Distribution of educational attainment among population aged 25-64 (2015)



Source: Eurostat [lfsa_pgaed]

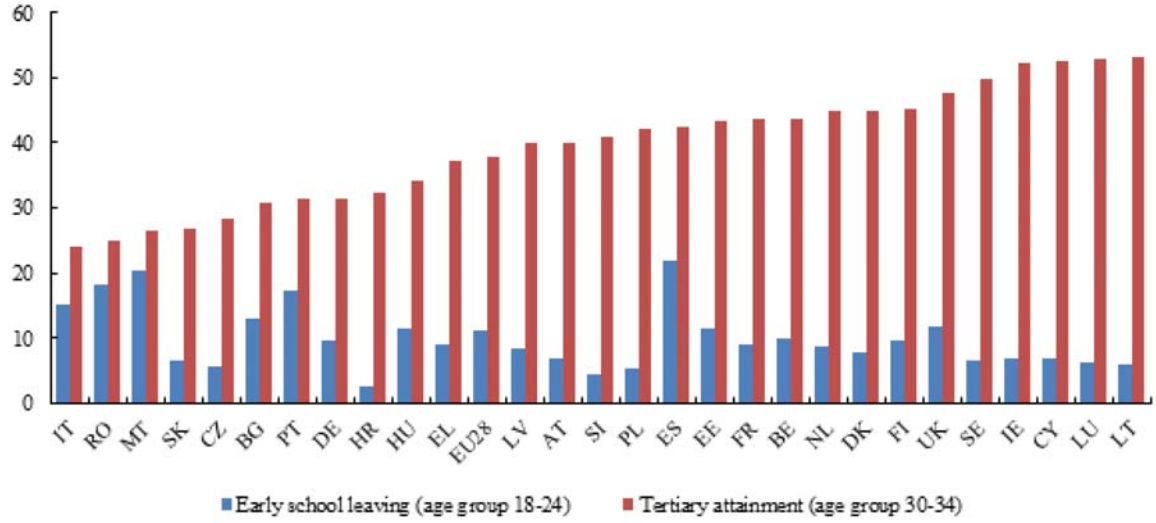
Education outcomes are not evenly distributed across population sub-groups and some of them are much more likely to have adverse outcomes. For instance, around 44% of third-country nationals residing in the EU are without at least an upper secondary education qualification[70], which is a much larger share than among natives.

For a cross-comparison of the performance of education systems today, it may be more relevant to look at educational attainment among young generations entering the labour market today, rather than at educational achievement of the entire adult population. Figure 9 shows that in 2014, 11.2% (4.6 million) of European youth (aged 18-24) left initial education without an upper secondary school diploma. While this share of early school leavers has been continuously declining since 2004, when it stood at 16%, there is still ample room for improvement for many Member States. For example, the share of early school leavers remains at 15% or above in Italy, Portugal, Romania, Malta and Spain. Some convergence can be observed: especially in Italy, Portugal, Malta and Spain, early school leaving declined a lot over recent decades. Again, some groups are more affected by early school leaving such as young third-country nationals (25.7% in 2014)[71] as well as to some extent native children of foreign-born parents (the so-called "second generation[72]").

Figure 9 also shows that almost 38% of people in Europe aged 30-34 hold a tertiary degree. Again, there is wide variation: tertiary attainment ranges from 23.9% in Italy to 53.3% in Lithuania.

Figure 9: Education outcomes among young cohorts (2014)

[70] Eurostat, EU Labour Force Survey, 2014
[71] Eurostat, Early leavers from education and training by sex and citizenship, 2016
[72] OECD/European Union, Indicators of Immigration Integration 2015 – Settling In, OECD Publishing, 2015, see in particular Chapter 13.9



Source: Eurostat [t2020_4 and t2020_41]

Note: Early school leaving measures the % of the population aged 18-24 with at most lower secondary education and not in further education or training.

2.2. Challenges related to skills levels and relevance

2.2.1. Basic skills

Basic skills are those that people need to play a full and active part in society and in the labour market, undertake their responsibilities, and develop their full potential through life-long learning[73]. They are commonly defined[74] as literacy and numeracy and, in today's fast-changing world, they include also digital skills which are becoming indispensable in daily life. In the context of this skills agenda it is considered that the required level is at least that comparable to those held by upper secondary school leavers – equivalent to EQF level 4 (broadly, PIAAC level 3)[75]. This is the level of skills that enables people to manage their own development and provides them with better protection from unemployment risk[76].As noted in section 1.5 above, 23.4% (64 million) of the EU28 population aged 25-64 did not attain an upper secondary education[77], and a fifth of European adults in the Member States that took part in PIAAC possess only rudimentary literacy and numeracy skills (below PIAAC level 2)[78].

[73] PIAAC (previously IALS and ALL) is the only survey which tests adults' skills and currently data are only available for 17 EU Member States. The Eurostat Labour Force Survey, which is carried out annually, covers all Member States and gives a breakdown by educational attainment level. Throughout this section, data on ISCED level 0-2 (lower secondary education or below) is used as a proxy for "low-skilled".

[74] For instance the OECD worldwide report Universal Basic Skills, 2015, considers as a straightforward and useful definition of basic skills is the acquisition of at least level PISA 1 skills (420 points).

[75] The OECD Survey on Adult Skills within the Programme for the international assessment of adult competences (PIAAC) directly tests literacy, numeracy, reading components and problem solving in technology rich environments. Cf. http://www.oecd.org/site/piaac/surveyofadultskills.htm.

[76] People with at most lower secondary education were the most affected by the crisis, with an unemployment rate rising from 9.7% in 2008 to 17.4% in 2014. Cf. Eurostat; EU Labour force survey [lfda_urgaed].

[77] Eurostat, EU Labour force survey, 2015

[78] Aged 16-65, OECD, Skills Outlook 2013, First results from the Survey of Adult Skills (PIAAC), OECD Publishing, 2013

How do adults in Europe compare with other major industrial countries on basic skills? Based on the OECD survey of adult skills (PIAAC) across the OECD, nearly 20% of the population aged 16-65 in the participating EU Member States has at most basic literacy skills (at most PIAAC level 1), while in Japan this applies to less than 5% of the population aged 16-65. In literacy, participating EU countries on average perform slightly worse than OECD countries as a whole but comparable to the US (see figure 10a). While in EU17, 9% of the population showed high levels of literacy skills (levels 4 and 5) the share for the OECD is almost one third higher (12%); in numeracy, the difference between the two is slightly lower. However, there are considerable differences in the distribution of skills across participating countries. At global level, Japan outperforms all other countries with its high share of performers at levels 3-5 and very few low performers. Big non-European economies like Canada and the US do not score very differently from many EU countries. For numeracy, the pattern of proficiency across countries is broadly the same, with few differences (see figure 10b). In EU17, the share of high performers (those scoring on levels 4 and 5) is at 10%, slightly lower than the overall OECD average. Japan stills outperforms all EU Member States with 63% of the working age population scoring on levels 3-5 (next comes FI with 58%), and other large economies are a little below (US) or above (Canada) EU average.

Figure 10a: How proficient are adults in literacy? Share of the population 16-65 years old at each skills level per country

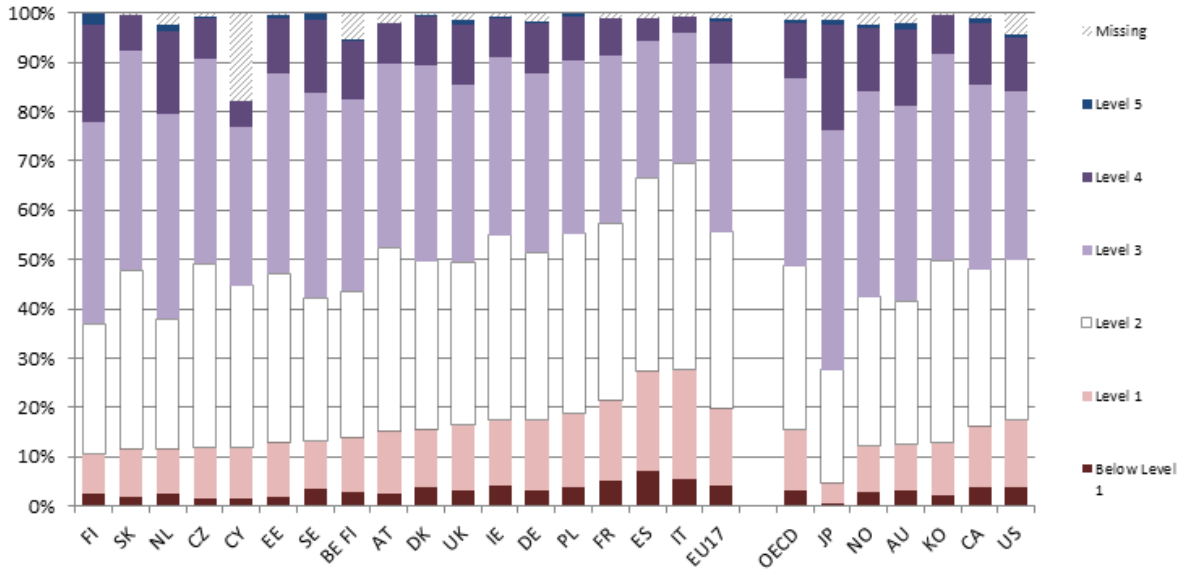
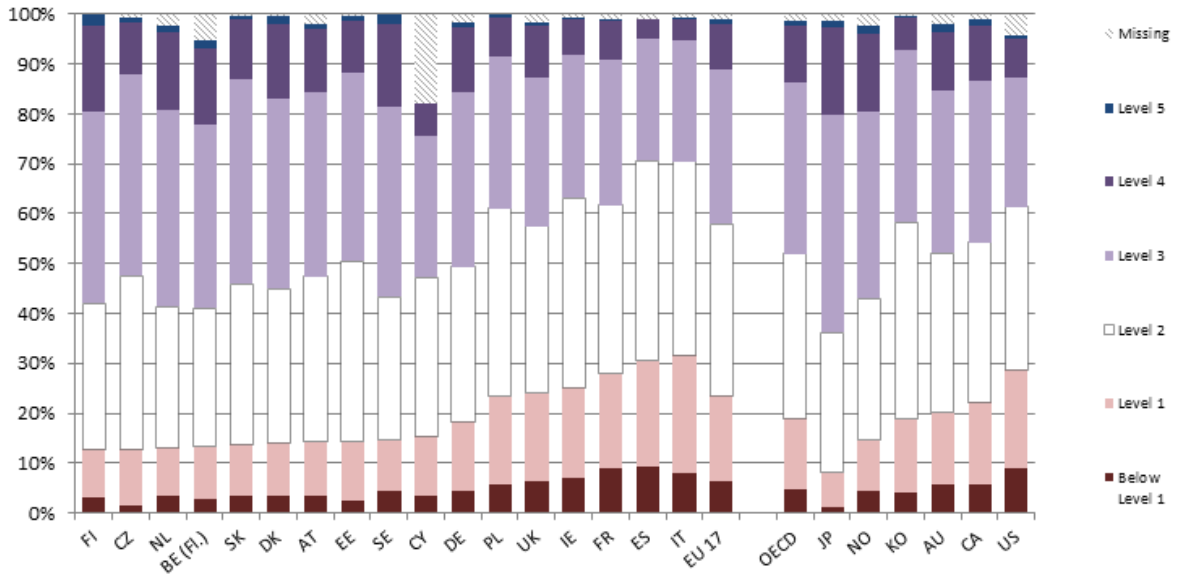


Figure 10b: How proficient are adults in numeracy? Share of the population 16-65 years old at each skills level per country

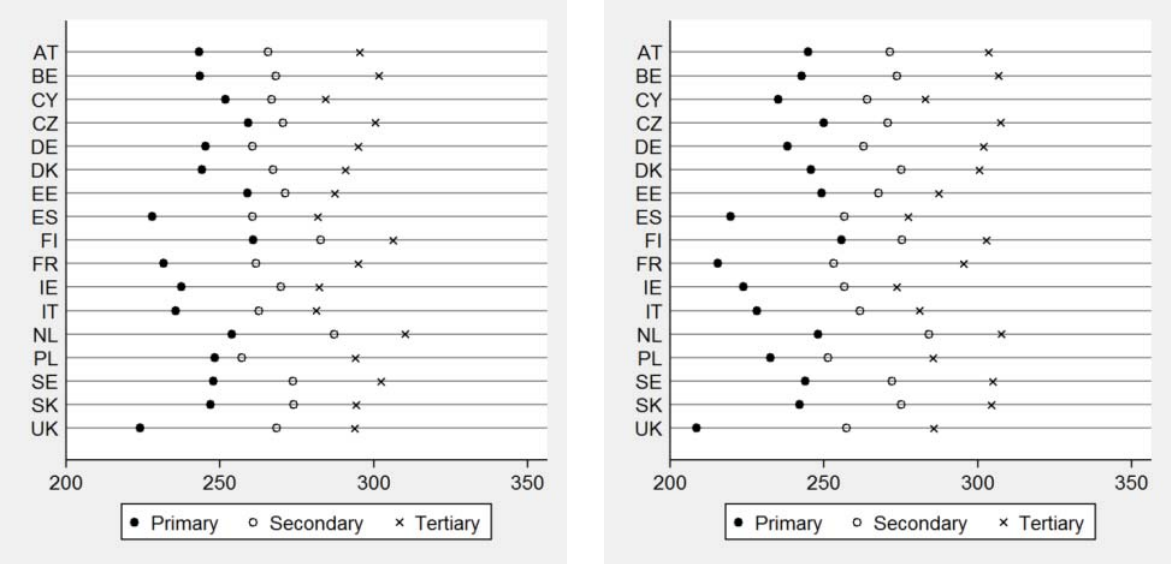


Source: Survey of Adult Skills (PIAAC), ordered by the share of level 1 and below. Missing: did not take the test.

Figure 11: Differences in literacy and numeracy proficiency across education levels

(a) PIAAC Literacy Score

(b) PIAAC Numeracy Score



Source: Own calculations based on Survey of Adult Skills (PIAAC) (OECD, 2012)
Note: Scores reflect weighted averages and are on a scale from 0-500.

Research has shown that educational attainment levels are not always fully comparable across Member States. The Survey of Adult Skills (PIAAC) shows a strong variation in basic skills (in particular numeracy and literacy) levels across graduates from different Member States (Figure 11). Most notably among Member States participating in the survey, upper secondary education graduates from FI and NL have similar or higher literacy and numeracy scores on average than tertiary education graduates in ES, IE and IT.

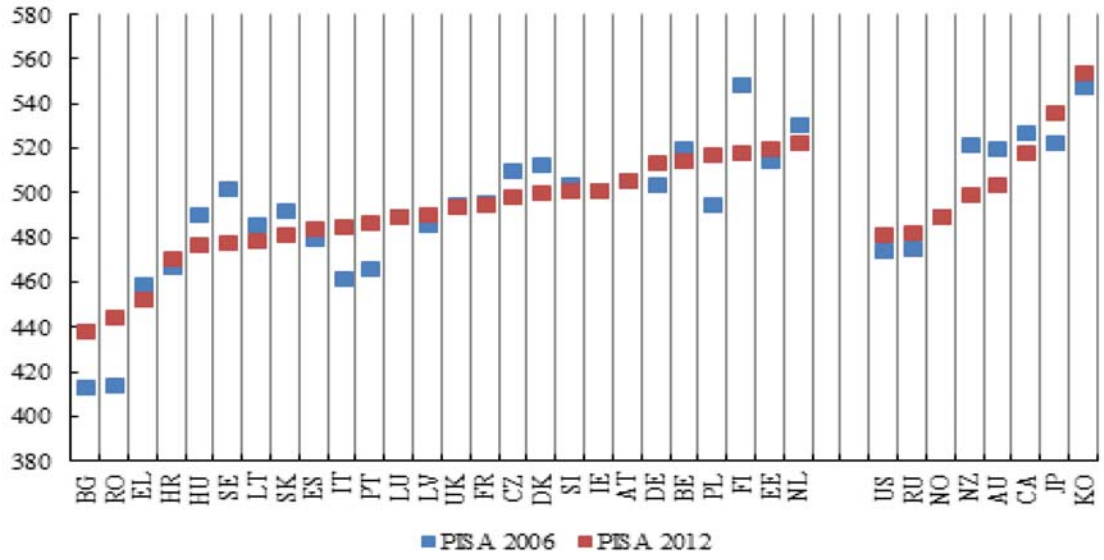
Not having attained a sufficient basic skills level has a clear effect on labour market participation and employment possibilities. Among the 64 million aged 25-64 not having attained secondary education in 2014[79]:

- 23.3 million were inactive in the labour market (36.4% of all low-qualified Europeans).
- 40.7 million were active in the labour market (63.6% of all low-qualified Europeans) including:
    - 6.6 million low-qualified Europeans were unemployed (16.3% of all active low-qualified Europeans);
    - 34.1 million low-qualified Europeans were employed (53.2% of all active low-qualified Europeans).

Initial education and training systems are the main providers of the development of the basic skills required for labour market participation. They face a number of challenges, such as early school leaving. In addition, not all those who complete secondary education achieve at least the minimum level of basic skills. An early indication is given by the OECD's PISA proficiency tests among 15 year old pupils. Figure 12a and 12b present average PISA numeracy and literacy scores of 15-year olds by country, and show how they changed over time.

Figure 12a: Proficiency in numeracy as measured by PISA in 2006 and 2012

[79] Calculation based on: (1) Unemployment rates by age and educational attainment level (%) (2) Active population by age and educational attainment level (1 000) (3) Population by age and educational attainment level (1 000), according to Eurostat, Employment Statistics, 2016



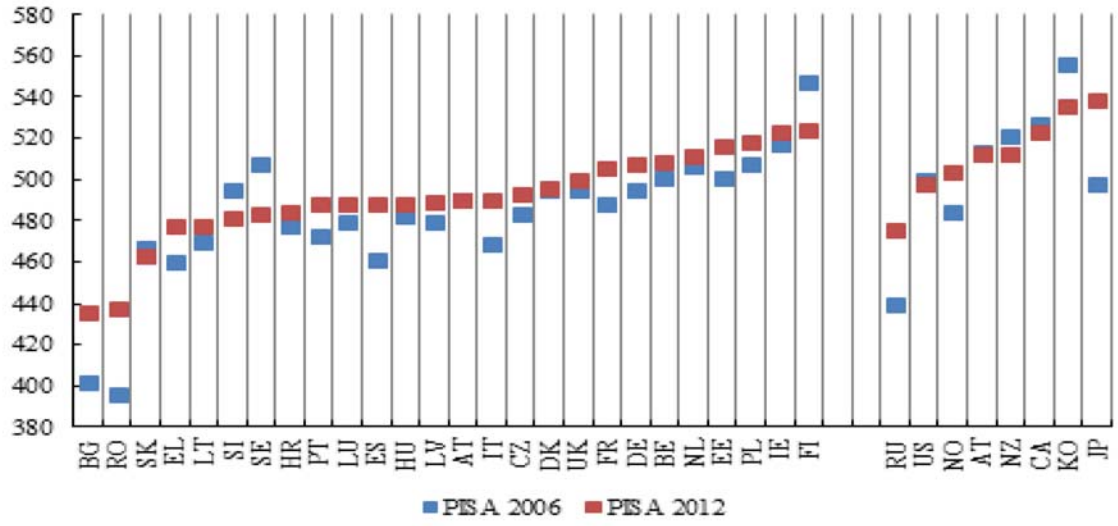
Source: OECD (2014)

In international comparison, many EU Member States' average performance in numeracy is similar to that of Norway, and better than of the United States and Russia; but below the performance of high-performing Asian countries such as Japan and Korea and of Canada, again supporting the need for further improvement in the EU.

However, there is broad variation between individual countries within the EU. Both for literacy and for numeracy, there are some EU Member States that have mean scores at par with Canada, which means they are among the best performing countries globally. In the domain of mathematics, these are the Netherlands, Estonia, and Finland; in the reading domain, these are Finland and Ireland. At the other end, some Member States are trailing behind significantly. In particular Bulgaria and Romania still have a long way to go to reach even the level of Norway, as they perform worse than the United States and Russia.

The picture shows some signs of convergence, in the sense that the lowest performers (Bulgaria and Romania) made substantial improvements between 2006 and 2012; but also, on the other hand, that the scores of the best performers in 2006 (Finland, the Netherlands and Belgium) slightly deteriorated by 2012.

Figure 12b: Proficiency in literacy as measured by PISA in 2006 and 2012



Source: OECD (2014)

Low-skilled adults face a number of challenges. Low-qualified adults are three times less likely to participate in learning compared to high-qualified adults. In real terms this means that in the EU28, in 2014 of all European aged 25-64:

- Only 2.8 million of low-qualified adults (or 4.3% of all those aged 25-64) whose highest educational attainment level is lower secondary participated in education and training (in last 4 weeks);
- Only 0.6 million low-qualified adults (or 1% of all those aged 25-64) whose highest educational attainment level is lower secondary participated in **formal** education, and;

- Only 2.2 million low-qualified adults (or 3.4% of all those 25-64) whose highest educational attainment level is lower secondary participated in **non-formal** education.[80]

61.2 million of low-qualified adults (95.7%) **did not participate** in education and training.[81]

Not only do lower-qualified persons need more learning opportunities, they also require more learning hours to have a durable impact on their skills levels enabling them to acquire a qualification. However, in practice, highly qualified adults receive around 45% of all training hours, medium qualified people receive about 42% and low-qualified people receive only 13% of all hours.[82]

[80] Eurostat, Labour Force Survey 2015
[81] Eurostat, Labour Force Survey 2015
[82] European Employment Policy Observatory (EEPO), Thematic Review Synthesis: Upskilling Unemployed Adults (aged 25 to 64), The Organisation, Profiling And Targeting Of Training Provision, Publications Office of the European Union, 2015

Adults' limited engagement in further learning is due to structural and situational obstacles, which are closely interlinked.

The main structural problems that hinder the participation of low-skilled adults in learning are[83]: limited outreach and guidance, limited opportunities for skills audit and validation which would assess the skills they have and recognise any skills acquired informally and non-formally, limited individualised support and limited flexibility of adult education and training provision. In most Member States, guidance services focus largely on unemployed people, while adults who are in employment or who are economically inactive as well as being low-skilled risk falling outside the focus of the guidance services[84]. Adults find it easier to take part in further education and training if the skills that they have acquired outside the formal education system (e.g. at work or in voluntary activities) can be validated and recognised. However, most countries still need to develop validation arrangements.

Situational obstacles relate to the specific context of the individuals concerned and include family responsibility, conflicting time schedule, costs, lack of employer support, proximity concerns etc. Among these, the first two appear to be the most frequently cited obstacles in the Adult Education Survey. Lack of motivation is another significant obstacle. Research also shows that those with weak basic skills are often unable or unwilling to recognise their weaknesses and, because of this, see no need to improve skills. The lack of engagement of the low-skilled adults in training is possibly influenced also by poor experience of schooling[85] or 'low skills-poor jobs trap' (50% of adults that did not participate in education and training were not motivated to do so because it was not immediately needed for the job[86]).

To address the above challenges and to tackle low skills in Europe, the European Commission is proposing a Council recommendation to establish a **Skills Guarantee** initiative. **The evidence underpinning this proposal is further elaborated in Annex 1 of this Staff Working Document.**

2.2.2. Transversal skills and other key competences

New ways of working, such as the collaborative economy, increased independent and contract-based work, and more frequent job changes (by necessity or opportunity) call for a broader set of skills. According to one survey of companies, 40% of employers in the EU report difficulties in finding candidates with the right skills[87], many of them stressing a lack of transversal skills[88] among job applicants. These can be defined as skills that are learned in one context in daily life, study or work and can be transferred to another context in daily life, study or work.

[83] Eurydice Report: Adult education and training in Europe, Publications Office of the European Union, 2015, and Eurostat, Adult Education Survey.
[84] The regular European inventory on validation published by Cedefop, http://www.cedefop.europa.eu/en/events-and-projects/projects/validation-non-formal-and-informal-learning/european-inventory
[85] Ibid
[86] European Commission, Employment and Social Developments in Europe 2015, Publications Office of the European Union, 2016
[87] http://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef1502en_0.pdf
[88] OECD/European Union, The Missing Entrepreneurs 2015: Policies for Self-Employment and Entrepreneurship, OECD Publishing, 2015

Many Member States have adapted and embedded at least some of the key competences defined in the 2006 Key Competences Recommendation in curricula for school education. Eight competences were identified: communication in the mother tongue; communication in foreign languages; mathematical competence; basic competences in science and technology; digital competence; learning to learn; social and civic competences; sense of initiative and entrepreneurship; cultural awareness and expression.

The Key Competences framework marked a shift towards a learning outcomes approach, away from measuring educational achievement based on length or setting of study. Each competence was defined in terms of knowledge, skills and attitudes appropriate to the context.

While this framework has proven its value reinforcing the shift to a learning outcomes approach, its implementation also showed some drawbacks[89]. Surveys and studies identified as areas for improvement: (i) embedding transversal skills into curricula; (ii) addressing all levels as insufficient emphasis on key competences were found in VET and adult education and as informal and non-formal learning were ignored, (iii) addressing all kind of learners as disadvantaged groups did not benefit fully; (iv) using innovative pedagogical approaches; and (v) effective design of useful assessment tools.

Many young people still lack a sufficient range and level of transversal skills (critical thinking, creativity, communication). Furthermore, there are on-going challenges with implementing high quality approaches to developing the key competences in young people, which include understanding the nature and benefits of the competences, ensuring a progression of skills development (including classroom approaches and assessment), mechanisms for monitoring and evaluating local and national initiatives, and validating key competences acquired through informal and non-formal learning.[90]

While implementing the Key Competences framework most Member States focussed on at least some basic skills in primary and secondary school education (literacy, numeracy and/or Maths, Science and Technology) but the majority of Member States pay less attention to transversal skills (see Figure 13).[91] Furthermore the demand for certain transversal skills by employers and industry has increased considerably[92]. This raised the question whether the eight key competences identified in the 2006 EU Recommendation are up to date. **With this in mind, the Commission is proposing to review the Key Competences for Lifelong Learning and the accompanying European Reference Frameworks in early 2017.**

The need to rethink the core skills to be taught and learned is not only visible in Europe but a worldwide concern. International players such as OECD (through PISA and PIAAC), Assessment of 21st Century Skills partnership (ACTS21 -worldwide), UNESCO, and BEAR

[89] Review of the implementation of the Framework, set out in the 2010 Communication 'Key competences for a changing world'. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0640:FIN:EN:PDF
2012, Rethinking Education Communication

[90] European Commission/EACEA/Eurydice, Developing key competences at school in Europe: Challenges and Opportunities for Europe, Eurydice Report, Publications Office of the European Union, 2012

[91] Eurydice study of 2012 looked at the use of Key Competences in schools;2012, the Key Competences Network on School Education (KeyCoNet) has continued work on the Key Competences Framework

[92] References to outcomes of the feasibility study on citizen's tool for transversal skills

in the US and Australia have started to broaden the scope of traditional school subjects (mother tongue, foreign languages, mathematics and science) and are introducing transversal skills. This international work, using the transversal skills below, is a starting point for further work:

Chart 1: Transversal Skills

Ways of thinking:

- *Creativity and innovation*
- *Critical thinking, problem solving, decision making*
- *Learning to learn, metacognition*

Ways of working

- *Communication*
- *Collaboration (teamwork)*

Tools for Working

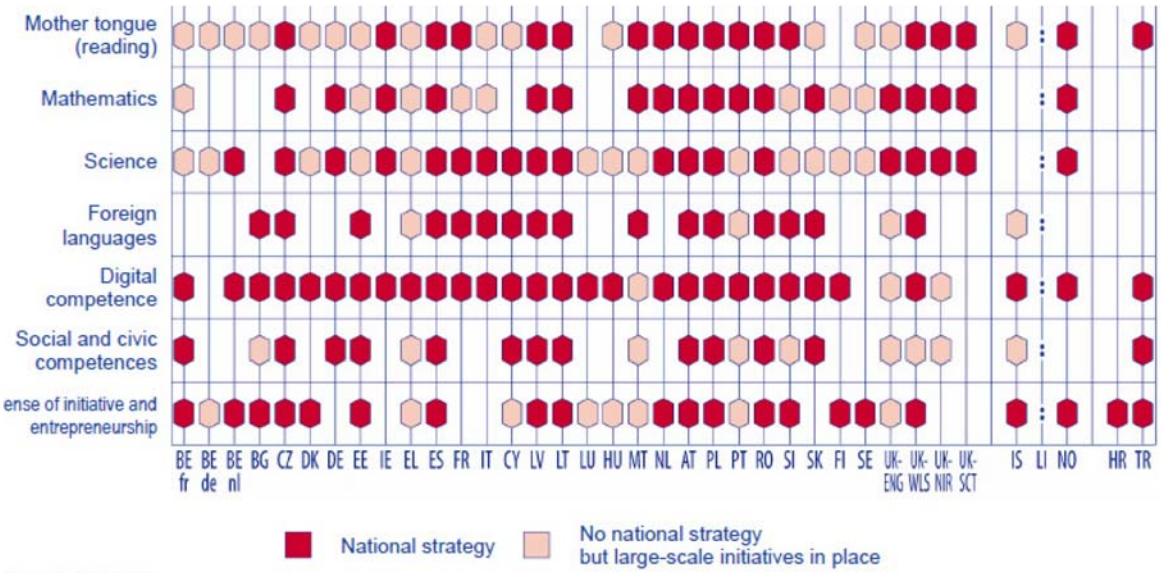
- *Information literacy*
- *Digital literacy*

Living in the World

- *Citizenship (local and global)*
- *Life and career*
- *Personal and social responsibility (incl. cultural awareness)*

Overall these competences are defined as soft, transversal, or generic skills, covering skills, attitudes and knowledge and have been widely recognised as central to the jobs and qualifications for this century.

Figure 13: Extent to which key competences are taken into account in Member States' education systems



Source: Eurydice.

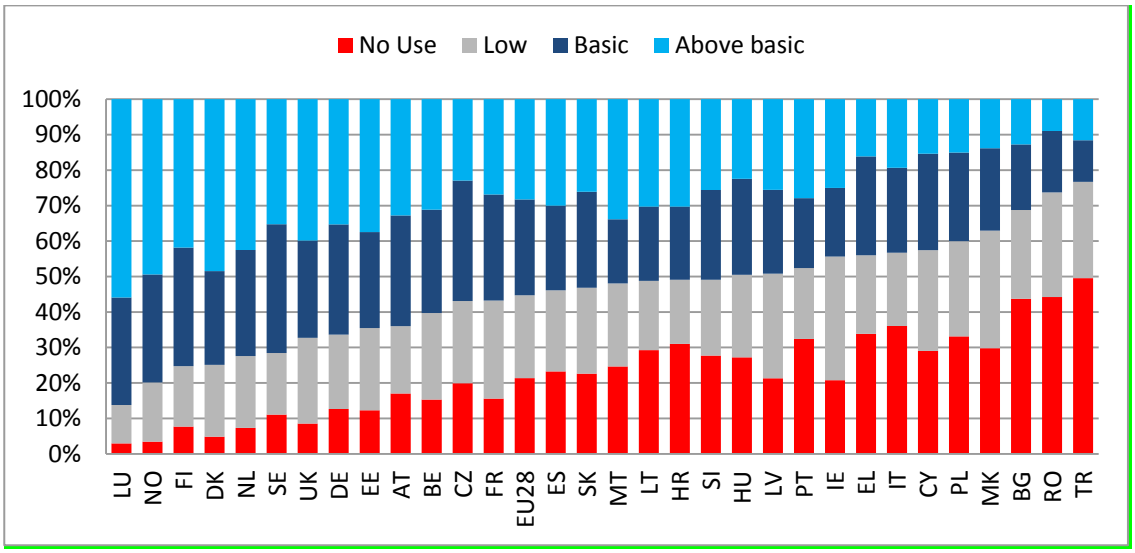
Country specific notes

Czech Republic: There is only an overarching strategy which includes general measures to support key competences.
Sweden: The large scale initiative for reading concerns only ISCED levels 1 and 2.

2.2.3. Focus on digital skills

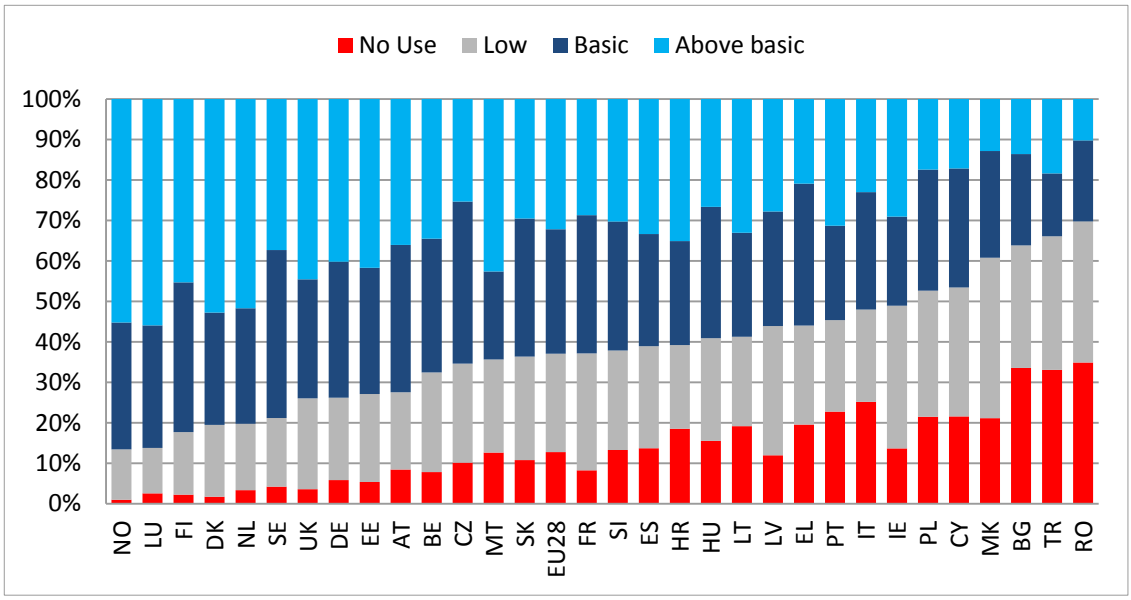
Research finds that 23% of the EU28 population has low digital skills, and an additional 21% does not use the internet (Figure 14). Amongst the labour force the figures are 24% and 13%, respectively **(**Figure 15**)**. This is problematic, as increasingly employability, use of public services and participation in society more generally relies on the use of ICT and online services. Again, these figures do hide substantial variation among Member States.

Figure 14: Digital skills of the EU population and NO, MK and TR (% individuals with above basic, basic and low digital skills and no internet use)



Source: Digital scoreboard, 2015 (Commission services based on Eurostat data)

Figure 15: Digital skills of the labour force (% labour force with above basic, basic and low digital skills and no internet use)



Source: Digital scoreboard 2015 (Commission services based on Eurostat data)

Digital skills are lacking in Europe at all levels: basic user, advanced user and ICT professional skills. The Commission's Digital Skills Indicator (published together with the Digital Economy and Society Index - DESI) for 2015 shows that 45% of the EU population lack a sufficient level of basic digital skills and around half has none at all.[93] Only around 32% of the EU population has more than basic user skills. These are the skills that every citizen needs for working, living and learning in the knowledge society. Digital skills can now be considered as basic due to their role in providing basic functional literacy in today's world. While it is true that digital skills is treated in many curricula as a subject in its own right, the

[93] The Digital Agenda Scoreboard measures progress of the European digital economy. Along its Human Capital dimension it measure the digital skills of EU citizens http://ec.europa.eu/digital-agenda/en/digital-agenda-scoreboard

fact that they can be transferred from one area to another means that they can also be considered transversal.

At European level, the Commission has been addressing digital skills gaps through a number of initiatives including in particular its "Opening-up Education" initiative to modernise education for the digital age, the "e-Skills for jobs" awareness raising campaign on ICT professional jobs, "EU code week" and the "Grand Coalition for Digital Jobs".[94]

The Digital Skills Indicator is based on the European Digital Competence Framework for Citizens (DigComp), which identifies, defines and describes the digital skills needed by all citizens as part of the key competences for lifelong learning.[95] DigComp has also been included in Europass as a self-assessment tool for job-seekers to self-evaluate their digital competence and have it described in their CV.

At national and regional level, DigComp is being used as the reference for self-assessment tools for employability (Basque Country and Andalusia in Spain), for the development of strategic policies (Italy, Malta, Navarra in Spain, Poland and the United Kingdom), for the assessment of education and training content and student performance (Estonia, Flanders in Belgium, Region Emilia Romagna in Italy and Slovenia) as well as for teachers professional development[96] (Croatia, Estremadura in Spain, Lithuania and Spain).[97]

The lack of digital skills also affects citizens as consumers. Skilled consumers can compare and contrast information collected through digital channels, thus digital skills are enablers of better consumer decisions at the moment of choosing goods and services both online and offline. For this reason, the Commission is developing a framework based on the DigComp targeted to consumer skills (DigCompConsumers), which is expected to be completed by summer 2016[98]. In addition, the education materials and e-learning modules on the Consumer Classroom[99] and Consumer Champion[100] platforms can be used by consumer associations and other intermediaries working with vulnerable consumers to help develop further consumer education materials in light of the changes brought by digitalisation. This is the case for instance in the energy sector as Consumer Champion materials already exist to support consumers with collective supplier switching which has been greatly facilitated by the digital revolution.

The Grand Coalition is a cross-European multi-stakeholder partnership aimed at reducing digital skills gaps and making the most of the job opportunities offered by digitalisation in Europe. So far, the initiative has attracted around 80 stakeholder pledges, largely from ICT

[94] European Commission website, "Grand Coalition for Digital Jobs", Digital Single Market
[95] Ferrari, A., DIGCOMP: A Framework for Developing and Understanding Digital competence in Europe, JRC Scientific and Policy Reports, Joint Research Centre, Publications Office of the European Union, 2013
[96] The Commission is currently working on the definition of a specific digital competence framework for teachers (DigCompTeach) which is expected to be issued by the end of 2016.
[97] European Commission website, "Being digitally competent – a task for the 21st century citizen", Joint Research Centre
[98] to be published at https://ec.europa.eu/jrc/digcompconsumers
[99] See: http://www.consumerclassroom.eu/fr/
[100] See: http://www.consumerchampion.eu/

companies, offering training, apprenticeships, and placements and/or carrying out awareness raising activities to encourage young people to study and pursue careers in ICT.

It has also raised political awareness and support for these issues. In 13 Member States, national coalitions on digital skills have been set up and more are planned. Initiatives by these coalitions have led to the training of many thousands of Europeans, in the workforce at large, unemployed, teachers, and young people in digital skills, including coding. Some Member States have also produced digital skills strategies and a small number have moved to introduced computing (including coding) into the school curricula. In December 2015, a first informal Ministerial level debate on digital skills took place.

These activities on digital skills have made a valuable contribution to reducing digital skills gaps in Europe. However, they have largely relied on the voluntary active involvement of a group or groups of dedicated stakeholders. A more active engagement of Member States, including adequate funding, would be essential to modernise education and training systems and provide their citizens with the skills needed for a thriving digital economy.

2.2.4. Focus on entrepreneurial skills

Among the competences identified as transversal by the Recommendation on the Key Competences for Lifelong Learning,[101] Sense of initiative and Entrepreneurship has been under the spotlight for the past few years. The 2012 results from the annual Global Entrepreneurship Monitor[102] show that only in a handful of the Member States do more than half of the adult population believe they have the required skills and knowledge to start a business. Furthermore, the 2012 Flash Eurobarometer (354)[103] Entrepreneurship in the EU and beyond shows that only half of the EU population aged 15 years and above agree that their school education helped them to develop a sense of initiative and a sort of entrepreneurial attitude, with 22% totally agreeing and 28% tending to agree. Advocated by the Small Business Act for Europe,[104] the Communication on Rethinking Education[105] and the Entrepreneurship Action Plan 2020,[106] the need to promote entrepreneurship education and entrepreneurial learning has led to a wealth of initiatives across Europe[107]. In 2014/15, 29 of 38 countries/regions surveyed[108] in the Eurydice 'Entrepreneurship Education at School' Report have either specific or broader strategies that include specific links to entrepreneurship education. Beyond the 11 countries/regions with a specific strategy, there are 18 with a broader strategy related to entrepreneurship education. Only nine countries/regions (eight

[101] European Parliament and Council (2006). Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning. Official Journal of the European Union, (2006/962/EC).
[102] Kelley D., Singer S., Herrigton M., 2015/16 Global Report, Global Entrepreneurship Monitor,
[103] European Commission, Entrepreneurship in the EU and Beyond, Flash Eurobarometer 354, 2012
[104] European Commission (2008). Communication to the Council, The European Parliament, The European Economic and Social Committee and the Committee of the Regions, "Think Small First" a "Small Business Act" for Europe, COM(2008) 394 final, SEC(2008) 2101 and 2102. Brussels, 26.6.2008
[105] European Commission (2012). Communication to the Council, The European Parliament, The European Economic and Social Committee and the Committee of the Regions, Rethinking Education: Investing in skills for better socio-economic outcomes, COM/2012/0669 final, SWD(2012) 371-377
[106] European Commission (2013a). Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Entrepreneurship Action Plan 2020, Reigniting the entrepreneurial spirit in Europe, COM(2012) 795 final
[107] Bacigalupo M., Kampylis P., Punie Y. (Eds.), Entrepreneurship Competence: An Overview of Existing Concepts, Policies and Initiative,. Final Report, JRC science and Policy Reports, Publications Office of the European Union, 2015
[108] EU 28 (including BE fr, BE de, BE nl, UK-ENG, UK-WLS, UK-NIR, UK-SCT and excluding DE, IE, LI) + BA, IS, LI, ME, MK, NO, RS and TR.

Member States) do not have relevant strategies (Croatia, Italy, Cyprus, Luxembourg, the Netherlands, Malta, Portugal, the United Kingdom (England) and Iceland).[109] While entrepreneurship education is increasingly recognised in primary education, it remains most common in upper secondary education. At upper secondary level, approaches are varied: it can be seen either as a separate subject or as an integral part of other subjects.

There is growing evidence of the benefits that higher levels of entrepreneurial attitudes and skills can bring. A mapping exercise of research on the impact of entrepreneurial education, commissioned in 2013 by the Commission[110] shows that entrepreneurship education is successful in fostering the entrepreneurial skills of young people, bringing benefits not only to the individual, but also to the economy and to society at large. This is because the likelihood that graduates having had entrepreneurship education will participate in a business start-up is substantially higher, the frequency with which they set up businesses seems to be higher and they become self-employed earlier in their careers. In addition, the enterprises run by these individuals are perceived as more innovative and the expectations regarding employment growth and turnover growth are higher[111]. Entrepreneurial skills have also a more general impact on the employability of young people, contributing to higher employment rates.

Despite the focus on the promotion of entrepreneurial skills, there is no consensus on what its distinctive constituents are, how it should be learnt and taught and in what learning context. This is reflected in a very fragmented entrepreneurship education landscape in Europe.[112] Across Member States no common definition of entrepreneurship competence is adopted, nor is the same priority given to the definition of learning outcomes for entrepreneurial learning. To improve the situation, the Commission is fostering a common understanding of what entrepreneurial skills are and what the relative learning outcomes[113] are as it has previously done for digital ones[114], gathering evidence on good practice projects[115] and helping relevant actors to exchange knowledge.

2.2.5. Relevance of higher level education

More advanced, complex skills are developed primarily in higher education systems. During the past decade, enrolment and attainment grew steadily, while higher education graduates

[109] European Commission/EACEA/Eurydice, Entrepreneurship Education at School in Europe, Publications Office of the European Union, 2016
[110] European Commission, Entrepreneurship Education: A road to success, Publications Office of the European Union, 2013
[111] European Commission, Effects and impact of entrepreneurship programmes in higher education, Publications Office of the European Union, 2012
[112] Eurydice, Entrepreneurship Education at School, Eurydice Reports,,Publications Office of the European Union, 2016
[113] On the definition of entrepreneurship as a competence, the European Commission is defining a common reference framework including learning outcomes and proficiency levels. See European Commission website, "Entrepreneurship Competence", Joint Research Centre
[114] European Commission website, "Being digitally competent – a task for the 21st century citizen", Joint Research Centre
[115] European Commission, Young People and entrepreneurship, European good practice projects, Youth in Action Programme, Publications Office of the European Union, 2013

continued to enjoy persistent advantages in both finding employment (Figure 16) and earning income[116].

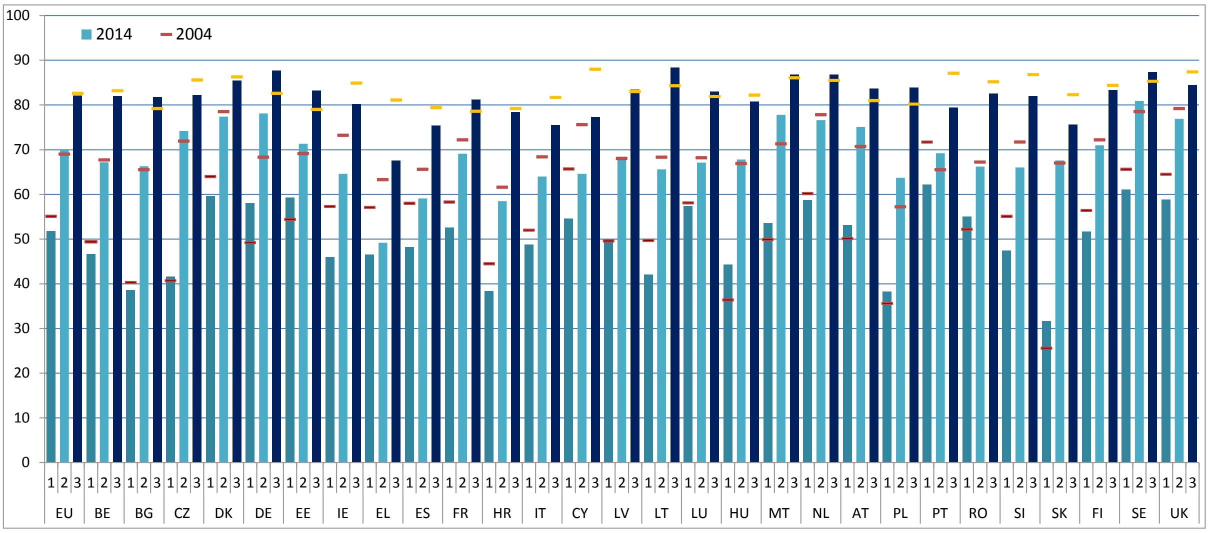
Despite these successes, European higher education systems face a number of key challenges in responding to increasing and changing demand for high-level skills. The results of the recent public consultation on the modernisation of higher education (**see Annex II for a full analysis**) highlight, among other key issues, the following:

1. There is a need for higher education and research performing institutions to prepare students and researchers for a rapidly changing labour market, where established occupations are constantly evolving. In such a context, the ability to adapt to change, think critically and solve problems independently, as well as other transferable skills such as high-level digital literacy, are more crucial than ever, which means it is all the more important for to implement student-centred higher education curricula and research programmes that help individuals acquire the skills sets they need.
2. Higher education also needs to respond to short to medium-term skills needs in regional and national labour markets. Demand for higher education graduates from particular fields of study varies between regions and national contexts. For example, although there is not generalised undersupply of Science, Technology, Engineering and Maths (STEM) graduates in the EU, shortages of specific STEM skills affect particular regions. Here, good guidance for prospective students and understanding of relevant skills needs within institutions are particularly important.
3. The changing labour market and high skills requirements are increasing demand for lifelong learning and continuous professional development, as people seek to up-skill over their careers. However, provision of lifelong learning options in existing higher education institutions is often limited.
4. To respond effectively to high-level education and training needs, higher education systems need to provide an adequate diversity of study options, including good quality professional programmes, good work-based learning opportunities and flexible courses accessible for those already in work. In this respect, the potential of online and blended learning is only starting to be tapped into.
5. Building effective higher education systems requires sustainable funding, which makes it possible to design and deliver high-quality, relevant programmes.

As mentioned in the introduction, a public consultation has recently taken place to have a wide range of stakeholder's views on the modernisation of higher education. A detailed analysis of the results of the consultation is presented in ANNEX II of this SWD.

Figure 16: Employment rates by level of education

[116] In 2012, tertiary graduates aged 25-34 in the EU earned on average 40% more than their peers with post-secondary, non-tertiary education at most. For the whole labour force the earning advantage was 60%. See OECD, Education at a Glance: OECD Indicators, OECD ¨Publishing, 2014, Indicator A6.1a



Source: Eurostat. 1=below upper secondary education (ISCED: 0-2); 2=upper secondary (3-4); 3=tertiary (5-8)

In doctoral education as in other levels, exposure to industry and transferable skills training[117] is increasingly encouraged. Today, certain institutions in Europe have started training doctoral candidates not only for an academic career. However, as many PhD will go on to work outside academia, they increasingly require the ability to adapt to another environment and to develop new essential skills. Essential skills such as people management, leadership, intellectual property rights and entrepreneurship, remain less common forms of 'structured' training for PhDs: around one out of ten reports receiving such training. When looking at intersectoral mobility (>3 months) during the PhD, 23% of researchers have had a non-academic research experience (in public, non-for-profit or private industry); a subgroup of only 4% have experience with private industry. This would suggest that more attention might be given to skills development during PhD training and continuous professional development. 'Transferable' skills and experience outside academia are, for example, embedded in the existing Principles for Innovative Doctoral Training[118].

Globally speaking the role of Science Education is becoming a crucial element that provides overall necessary curiosity, skills and knowledge to all citizens. Modern Science Education will help the youth to become participative citizens that are able to make right choices for themselves and for the society, and make it easier for them to stay employed or increase their employability and adaptability to the ever faster technological development and innovation process in a global economy.

[117] IDEA Consult, Support for continued data collection and analysis concerning mobility patterns and career paths of researchers, MORE2 Final Report, 2013
[118] European Commission, "Principles for Innovative Doctoral Training", 2011

This calls for enhancing the provision of both 'core' skills and transversal skills for researchers, innovators and entrepreneurs, notably for linking science to society. Hence, the components of the EU's Responsible Research and Innovation programme (more specifically science education, gender, ethics) should be taken into account in the curriculum development in order to provide very societally relevant and high quality science education and training to the young, independently of whether they choose a career in academia or the private sector.

Equipping researchers already at a very early stage with the 'right' skills has become a basic requirement of the ever faster evolving culture Europe belongs to. To provide for such opportunities, the 2005 'European Charter for researchers and the Code of Conduct for the recruitment of researchers' (Charter and Code) set out the rights and obligations for researchers with respect to their career.

Being top priority on the political agenda, appropriate skills, in particular e-skills, literacy, data management skills etc. need to be provided for to all researchers (and even already during curricula) to allow even early stage researchers to work in an Open Science environment, irrespective their career choice.

2.2.6. School to work transitions

Transition from school to work is a critical step for many young persons. Lacking work experience, but unable to obtain that experience without a job, throws young people into a vicious circle. Young people that do not manage to get their first work experience risk being permanently excluded from the labour market.

The European Union Labour Force Survey results show that "among medium-level VET programmes, the transition to work is 14% faster for work-based programmes than for school-based programmes."[119]

Medium level VET graduates are also more likely to have a permanent first job, and are less likely to find a first job with a qualification mismatch[120]. It must be born in mind, however, that general education programmes tend to orient their graduates towards further education rather than direct entry into the labour market.

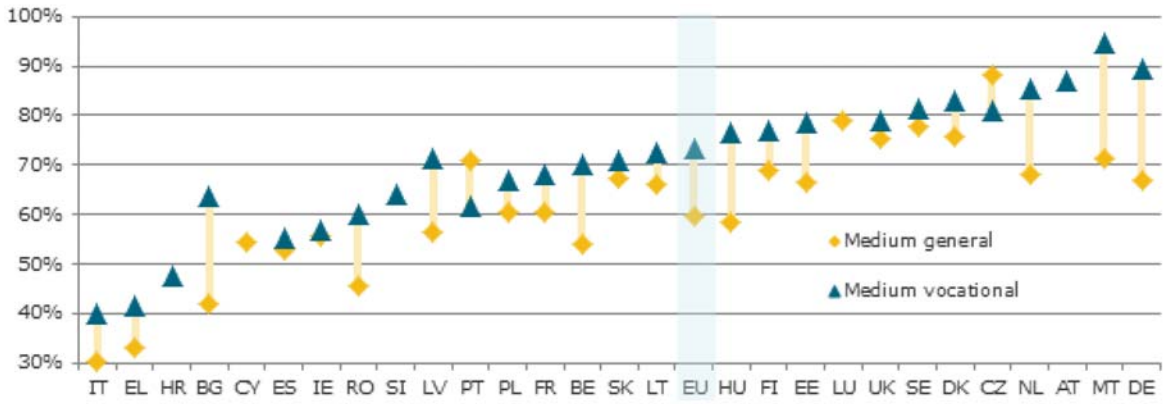
There are significant differences between countries. The transitions are faster in countries where school and work-based learning are closely connected. Furthermore, as VET graduates tend to be employed in occupations which are closely related to their studies, the likelihood of under-qualification is lower for them than for graduates from general education[121]

[119] Cedefop, Labour market outcomes of vocational education in Europe, Evidence from the European Union labour force survey, Publications Office of the European Union, 2013
[120] Idem
[121] Idem

Evidence also shows that young adults who finish initial VET programmes are better placed to access jobs compared to those young adults, who complete initial general education programmes and do not continue into further education. The employment rate of young VET graduates is 73.3 %, whereas that of young general secondary education graduates who did not go on to a higher level of education is 59.7 %. These are average trends, to which only CY, EL, PT and UK are exceptions[122].

In May 2012, the European Council agreed on a European benchmark on the share of employed graduates from education and training. The aim of this benchmark is to help to identify education and training policies which improve the transition between education and training and work. It was agreed that by 2020, the share of employed graduates (20-34 year olds) having left education and training no more than three years before the reference year should be at least 82% (as compared to 76.5 % in 2010). The current state of this indicator overall is 76.1 %, which shows that there has not been improvement in this area. The employment rate of recent higher education graduates is 80.5 %.

Figure 17: Employment rates by orientation of education qualification



Source: Eurostat (LFS, 2014), based on a May 2015 extraction. Note: The indicator captures the employment rate of 20 to 34 year-old persons with ISCED 3 or ISCED 4 education attainment *and no longer in formal or non-formal education* or training. Countries are ranked in ascending order by the total employment rate (ISCED 3 and ISCED 4). From Education and Training monitor 2015

Several measures have been taken at European level to contribute to reaching the employability benchmark. One of them is the Council Recommendation for Youth Guarantee

[122] Flisi S., Goglio V., Education and youth labour market outcomes: the added value of VET, JRC Technical Report, Publications Office of the European Union, 2015

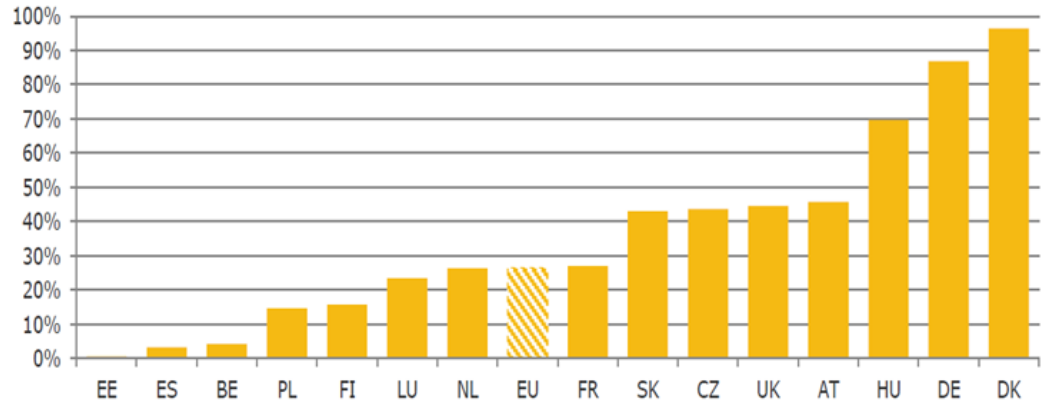
(a report/communication foreseen later in 2016). Other initiatives are the European Alliance for Apprenticeships (see below) and the Quality Framework for Traineeships, which was also launched as part of the youth employment initiative. The business-led initiative European Pact for Youth is also active in the field (see also below).

2.2.7. Role of work-based learning and business-education partnerships

Work-based learning and apprenticeships facilitate transitions to the labour market, thus improving employability; studies show that around two out of three apprentices are hired directly after their training[123]. They benefit also the training companies because, in addition to creating a 'training culture' in an enterprise, they can provide a supply of people trained to meet the company's specific needs. Apprenticeships and work-based learning in general also enhance the competitiveness of enterprises and help adapting employees' skills. Work-based learning actually provides a valuable alternative, non-academic pathway to build quality employment and careers. In 2025, about 40% of jobs will require medium-level skills[124], typically acquired through vocational education and training.

However, currently only one in four initial VET students are in work-based programmes (see Figure 18) [125], which is in part due to the lack of attractiveness of apprenticeships and knowledge about employment prospects[126], but also the lack of companies, in particular SMEs, providing work-based learning for young people[127]. Large companies, with over 250 employees, are most likely to offer apprenticeships (44%), compared to 31% of medium-sized companies (50-249 employees) and only 22% of small enterprises (10 to 49 employees).

Figure 18 Initial VET students in combined work- and school-based training



Source: Cedefop calculations based on Eurostat (UOE) data for 2012 (ISCED 1997 level 3). See Cedefop (2013), *On the way to 2020: data for vocational education and training policies* (http://www.cedefop.europa.eu/).

[123] Ecorys "Apprenticeship and Traineeship Schemes in EU27: Key Success Factors", 2013
[124] Cedefop, 2016 (forthcoming).
[125] European Commission, European Alliance for Apprenticeships: Good for Youth, Good for Business, p.14, 2015
[126] Cedefop, Stronger VET for Better Lives, 2015
[127] Cedefop, Stronger VET for Better Lives, 2015

The evidence shows that work-based learning is an effective way to prepare a smooth transition from education to work, which is an insight that governments, social partners and VET providers can use to design effective policies. A working group of experts under the framework for European cooperation in education and training (ET2020) reflected upon the ways to maximise the potential of work-based learning. In addition to giving real-life examples of how apprenticeship schemes can be put into practice, the final document "High-performance apprenticeships & work-based learning: 20 guiding principles"[128] focusses on four areas that need to be tackled when introducing and improving work-based learning schemes; national governance and social partners' involvement; support for companies, in particular SMEs, offering apprenticeships, attractiveness of apprenticeships and improved career guidance; and quality assurance in work-based learning. These are key areas for successful apprenticeships, but also areas where more support is needed.

Constructive cooperation between all apprenticeship partners is key to good quality apprenticeships. Companies' participation is crucial as it is them who provide the practical training part in apprenticeship schemes, which is why education-training partnerships are duly gaining more attention in vocational training. Strong partnerships with social partners and other relevant stakeholders such as chambers of commerce and various competent institutions were highlighted as one of the transversal priorities in the Riga conclusions on Vocational education and training priorities up to 2020[129].

Cedefop has undertaken apprenticeship reviews of Malta and Lithuania, and they are ongoing for Italy, Greece and Slovenia, whilst the ILO is carrying out similar work in Latvia, Spain and Portugal. The purpose of these reviews is to help the targeted countries to identify action to improve apprenticeship supply[130].

Since 2013, the Commission has promoted apprenticeships through the European Alliance for Apprenticeships, a multi-stakeholder initiative. The Alliance aims at improving the quality, the quantity and the image of apprenticeships. To date, 26 Member States, 5 EFTA and EU Candidate Countries, as well as around 100 organisations, including companies, have made commitments and pledges to take concrete actions. A study has been launched to monitor progress and to reflect the future priorities for the Alliance with the results expected in early 2017.

But cooperation between the world of education and companies should take a comprehensive approach above and beyond apprenticeships. A European study by McKinsey[131] showed that while 74 % of education providers believed their graduates were prepared for work, only 38 % of youth and 35 % of employers agreed. Similar results were found in the public

[128] European Commission website, "European Alliance for Apprenticeships", Employment, Social Affairs and Inclusion
[129] Latvian Presidency at the Council of the European Union, Ministry of Education and Science of the Republic of Latvia, European Commission, "Riga Conclusions 2015", 22.06.2015
[130] CEDEFOP, "High-performance apprenticeships & work-based learning: 20 guiding principles", 2015
[131] Mourshed M., Patel J., Suder K., "Education to Employment: Getting Europe's Youth into Work", McKinsey Center for Government, 2014

consultation on the modernisation of higher education (see Annex II). Moreover, whilst close cooperation between the education sector and business improves the relevance of education and training needed for the world of work at all levels, they are not yet the norm, not even in the area of VET, let alone at other levels of education.

Within the European Pact for Youth aimed at improving youth employability and social inclusion, launched on 17 November 2014 by CSR Europe and supported by the Commission, companies committed themselves to creating 10,000 quality business-education partnerships and 100,000 learning opportunities for young people by 2017. Implementation of this joint engagement of EU and business leaders will be monitored through the Group of Leaders co-chaired by the Commissioner Marianne Thyssen and Viscount Etienne Davignon.

Partnerships can also be made on other issues, such as research, regional innovation or entrepreneurship. Guest lecturers from business in schools, job shadowing for teachers, and student visits in the workplace are other ways to cooperate, to mention but a few. In particular, SMEs with limited administrative resources may benefit from continuous cooperation with companies as well as support provided through business-education partnerships at the local level.

2.2.8. The role of mobility

Young people who study, train or volunteer abroad not only gain confidence and knowledge in other cultures and languages, but also strengthen key transversal skills which are highly valued by employers. Studies show that graduates with international experience fare much better on the job market[132].

However, the number of young people benefitting from such an international experience is still limited. Only around 10% of higher education students in Europe go abroad for at least 3 months during their studies, which is still far from the EU target of 20% by 2020.

Mobility for apprentices and IVET learners is still underdeveloped compared to mobility for students in higher education within the Erasmus+ programme and beyond. Within Erasmus+, the resources allocated to VET mobility allowed to fund about half of the eligible applications (in 2014, 53%, compared to 71% in higher education), and while most VET mobility experiences are short, individual participants were less than one third the number of mobile higher education students[133]. However, there is also a lack of reliable data IVET mobility outside of the Erasmus+ programme is difficult to measure. There is also a need to improve the quality of VET mobility, in order to increase mobility flows and to contribute to reaching the VET mobility benchmark of 6 %. The benchmark was agreed by the Council of the European Union in May 2012. While setting the target, the Council also requested the Commission to establish a regular data monitoring systems for all mobility targets, including I-VET mobility. The Commission has initiated a data development exercise and, as part of this exercise, a pilot data collection has been implemented by Eurostat. The average I-VET

[132] European Commission, "Erasmus Impact Study Regional Analysis", Publications Office of the European Union, 2016
[133] Erasmus+ Programme Annual Report 2014, chapter 4.

learning mobility, based on the 16 countries that participated in the exercise and defined as formulated in the benchmark, was 3.1% (weighted average of those sixteen countries).

A Mobility Scoreboard should make the quality of the organisation of mobility and overall numbers more visible. Cedefop has produced a report demonstrating that collecting data and developing an IVET Mobility Scoreboard is feasible and that the scoreboard can be produced on a yearly basis[134].

2.2.9. Supporting transitions of adults

As working careers are changing and jobs are no longer for life, individuals have to update, increase or change their skills, hence continuing training and upskilling is a constant need. Work transitions, within the organisation, into a different one, or in a new sector, are the reality for an increasing number of people. Adults in employment, who do not engage in substantive upskilling or reskilling for five or more years, run the risk of being locked into particular ways of working. The actual knowledge base requires substantial updating, achieved partly through work, partly through career development activities outside work. [135]

Good jobs are needed to develop good skills. Skill-intensive jobs with opportunities to acquire skills continuously are a pre-requisite so that individuals have incentives to engage in continuous learning as part of their jobs. Around 26% of EU adult employees have significant skill deficits, leaving scope to improve skills and productivity[136]. The underqualified, however, though lacking qualifications needed for their jobs, are likely to possess a large stock of (non-formal or informal) skills to perform their jobs, thus indicating the need for validation or certification of their acquired, yet unrecognised, skills for the purposes of enabling their continued mobility and career progression in the labour market.[137]

Adult education helps to improve economic growth and society. Adult education can reduce social inequality, increase inclusion, cohesion and active citizenship. Erasmus+ supports capacity building of adult education organisations and the improvement of teaching and learning provisions. The programme fosters the inclusion and employability of specific adult target groups with poor basic skills by supporting provisions for enhancing their basic skills and key competences.

The formation of skills through non-formal and informal learning is an investment by firms, in many respects akin to other forms of investments. Small and medium-sized enterprises (SMEs) provide less continuing vocational training to their staff relative to larger-sized organisations, which partly reflects the skewed distribution of occupations in the latter and the more limited scope for vertical mobility within the organisation; for example, a greater share of professionals are employed in larger-sized firms while SMEs rely more on service and market sales workers. Nevertheless, there is evidence that, after taking into account their differential occupational/sectoral distribution, individuals in SMEs require a higher level and

[134] See: http://www.cedefop.europa.eu/en/events-and-projects/projects/mobility-scoreboard & Cedefop, Work programme 2016, p.31
[135] Cedefop, Navigating difficult waters: learning for career and labour market transitions, Publications Office of the European Union, 2014
[136] Cedefop, Matching Skills and Jobs in Europe, Insights from Cedefop's Skills and Jobs Survey, 2015
[137] Cedefop, Matching Skills and Jobs in Europe, Insights from Cedefop's European Skills and Jobs Survey, 2015

spectrum of skills to do their jobs compared to comparable workers in large establishments. [138]

Workplace support is key to career development and transitions. Decisive factors are motivation (personal and work-related), whether time away from work is granted, or whether further training is financially possible. Successful learning in the workplace schemes is based on an initial assessment of participants' skills and motivation, validation of prior learning, individual training plans and tailored learning to help develop both key competences and job-specific skills.

But individual commitment to learning also needs to be supported and matched by workplace innovation practices. These are also important for the mutual learning between employees and transfer of knowledge within the company. European Commission's European Workplace Innovation Network (EUWIN) project[139] gathered important evidence and best practises in this regard. Building on EUWIN's experience, more practices of this kind should be promoted in European companies, especially SMEs, start-ups and innovation villages.

2.3. Making skills visible and comparable

2.3.1. Transparency and recognition of skills and qualifications: main issues

The lack of relevant skills is not the only cause for low employability and skills mismatches. In many cases, skills exist in the labour market but are not identified, exploited or rewarded. This leads to under-utilisation of the skills available in the economy. It also has implications for mobility of individuals between countries. Skills and qualifications acquired in a given country and in a specific economic sector might not be recognised or even properly understood by prospective employers of other countries and sectors. Skills acquired on the job or through other relevant experiences such as non-formal and informal learning are not necessarily recorded in a qualification or documented.

According to a 2014 Eurobarometer, 6% of EU citizens have tried to work or study in another EU Member State but were not able to do so. This was partly due to a lack of recognition of their qualifications and related support and information. Considering that 3.3% of the total labour force in 2013 was mobile, it is evident that there is potential for greater mobility also based on improved recognition of qualifications at EU level.

Recognition arrangements for qualifications have, in the EU context, focussed exclusively on access to regulated professions and on recognition of qualifications for Higher Education. In the field of academic recognition, recognition of higher education qualifications is provided for in the context of the Lisbon Recognition Convention. Important efforts have also been made to increase "trust" on qualifications without necessarily leading to automatic recognition – notably through the European Qualifications Framework.

[138] Ibid
[139] European Commission website, "Workplace Innovation", Growth

2.3.2 Recognition of professional qualifications and European professional card

Recognition arrangements for qualifications have, in the context of the achievement of the internal market, focussed on access to regulated professions i.e. professions access to which and pursuit of which is subject by virtue of legislative or administrative provisions to the possession of specific professional qualifications[140]

Regarding recognition of qualifications in regulated professions, the European Union has developed a comprehensive system of legal texts and case law in order to allow the holder of a professional qualification to access and pursue that profession, or part of that profession as appropriate, in another Member State on a permanent or occasional and temporary basis, under the same conditions as nationals. The main tool is the 2005/36/EC Directive[141], on the recognition of professional qualifications, besides some specific directives for given professions e.g. lawyers.

The revision of the directive 2005/36/EC in 2013 introduced the first EU-wide electronic procedure for the recognition of professional qualifications, the so-called European professional card (EPC). The EPC uses the Internal Market Information System (IMI) which is an electronic exchange information system between national authorities coordinated at European level and used in the context of the achievement of the internal market. The EPC offers an alternative and electronic method for professionals to get their qualifications recognised in other Member States. “Traditional" recognition procedures under the Professional Qualifications Directive remain nevertheless available, in parallel, to migrating professionals, who can still use them, if they so wish.

The EPC is based on on-line applications, on direct channels of electronic communications between national authorities and between national authorities and the applicants, on standardised and time-sensitive processes and on multilingual communication facilities. The EPC significantly improves transparency on document requirements and fees. Finally, the applicant whose qualifications will be recognised under this process will obtain an electronic recognition certificate but not a plastic card.

The EPC was formally launched on 18 January 2016 and is for the time being available to 5 professions: nurses responsible for general care, pharmacists, physiotherapists, real estate agents and mountain guides[142]. These professions were selected after thorough consultation with professional organisations, competent authorities and Member States. As of 30 March, 2016, 629 EPC applications were recorded in IMI and 44 EPCs had been issued. Applications cover all five professions and involve almost all Member States. The EPC could be extended

[140] See article 3(1)(a) of Directive 2005/36/EC.
[141] Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications (Text with EEA relevance) OJ L 255, 30.9.2005, p. 22–142
[142] Implementing Regulation (EU) 2015/983

to other mobile professions in the future in subsequent implementation phases. However, there is no set plan for such an extension yet.

2.3.3. Skills acquired outside the education system and through new forms of learning

Nowadays, skills relevant for the labour market can be acquired in a variety of different ways, both in formal education and through other non-formal or informal ways.

Online learning is one of these. MOOCs in the Higher Education (HE) and the research sector are increasingly a feature of HE education and research institutes and are more and more reaching a point of maturity. They are progressively becoming a standard element of credentialed University education, partially responding to the increasing demand for the higher education and training sector to provide flexible pathways to learning that are accessible and affordable.[143]A spring 2015 representative survey of Higher Education Institutions in five European countries (France, Germany, Poland, Spain and the United Kingdom) found that MOOCs are on the agenda of (41%) of HE institutions: 22% of HEIs declared they are already offering MOOCs and 19% are planning to do so. However, so far only a small subset of HE institutions has mechanisms for providing MOOCs recognition and certificates in ECTS credits to learners[144], but with the continuing rise in the offer of MOOCs, recognition is a key issue that needs to be dealt with.

Youth work and grassroots sport also provide young people with opportunities to develop their skills and improve their employability. As a recent expert group report[145] shows, youth work and non-formal and informal learning develop the life management and social skills of young people which assists their transition to the labour market. Participation in grassroots sport may also develop positive social attitudes and values, as well as individuals' skills and competences, including transversal skills[146]. However, the awareness of the broad contribution and further potential of youth work and grassroots sport in the lives of individuals and society as a whole needs to be raised.

Based on the 2012 Council Recommendation on the validation of non-formal and informal learning (VNIL). Member States have agreed to put in place by 2018 arrangements for the validation of VNIL experiences enabling individuals to obtain a qualification (or part of it) on the basis of their validated experiences. These experiences would be linked to qualifications and in line with the EQF and would have the same or equivalent standards as qualifications obtained through formal education.

[143] Department for Business, Innovation and Skills, The Maturing of the MOOC, UK Government BIS
[144] Castaño Muñoz J. et al., How are Higher Education Institutions Dealing with Openness? A Survey of Practices, Beliefs and Strategies in Five European Countries, JRC Science for Policy Report, Institute for Prospective Technological Studies, 2016.
[145] The contribution of youth work to address the challenges young people are facing, in particular the transition from education to employment. Results of the expert group set up under the European Union Work Plan for Youth for 2014-2015, http://ec.europa.eu/youth/library/reports/contribution-youth-work_en.pdf.
[146] Council conclusions on maximising the role of grassroots sport in developing transversal skills, especially among young people (2015/C 172/03), OJ C 172, 27.5.2015, p. 8-12.

The 2014 European inventory on the validation of non-formal and informal learning show that there has been clear progress with regard to the introduction of national validation policies and frameworks since 2010, although less so on implementation. Progress has also been uneven across countries[147]. Based on the 2012 Council recommendation on the validation of non-formal and informal learning[148], pathways have been established on the validation of skills acquired outside of the formal education and training system, e.g. through work experience, in-company training, digital resources, volunteering and life experience in general. Opportunities and uptake of validation, however, vary significantly across the EU. For instance, skills audits for particularly disadvantaged groups are available in only 13 MS[149]. The possibility to acquire a national qualification or gain access to formal education on the basis of validation is available in 15 MS[150]. Some of the major challenges include: the low level of awareness regarding the possibilities and potential value of validation, especially amongst the general public; the social and labour market acceptance of validation which, whilst growing, remains in many countries lower than the acceptance of formal education; the level of bureaucracy and costs involved in validation; and the lack of a long-term and comprehensive approach to validation, which in many cases remains a collection of initiatives and projects with low coordination between stakeholders and across sectors. Identification of validation of skills is particularly relevant for people with lower qualifications, the unemployed or those at risk of unemployment, and for those who need to change their career paths, i.e. to identify further training needs and access re-qualification opportunities.

In December 2015 the Commission and Cedefop published a revised version of the European guidelines on validating non-formal and informal learning. The guidelines address the wide range of policy-makers and practitioners involved in developing and implementing validation arrangements[151].

2.3.4. Valuing skills on the labour market and tackling discrimination

Skills might be fully recognised and referenced by qualifications, but not fully valued on the labour market, especially in case of discrimination.

The effective application of the existing EU legal framework on equal treatment is indispensable for tackling discrimination as well as gender gaps in pay and employment more broadly. The Commission monitors the correct application and enforcement of existing EU legislation in the Member States. In 2014, a Recommendation on strengthening the principle of equal pay between men and women through transparency was adopted. The Recommendation provides a toolkit of concrete measures on pay transparency as a means to tackle the gender pay gap, including:

[147] European Commission/CEDEFOP/ICF International, European inventory on validation of non-formal and informal learning 2014, Executive Summary, 2014

[148] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2012:398:0001:0005:EN:PDF

[149] BE (Flanders and Wallonia), NL, SE, SI, LU, EL, HU, FI, IT, PL, FR, HR, LV (Source: European Commission; Cedefop; ICF International (2014). European inventory on validation of non-formal and informal learning 2014. Final synthesis report http://libserver.cedefop.europa.eu/vetelib/2014/87244.pdf)

[150] AT, BE (Flanders), BG, CZ, DK, FR, IE, LV, LT, LU, MT, PT, SI, ES, UK (England, Scotland, Wales) (Source: European Commission; Cedefop; ICF International (2014). European inventory on validation of non-formal and informal learning 2014. Final synthesis report http://libserver.cedefop.europa.eu/vetelib/2014/87244.pdf)

[151] Cedefop, European guidelines for validating non-formal and informal learning, Cedefop Reference Series, Publications Office of the European Union, 2015

- an entitlement for employees to request information on pay levels, broken down by gender, for categories of employees doing the same work or work of equal value;
- regular reporting by employers regarding wages by category of employee or position, broken down by gender (limited to large and medium-sized companies);
- pay audits in large companies; and
- the inclusion of equal pay issues (and pay audits) in collective bargaining.

The Recommendation invites Member States to undertake at least one of the above measures. Other measures provided include improved statistics; a clear definition of "work of equal value" and the promotion of gender-neutral job evaluation and classification systems.

Based on the information provided by Member States, the Commission will draw up a Report on the Implementation of the Recommendation planned for the adoption in the second half of this year. The report will provide a state of play of measures adopted by Member States as well as an assessment of the potential need for additional EU measures in this area, including whether the review of the Gender Equality Recast Directive 2006/54/EC is necessary.

Work on the transparency and comparability of qualifications across Europe started a decade ago and the European Qualifications Framework (EQF) has advanced Member States' trust in the quality of each other's qualifications. A key purpose of the EQF is to strengthen the transparency, comparability and portability of qualifications. The mobility of learners and workers requires that qualifications acquired in different institutions and countries can be combined and accumulated so as to facilitate progress in education, training and employment. The focus has therefore shifted from the number of hours and duration of qualifications to the learning outcomes achieved.

To implement this change, participating countries in the EQF started the complex task of developing overarching and comprehensive learning outcomes based national qualifications frameworks (NQFs), involving a broad group of national stakeholders. As a result the number of NQFs rose from 4 in 2008 to 43 in 2016. The shift to learning outcomes was not just a technical challenge but requires trust, commitment and consensus among national stakeholders.

Despite the good implementation of the 2008 Recommendation, the objectives of transparency, comparability and portability of qualifications, have not been fully reached, mainly due to limitations of the Recommendation. The Commission is presenting a proposal for the revision of the EQF recommendation as part of the New Skills Agenda. More details on the challenges identified and options to be considered for decision can be found in Annex III of this Staff Working Document.

2.4. Skills intelligence, documentation and informed career choices in Europe

Labour market and skills intelligence (LMSI), namely information on current and future labour market trends and skills needs as well as on the availability of relevant skills development opportunities, helps to make informed and unbiased decisions about human resource investments that will generate the best return. Although such intelligence cannot predict future skills evolution with precision, it can offer (early) warning signals of skills mismatches, thus helping a multitude of stakeholders to steer their decisions and strengthening evidence-based policymaking.

As an indication of the potential that skills intelligence has in influencing individuals' education and training decisions, in spring 2014, 44% of EU citizens said that they had looked for information about education, training and career options as well as if their skills and qualifications can be recognised in other Member States (European Commission, 2014). While respondents from DK (63%), NL (56%) and FI (52%) were the most likely to have looked for skills intelligence, only a very small share of citizens in BG (14%), PT (13%) and EL (10%) did. Fewer than half of youth in DE and UK say that when they chose their professional orientation they had a good understanding of which educational paths lead to professions with job openings and good wage levels[152].

2.4.1. Skills intelligence at national level

The ability of skills intelligence to influence individual choices and policy design depends on the degree of maturity and effectiveness of a country's *skills governance system* – the extent to which key stakeholders generate, disseminate, coordinate, use, and act upon the information on current and future skills needs and trends.

The approaches to skills intelligence applied across Europe to measure and/or anticipate skills and labour market trends range from more conventional education and labour market analyses, or employer and household surveys to quantitative projections of employment/labour supply and the adoption of foresight and other qualitative methodologies (see Figure 19). More recently, innovative Big Data techniques have been increasingly applied, such as digital web-crawlers that scan across online job vacancies, filtering information about desired skills and other behavioural traits in demand from job applicants[153]. All skills intelligence techniques complement rather than substitute each other[154] and it is widely acknowledged that best practices are those that attempt to combine quantitative and qualitative elements in order to develop a more holistic understanding of trends.[155].

[152] Mourshed M., Farrell D., Barton D, Education to employment: designing a system that works, McKinsey Centre for Government, 2014

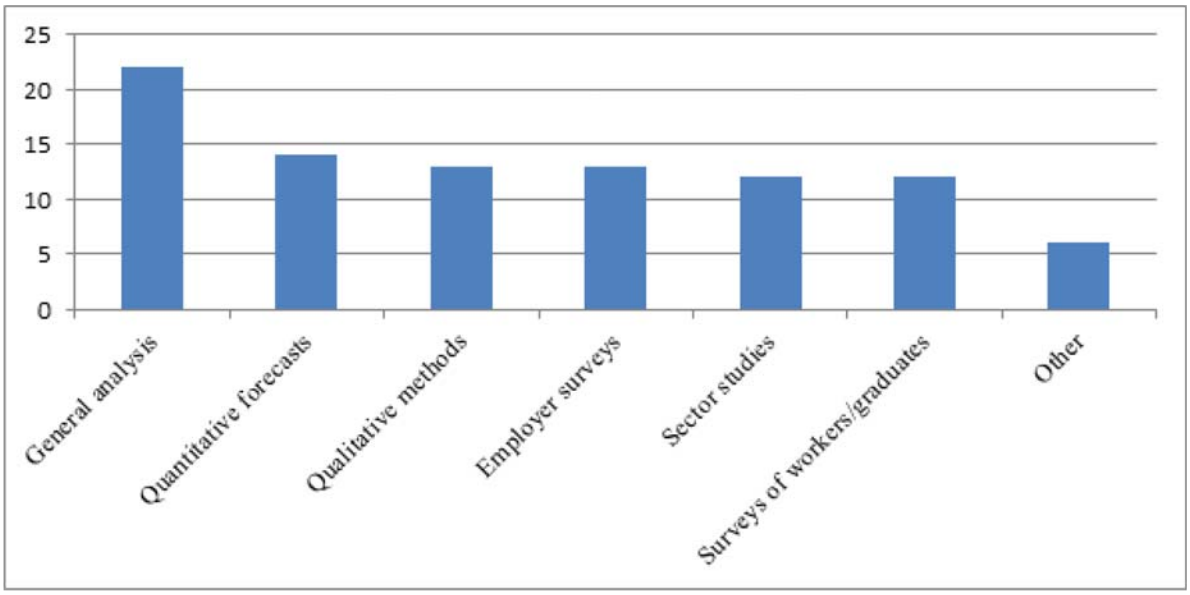
[153] Kuhn P.J 'The internet as a labor market matchmaker', IZA World of Labor, Vol. 18. , 2014; Cedefop, Real-time LMI on skill requirements: feasibility study and working prototype, call for tender http://www.cedefop.europa.eu/en/about-cedefop/public-procurement/real-time-labour-market-information-skill-requirements-feasibility,2014

[154] For instance, elements of foresight efforts are sometimes included in the assumptions underlying quantitative models, improving forecasts. Furthermore, foresight scenarios benefit from the provision of structured information collected part of quantitative forecasting exercises.

[155] Cedefop-ETF-ILO, 2016, Developing skills foresights, scenarios and forecasts, Guide to anticipating and matching skills and jobs Vol. 2, forthcoming

In light of the stark differences between countries in their statistical infrastructure, culture of stakeholder collaboration, links between their education and training systems and the labour market and overall policy priorities and context, there is no single model of skills intelligence that can be applied universally across the EU.[156] However, several common principles and approaches of LMSI exercises can be identified, while similar experiences in data and institutional requirements are frequently reported across countries.

Figure 19: Main methods and approaches to LMSI, 2014, EU Member States



Notes: Total number of positive responses received by Ministry representatives per country. When more than one Ministry responded in a particular country, responses were merged and counted as one.
Source: OECD-Cedefop-ETF-ILO (2014) 'Questionnaire on Anticipating and Responding to Changing Skill Needs'

For instance, important differences exist across EU Member States given that some exercises focus on the macro level (e.g. national economy), while others at the meso (e.g. region, sector) or micro level (e.g. households, graduates, employers). The time frame covered also differs (e.g. short-, medium- or long-term), whereas the data sources (e.g. national accounts, labour force surveys, vacancy data) and the regularity of updates (e.g. annual, every few years, ad hoc) also vary. Some initiatives aim at better describing the current state of play in skill supply and demand in the economy or in a given sector/region and the associated skill

[156] Cedefop (with the support of the European Commission) has produced since 2008 regular annual forecasts of skill supply and demand for the EU and each Member State using comparable data and a harmonised methodology (See Cedefop website, "Main forecasting results", Forecasting skill demand and supply).

mismatches that may ensue. By contrast, others focus on long-term projections and imbalances of changing skill needs and labour force stocks.

Moreover, there is significant variance in the measurement of 'skills' across different countries, with very few exercises actually measuring labour market needs for generic or information processing skills. Instead, they tend to focus on levels and types of qualifications or on employment trends across economic sectors and occupations, which are readily measurable proxies of skills. Critically, the stakeholders involved in commissioning and producing skills intelligence are also heterogeneous – in some cases central authorities such as Ministries of Labour or Education or Public Employment Services spearhead the initiatives, whereas in others it is employers, social partners or education and training providers who produce their own information.

Current skill needs assessments, which aim to describe the short-term state of skill supply and demand and of skill mismatches using labour market analyses, tracer surveys of graduates, and researchers, employer barometers and sector-specific studies, prevail as the most dominant form of LMSI in EU countries. Ad hoc sectoral studies can offer greater depth to identify emerging skill needs relative to large-scale forecasting models. This makes them more relevant for linking LMSI to the implementation of policy processes and to steering education and training provision. Nevertheless, there is a downside to over-reliance on sectoral or other ad hoc investigations, since they tend to rely on irregular or partial coverage (e.g. of a specific population group, sector or geographical area). Analyses of contemporary labour market data may ultimately appear not very useful given the lags inherent to skill development. Finally, surveys of households and employers can often capture marginal or biased views in terms of skill mismatches or shortages.[157]

Quantitative skills forecasts have also become a cornerstone of skills intelligence in most EU Member States, capturing future labour market developments by sector, occupation, qualification or skill level in each labour market. They are more demanding in terms of adequate labour market data, both in quality and in the length of the data series required. Building and interpreting quantitative models also requires significant time and expertise. Nonetheless, they constitute an essential building block of any comprehensive assessment of skill needs, given that they are bound by explicit and transparent assumptions and systematic thinking about complex economic interrelationships.

Qualitative foresights[158] of long-term skill trends are used less frequently, despite the fact that they require less formalised (data) inputs and are easier to set up than large scale macroeconomic models.[159] They also do not require extensive time series of data or the quantitative modelling of labour market accounting identities. Nevertheless, foresight

[157] Cedefop, 2008, Systems for anticipation of skill needs in EU Member States, Working paper Vol. 1 http://www.cedefop.europa.eu/en/publications-and-resources/publications/wp012015a; European Commission, 2016, Employment and Social Developments in Europe 2015, Luxembourg: Publications Office of the European Union.

[158] There are several foresight techniques which researchers may choose from and combine into a preferred 'foresight package' (e.g. Delphi methods, expert panels, scenarios, literature and statistics review, brainstorming and SWOT analyses) (Cedefop-ETF-ILO, 2016).

[159] An example of a comprehensive qualitative 'scenario development' exercise at European levels is the DG Employment Sectoral Studies, administered in 2009 as part of the New Skills for New Jobs initiative. They comprise a series of 19 sector-based studies that provided a transversal analysis of the evolution of skills needs in the selected sectors up to 2020, taking into account their global, national and regional contexts. The results were discussed and validated by panels of experts from industry, academia and various sector organisations including workers' and employers' representatives (European Commission, 2010).

techniques are highly dependent on the quality of the inputs from key experts and stakeholders, their interaction and on their willingness to engage in joint vision-building and priority-setting during the course of the exercises.

Box 1. "Horizon Scanning": qualitative foresight in the Health Sector

The Joint Action on Health Workforce Planning and Forecasting, an EU-funded collaborative project, applied the future-orientated technique of "horizon scanning[160]" to increase knowledge and allow systems dynamics modelling of the factors and forces which may drive changes in the skills and competences required from future health workforces in Europe.

Using the potential of new technologies, novel attempts have been made in recent years to explore *big data analysis and real time labour market intelligence* sources, such as online job portals, web scraping of online information and web crawling of job vacancies and/or job application resumes (Cedefop, 2014)[161]. Real-time online data on job vacancies and advertisements can capture up-to-date information on employer's skill requirements and even of new and emerging occupations and skills. Using such data, labour market needs can be analysed in a cost-effective way without the time lags found in traditional administrative and survey data sources. They offer a snapshot of the market at any moment in time, including trends in particular sectors or occupational groups, and may be the best source of information regarding specific job requirements, such as industry-based qualifications, which are difficult to cover in large administrative surveys.

Real-time LMSI complements traditional instruments by filling gaps in existing knowledge of employers' skill requirements including emerging occupations, newly demanded skill profiles (both generic and occupation-specific) and new qualifications/certifications requirements. It therefore constitutes a valuable source of LMSI with increased utility for a range of end-users, including policymakers, career guidance and counsellors, education and training providers, human resource managers and job seekers. Kuhn (2014)[162] provides evidence of the prominent role of online tools in job matching in the US and of their potentially significant unemployment reducing effects. Kureková et al. (2015)[163] pioneer the usage of the European-wide publicly administered job-vacancy portal EURES to perform a comparative study of employers' skill demand in small European economies. The authors argue that EURES data are a well-suited source for comparative analysis due to their standardised platform and relatively wide usage across European countries.

Despite the great promise of such big data analysis, available tools and instruments are largely unexploited by most Member States. Moreover, significant difficulties in the analysis and the

[160] Fellows, J. and Edwards, M., Horizon Scanning: future skills and competences of the health workforce in Europe, EU Joint Action on Health Workforce Planning and Forecasting, 2016.

[161] Cedefop is currently exploring the possibility of developing a working prototype of a web crawler instrument that will collect data on skill requirements in different sectors/occupational groups from online job vacancies using a harmonized process and classifications in a pan-European context, See Cedefop website, "Real-time labour market information on skill requirements: feasibility study and working prototype", Public Procurement

[162] Kuhn, P.J. (2014), 'The internet as a labor market matchmaker', IZA World of Labor, Vol. 18

[163] Kureková LM, Beblavý M, Haita C, Thum A-E (2015). "Employers' skill preferences across Europe: between cognitive and non-cognitive skills". J Educ Work 0:1–26

generalisation of use of such data exist, including a distorted distribution of particular sectors/occupations (e.g. overrepresentation of IT sector postings), underrepresentation of low-paid or 'insider' posts, omitted wages, duplicate entries, quality concerns and inconsistent classifications. There is also marked variation at present across EU countries in the potential usability of big data. For instance, there is significant cross-country heterogeneity in (i) the share of the employer/individual population that uses the web for job search activities or as a channel for posting vacancies; and (ii) the concentration of sectors and/or occupations most likely to utilise online sources for job matching purposes (e.g. in Germany online job vacancies are more prominent in the construction and transport and storage sectors, whereas in Ireland and the UK there is skewness towards the administrative and support service and ICT sectors).

Despite these challenges, methodological developments in this area of research are fast-paced and form part of the growing industry of Big Data. Given the increasing reliance on Internet-based recruitment and the spreading access to the Internet across socioeconomic groups and countries, it is highly likely that reliance on such data will grow. And in the medium-term, by orienting the classification of real time skills intelligence to make it compatible with the ESCO taxonomy, it may become possible to provide comparable information on skill needs in different sectors and occupations across Europe.

The full potential of skills intelligence is often undermined by poor dissemination channels and lack of an overarching strategy, e.g. when transmission activities are non-systematic, do not target audiences via dedicated communication activities or when the information is not bundled or customised to cater to the needs of specific target groups (e.g. students, researchers, unemployed, employees, trade unions, policymakers).[164] Time inconsistencies between skills intelligence production and planning/policy cycles, multiplicity of outputs and reporting of output that employs technical jargon also put a dent to the effective dissemination of skills intelligence.

To guarantee effective use of skills intelligence, results have to be sufficiently disaggregated and user-friendly, appropriately customised, taking into account the profile and needs of diverse actors, and the user base sufficiently monitored to assess whether the overall 'reach' of the information is satisfactory. Also, transmission of LMSI is effective when it is institutionalised (e.g. coordination committees, budget lines etc.), which helps to streamline and feed the information into the appropriate policy circles (Box 2).

Box 2. Examples of effective transmission of LMSI[165]

The experience of Poland

[164] For instance, using skills anticipation knowledge to specifically target unemployed persons requires simplification of the information provided to make it more useable and explicit with regards to qualifications and occupations in shortage (now and in the future). Particularly valuable for the unemployed, but also workers at risk who may be considering a career change, is information on the potential transferability of their skills across 'similar' occupations in the same sector. By contrast, data provided to experts require a high level of scientific rigor, while tailoring aggregated LMSI findings for career guidance and counselling purposes and for students and job seekers can be a challenge, since detailed information on job vacancies, skill requirements and other job-specific attributes is needed.

[165] Source: European Commission (2015)

In Poland the main tool for forecasting, the Study of Human Capital (BKL) includes a clear dissemination strategy, with structured steps and mechanisms with a specific budget line. Dissemination initiatives include annual reports on the BKL website, cycles of national conferences, and regional seminars targeting multiple stakeholders. Further, BKL experts participate in an advisory role in employment committees while PES officials are actively involved as stakeholders in the BKL analysis.

Use of skills intelligence

LMSI feeds into the design of employment and activation strategies by informing or updating occupational standards or the design and revision of training for the unemployed and employed workers. LMSI can also influence education and training provision by providing information about desirable course funding/allocation or the development of VET programmes and apprenticeships. Moreover, migration policies and other sector-specific policy goals, such as the transition to a resource-efficient and low carbon or digital economy, are often influenced by LMSI, particularly in relation to occupations that are identified as being 'in shortage'.[166, 167]

Box 3. Steering education and training in Finland with LMSI[168]

Finland has a long tradition of consensual policy making, high use of collective agreement and acceptance of forecasts results; hence skills forecasts are widely used and valued.

As part of the National Education Development Plan, the two key forecast tools VATTAGE (steered by the consortium of key ministries) and MITENNA (the Ministry of Education and Culture) steer education in accordance with sectoral developments and vocational education needs for young people. Sector-specific long-term forecasts from VATTAGE form the basis for education design. The MITENNA system translates the results of VATTAGE scenarios (sector-specific labour needs) into educational provisions. These provisions are discussed by Councils at different levels (national, regional and local) in order to make adjustments to provisions according to stakeholder views (e.g. the 26 National and sector-specific Education and Training Committees, tripartite bodies in each occupational field, supporting the design and content of upper secondary VET and HE). The educational estimations are then made into proposals for future occupations.

Skills intelligence is also increasingly employed for the purposes of 'competence-based matching' or as a pillar of learning outcomes oriented approaches (Box 4). These are reliant on the collection of up-to-date intelligence of suitable *education and training qualifications and pathways* that can assist jobseekers in finding well-matched job opportunities. A *sine qua*

[166] By contrast, LMSI is used less often in collective bargaining processes, the development of tax incentives for employers and workers, staff planning in companies and the up-skilling/re-skilling of teachers and trainers.
[167] The discussion in this section focusses exclusively on the use of LMSI for education and training purposes, including implications for guidance and skills validation. Further discussion of the relevance of LMSI for employment and migration policies can be found at OECD (2015, forthcoming).
[168] European Commission (2015), Skills Governance in the EU Member States: Synthesis report for the EEPO, Luxembourg: Publications Office of the European Union.

non condition for the success of such instruments is close collaboration between social partners, who are responsible for delivering the input necessary for linking learning outcomes to the national (and European) registers of occupations and qualifications.

Box 4. Competence based matching in Belgium

In cooperation with the main social stakeholders, the Flemish PES (VDAB) launched 'competence-based matching' under the 'competence-alliance' in 2010 to set up a more precise process to match the skills of the unemployed to labour market needs. The main visible output of the instrument is a web application with the primary function of a vacancy database. However, most interesting is the operating mode of the web application. The Flemish Social and Economic Council (SERV) developed a skills database, which included a precise list of skill needs for most occupations in Flanders. The matching tool requests jobseekers to indicate their skills profile (a personalised suggestion is made based on previous work experience and education background). Subsequently the application links this to the skills requested for a certain vacancy. Website users receive a matching-score in relation to an existing vacancy that goes beyond qualifications, along with suggestions on possible trajectories for skills and personal development. The philosophy of the tool is that vacancies can be relevant for a person who already has half or more of the required competences.

Skills intelligence can inform career decisions of people, whether they are aspiring youth, experienced professionals, employed, unemployed or older people.[169] However, it is not often used for this purpose, with just over a third of Member States reporting activities specifically targeted to jobseekers and guidance practitioners[170].

Survey findings from a Eurobarometer[171] show that only a quarter of EU citizens have used a career guidance service (mostly while they are still in education) but a majority agrees that guidance services are useful for making the right choice for further studies. The same survey shows that younger age groups and those with higher levels of education are more likely to have used a guidance service. Importantly, guidance services are a point of convergence for many of the tools and services, including skills intelligence, that could enable and guide informed decisions by individuals. Guidance services can reach out to the most in need of new and updated skills and enables citizens identify their capacities, competences and interests and to make learning and employment choices. The Commission has sought to gather statistical data on guidance activities at Member State level but the feedback (from both the Euroguidance Network and European Lifelong Guidance Policy Network) is incomplete with centres unable to provide feedback in a consistent way due to variation in structures and practices. What is clearly in evidence however is the scale of guidance services in many Member States; guidance activities are organised across multiple sectors and structures; and in effect every teacher within every institution acts in a guidance capacity for individuals. As such, guidance services offer a major outlet for tools and services, such as

[169] The value of real-time LMSI in offering increased utility for career guidance counsellors and individual job seekers is yet to be seen. Nevertheless, big data, derived in real-time from actual job postings, is expected to enable guidance counsellors to provide superior information about learning/employment pathways based on updated skills descriptions of existing and emerging occupations.
[170] OECD/Cedefop/ETF/ILO, Questionnaire on Anticipating and Responding to Changing Skill Needs, 2014; European Commission, Skills Governance in the EU Member States: Synthesis report for the EEPO, Luxembourg: Publications Office of the European Union, 2015
[171] Special Eurobarometer 471: European Area of Skills and Qualifications, p. 6

skills intelligence, but the role and scale of activity by guidance services must be made more visible and understood.

Moreover, the relevance of skills intelligence for guiding career choices may be inhibited, if the information regarding the jobs available is not at a local level or if it fails to present reasonable mobility pathways to individuals. Also, while skills intelligence holds the potential to support career decisions, it only does so if its quality is assured (reliability, up-to-dateness, appropriate geographic scale) and if it is accessible by a diverse set of users (including low-skilled), who must, in turn, have an adequate set of skills to reflect upon the information provided[172] or must be supported with relevant advice services.

EU practices that link skills intelligence and career guidance with notable success tend to put an emphasis on multi channelled delivery and a holistic approach to career development (Box 5)

Box 5. Linking LMSI with career guidance[173]

The use of multichannel approaches is the most frequent way to guarantee access to quality services by a diversity of users. Particularly important are the combinations of distance services integrated with appropriate professional career services. The **Danish eGuidance** service offers to both youth and adults, via its "Education Guide" web-portal, a wealth of information on education and training opportunities, jobs and professions, labour market conditions and statistics and study programmes taught in English. The same service provides a variety of guidance activities via a combination of channels, which include online chat, telephone, webinars, email services and social media interaction. Each service is used carefully according to the profile and needs of clients, supported by professional counsellors with targeted ICT training.

2.4.2. Skills needs at sectoral level

There is a substantial body of evidence of skills gaps at sectoral level. Additional qualitative and more sector-specific insights can be gained from exploring national data sources. Attström et al. (2014) use national data to identify occupations with evidence of recruitment difficulties.[174] The top five bottlenecks in the EU (at the ISCO 2-digit level) are reported for metal, machinery and related trades workers; science and engineering professionals; ICT professionals; health professionals; and building and related trades workers. Out of these, some tend to require a university degree and hence several years of training. This is the case notably for science, engineering, ICT and health professionals. Some others require at most an upper secondary degree and could be learned in a relatively short time span, including through non-formal training programs. Many of these bottlenecks are persistent and can be considered as structural, as they have existed for a number of years. Especially those requiring high skills levels and offering attractive wages and other working conditions should be considered as

[172] Cedefop, 2016, LMI in Lifelong Guidance, forthcoming
[173] Cedefop,2016, ibid
[174] Attström K. et al., Mapping and analysing bottleneck vacancies on the EU labour markets, Overview Report, European Commission, 2014

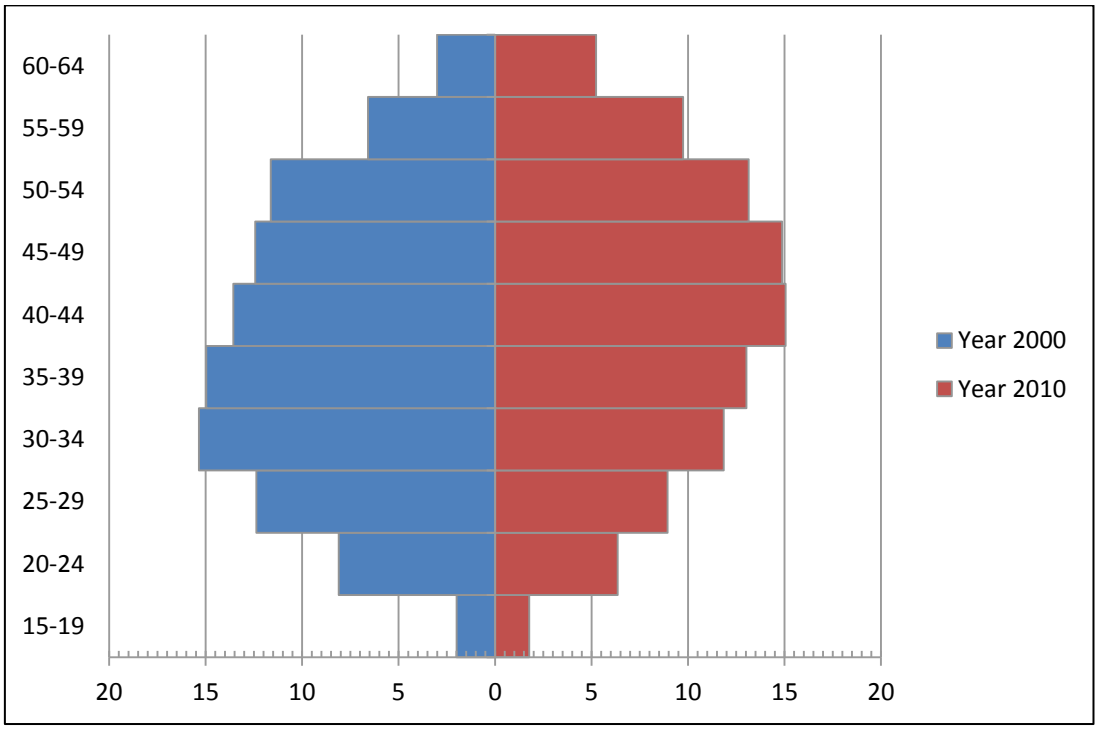
reflecting genuine skills shortages, where there are not enough graduates. However, bottleneck vacancies may also be related to inefficient job matching, inadequate recruitment strategies, insufficient involvement of employers with education systems, a reluctance to provide training on-the-job, the growing need for soft skills besides technical skills, and unattractive working conditions, including wages – especially in case of bottleneck vacancies with low skills requirements. **The information on skills needs in some key sectors below is intended as further evidence to serve as rationale for the new proposed EU initiative for a "Blueprint for Sectoral Cooperation on Skills".**

Transport sector

The Commission's Joint Research Centre made a forward looking study on "Future Employment in Transport Sector"[175] looking at, among others, potential skills mismatches in the sector. Accordingly, demand is found to grow at different rates among both occupational groups and skill levels within the sector by 2020. Mobile and technical staff together with high and medium skilled individuals are expected to be demanded more than administrative and low skilled staff. In some cases this could result in skill mismatches for specific occupation and skill combinations in certain market segments with specialised job content that requires long education and training. Given also the aging profile of the workforce in the sector (Figure 20), the main challenge would be to reskill the incumbent workforce with a specialisation so that they can perform demanded tasks.

Figure 20: The ageing workforce in transport: distribution by age as a percentage of total transport workers (years 2000 and 2010)

[175] Christidis P. E. et al., Future employment in transport – analysis of labour demand and supply, JRC Technical Reports, Joint Research Centre, Institute for Prospective Technological Studies,,2014.



Source: EU Commission JRC calculations based on LFS data.

Construction sector

The European construction sector generates about 9 % of the EU's GDP and provides 18 million direct jobs. Construction is also a very heterogeneous industry, accounting for approximately 3 million businesses in the EU-28, of which 95% are small enterprises that provide local employment.

The sector has been hit particularly strongly by the financial and economic crisis in 2008. As a consequence, the construction activities fell sharply and more than 2.5 million jobs were lost between 2008-2013[176]. Moreover, while GDP has returned to positive growth, the construction index lags behind. The increase in construction employment in the coming years will partly reflect the substantial contraction in the period before 2013. Over 6 million job openings are anticipated during the period 2013-2025, primarily through a need to replace employees leaving the sector due to retirement or for other reasons, rather than the creation of new jobs[177]. For example, in Germany it is projected that 30% of the construction workforce will retire of over the next decade[178].

[176] European Construction Industry Federation, Construction Activity in Europe, Statistical Report, 2015
[177] European Commission, Analytical Highlight, Focus On Construction, EU Skills Panarama 2014, 2014
[178] See http://ec.europa.eu/growth/sectors/construction/observatory/index_en.htm

The construction sector is a labour-intensive sector; it needs a continuous supply of a skilled workforce, which has to show its adaptability in addressing challenges of the coming years. The shortage of skilled labour can, among others, be explained by the growing need for skills corresponding to specific qualifications, which education and training (as well as the employment market) have difficulty in satisfying. The European Commission encourages specifically the construction sector to take part in the European Alliance for Apprenticeships, to offer more and better apprenticeships and thus to address the skills shortages.[179]

In terms of environmental impact and pressure on natural resources, the built environment is responsible for around 40% of total energy use, 36% of global greenhouse gas emissions, 30% of raw materials use and 30% of solid waste generation[180]. Construction is therefore an enabling sector for a low carbon and resource-efficient transition and can be a leading sector in "green" jobs creation.

The transition to a resource-efficient and low-carbon economy will also bring important structural changes in the sector, which will have to adapt and anticipate the needs for skills and competences in these areas. This is especially the case regarding the preparation of the labour force for the construction of 'near zero energy buildings', whether this concerns new or renovated buildings. Analysis undertaken as part of the BUILD UP Skills European initiative, focusing on craftspeople and on-site workers, suggests that "by 2020 more than 3 million workers in Europe will require training on energy efficiency or renewable energy sources"[181].

The deployment of enabling technologies and the use of flexible work-organisation practices will also require changes in skills and qualifications in construction. For example the introduction of Building Information Modelling (BIM) into the construction value chain will require a significant evolution of skills from architects through to the final customers and users of the construction works. This will be even more important when EU public procurement rules requiring electronic communication and recommending the usage of BIM for public calls for tender will enter into force by 2018. The construction sector is today one of the least digitalised sectors and reserves much potential for improving its productivity.

Tourism sector

Tourism employed just over 12 million persons in Europe in 2014182 (around 9% of the total employment in the EU non-financial business economy). The sector provides employment both to the highly qualified, as well as to low-skilled workers. It offers job opportunities to both workers who enter the job market for the first time and to people re-entering the job market. It is the largest employer of migrant workers, part-time workers, as well as female workers[183], and young people[184].

[179] See http://ec.europa.eu/growth/sectors/construction/apprenticeships/index_en.htm
[180] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on Resource efficiency opportunities in the building sector, Communication COM(2014)445
[181] See http://www.buildupskills.eu
[182] EUROSTAT: http://europa.eu/rapid/press-release_STAT-15-6315_en.htm
[183] More than 58% of those employed in the sector are women.
[184] More than 13% of those employed in the sector are aged 15 to 24.

High-quality client service, provided by adequately skilled staff, is the key precondition for surviving and growing in an increasingly fierce competition against new emerging destinations in non-EU countries. Yet, the tourism industry struggles to find and retain skilled employees[185]. The sector does not attract graduates due to negative perception of the job quality, seasonality and limited career prospects. In addition, SMEs in the tourism sector make relatively less use of formal learning, due to a lack of financial resources, lack of time, limited human resources. This is particularly the case for micro enterprises, e.g. small family businesses, which represent up to 90% of tourism economic operators. Given a small workforce, the owner/manager and every member of its personnel are expected to possess or develop a wide range of skills.

While there are skills gaps for the traditional core skills (foreign languages, interpersonal skills, communication, multicultural knowledge), new skills are needed for newly developed areas of occupation (e.g. destination management, sustainable tourism, cultural tourism, adventure tourism, accessible tourism, green tourism) and tourism professionals are expected to deliver innovative and customised services for a wider range of target groups, including seniors or travellers with special needs[185].

Moreover, rapid digitalisation in the tourism sector requires new, specific knowledge not only from employees, but also from tourism entrepreneurs. SMEs often lack the necessary e-management skills that would enable them to keep up with the developments of online market places and distribution channels, new forms of marketing and communication with customers.

Finally, education providers have a limited understanding of the requirements of employers and expectations of travellers in terms of the service provided. There is, therefore, a need to pursue new and innovative ways to provide VET, including new forms of apprenticeship, business simulation and training for seasonal workers. This will help create pathways into and within tourism occupations.

Textile, Clothing, Leather and Footwear sector

The Textile, Clothing, Leather and Footwear (TCLF) sector also provides evidence of some specific bottlenecks. The sector is composed of 260,000 enterprises, has a turnover of EUR 240 billion and employs more than 2 million persons in Europe, of which 51% in the clothing industry, 31% in textiles, 13% in the footwear industry and 5% in the leather industry. The TCLF is an SMEs driven sector. The size of the companies is relatively small: an average number of employees per company presents as follows: 10 in textiles: 8 in clothing, 9 in leather and 14 in footwear. Traditionally, TCLF industries employ a high proportion of women, not only in services and administration but also in production activities.

There are significant productivity differentials between the subsectors within the TCLF: textile is more capital intensive and relatively higher added value production, whilst clothing and leather create relative more jobs. European producers are world leaders in markets for

[185] Centre for Strategy and Evaluation Services, Mapping and performance check of the supply side of tourism education and training, Publications Office of the European Union,,2016

technical/industrial textiles and non-wovens, such as industrial filters, hygiene products, products for the automotive and medical sectors.

The TCFL sector is part of complex and interlinked value chains of fashion and high-end industries. These industries are one of the most promising and creative sectors in Europe. They provide an important contribution to the EU economy with a total 5 million people employed in the fashion value chain[186] and over 1 million people employed in high-end industries[187].

Despite the economic crisis, many European companies in the sector have managed to develop in global markets, taking advantage of European high quality, knowledge and craftsmanship's worldwide reputation.

However, in spite of innovation and creativity, the TCLF industry faces increasing skill gaps and shortages, mostly due to ageing of workforce, mismatch between education and industry's needs, technological transformations, as well as because of low mobility of workers.

The sector also suffers from an image problem within broad public perceptions which causes difficulties in attracting new recruits, especially younger workers and within the production chain. However, the sector has evolved with many interesting opportunities, also available alongside traditional artisan and craft occupations. The TCLF sector requires a wide spectrum of skills and qualifications, from engineering technologists and digital experts to experts with specific craftsmanship and knowledge of traditional skills.

Automotive sector

The automotive industry accounts for almost 7% of the EU's GDP and provides employment to 12 million workers (5.6% of total EU employment). Direct jobs in automotive manufacturing amount to 2.3 million people. The vast majority of persons employed in the manufacture of motor vehicles (over 80%) and in the rubber and tyre industry (over 60%) work in large-sized enterprises (250+), followed by medium-sized enterprises (50-249).The European automotive sector also is world leader in terms of product innovation: by accounting for 20% of all industrial research funding in Europe, it constantly develops and furthers flexible and modular production systems, high-quality (premium) design, alternative powertrain technologies and the management of complex value chains.

The automotive industry experiences increasing qualitative and quantitative shortage in suitable workers. This is due mainly to the ageing workforce (23% are approaching or starting to approach retirement age), the poor image of the manufacturing sector in the eyes of young talented people, the wide diversity of national education systems and cultures and the ever

[186] European Commission, Policy Options for the Competitiveness of the European Fashion Industries-Where manufacturing meets creativity, Commission Staff Working Document, 2012

[187] European Commission, Competitiveness of the European High-End Industries, Commission Staff Working Document, 2012

accelerating pace of technological change. Taking account of a substantial need to replace employees leaving the sector due to retirement or for other reasons, an estimated 888,000 automotive jobs will need to be filled from 2013 to 2025[188].

The automotive industry is particularly lacking STEM (Science, Technology, Engineering and Mathematics) profiles and engineering jobs and it is facing stiff competition from other sectors in the search for those highly skilled employees.

Indeed, the sector is facing many structural changes, including ever stricter emission standards and decarbonisation as part of new mobility concepts, connectivity and an ever growing share of digital technologies in the added value of cars, changes in consumer preferences, relocation to low-cost countries and development of global manufacturing systems. All these new technologies and the growing automation of manufacturing processes require automotive industry workers to acquire more advanced technical skills. Automotive employers therefore depend not only on sufficient supply of STEM graduates but also they need to recruit and develop staff that are both technical specialists and have the problem-solving and team-working skills necessary to adapt to rapid technological change.

For instance, the continued development of cleaner vehicles is projected to impact considerably on the occupational and skills profile of the sector. Over half of the total job openings to 2025 are forecast to require high-level qualifications and a declining number of jobs will require low- and medium-level qualifications in the sector. The push for clean vehicles will lead to further jobs in R&D, design and senior roles in the manufacturing process.

Similarly, the need to have connected vehicles with advanced electronic information and entertainment features will require new skills and novel technologies in the near future. New areas of expertise, including those which result from the ongoing shift to a highly sophisticated, digital manufacturing (Industry 4.0), will therefore need to be added in order to bridge the existing knowledge gap between the automotive and the ICT sector.

Defence sector

With a turnover of €97.3 billion in 2014, the European defence industry brings a major contribution to the wider economy. It directly employs more than 500,000 people and has a high percentage – over 50% – of highly skilled and specialised employees.[189] Driven by a multiplier effect of between 2.2 and 2.4,[190] it generates up to another 1,200,000 indirect jobs.

The defence industry generates significant innovation, is centred on high-end engineering and technologies and its cutting-edge research has created important knock-on effects in other sectors, such as electronics, space and civil aviation. However, companies are experiencing skill shortages. This trend is expected to increase in the future due to the high number of

[188] European Commission, Analytical Highlight, Focus On Automotive sector and clean vehicles, EU Skills Panarama 2014, 2014
[189] Aerospace and Defence Industries Association of Europe (ASD) data
[190] Duran J., Isusi I., Corral A., Study on the Perspectives of the European Land Armament sector, IndustriAll, 2012

employees approaching retirement age and relatively low attractiveness of the industry for young professionals.[191]

The European defence industry has to retain key skills and acquire new ones to remain in a position to deliver high-tech solutions in a global setting. Due to the high tech level of defence products the loss of skills would require a generation to bring the know-how back to the same level and consequently this would severely affect Europe's strategic autonomy.

Innovation for defence is increasingly coming from the civil sector. Defence industry, will very likely also be affected by the Industry 4.0 evolutions. Although it is not clear what the defence industry of the future will look like, it is clear that it is likely to be different to what we have today and we need to start preparing for this now.

Naturally, the skills required in defence are not necessarily industry specific, as most of them are and will be similar to skills required in other industrial sectors. Most of the defence-related companies are also involved in civilian activities, and this will increase further in the foreseeable future. This means that the majority of company staff will work on civil and defence technologies and products during their career.

The European defence sector consists of a small number of large companies and more than 1,350 SMEs. Whereas large companies tend to have their own skills strategies to deal with the challenges, it is mostly the SMEs (often specialised in cutting-edge technologies) that are struggling to attract, create and maintain high-end skills and preserve their comparative advantage. Often SMEs lose employees that have acquired specific skills to large companies that can offer them greater career opportunities.

According to a recent study the sector is facing uncertainty due to limited communication in relation to governments' equipment requirements, which hampers industry's ability to manage skills through recruitment and retention. In addition, it is lacking a strategic approach to the management of skills across government, industry and the education sector. The study produced the sector's skills taxonomy, overviews of the supply and the demand side, and showcased best practices.[192]

More work needs to be done however on mapping present and future skills' shortages and bottlenecks to ensure a clear understanding of the capabilities and technologies critical to the industry and prepare for the future.

Maritime technology sector

Seas and oceans are drivers for the European economy and have great potential for innovation and growth. The European maritime technology industry is a forerunner and world leader in terms of innovation and key enabler, providing the more advanced technologies and structures

[191] Bergstrom et al., Anticipating Restructuring in the European Defence industry, BIPE,,2008
[192] Retter L., Taggart L., Freeman J., Study on Key Skills and Competences for Defence, RAND Europe,, 2015, commissioned by EDA.

needed to ensure the development of all other maritime activities, such as offshore renewable energies or aquaculture. This is vital to secure Europe's needs in terms of transport, defense, energy and food supply.

The maritime technology sector has a turnover of €91 billion and directly employs more than 500,000 people of which a high percentage are high skilled. It generates at least as many additional jobs and contributes significantly to regional development (200 regions in 18 countries).[193]

The economic and financial crisis that started in 2008 dramatically hit the maritime technology sector. The industry went through painful restructuring and widespread job losses. In order to maintain its leading position, European companies abandoned mass markets in favour of complex, high-tech products and services based on knowledge, innovation and technology. It has become an innovation-driven, technologically advanced industry requiring more and more highly skilled technical people. Today it is estimated that 50% of the employees have a technical university degree and additional 30% are highly skilled workers.

Existing skills gaps in the marine and maritime industry have been identified in several policy documents in recent years, such as LeaderSHIP 2020[194]. The 2014 Communication "Innovation in the Blue Economy: realising the potential of our seas and oceans for jobs and growth"[195] highlighted that the scarcity of a skilled workforce, able to apply the latest technologies, represents one of the main obstacles to the further development of the blue economy. In fact, the demand for skills is changing, due to highly specific niches in which lies its future competitiveness and to the fact that in the growing markets there are more and more competing actors and technologies. A number of changes are already anticipated in the sector and relate to the technological, infrastructural and business-related advancements.

Closely linked to the availability of new skills is the need for dedicated research & development programmes, able to deliver innovative technologies and services. For example, the maritime transport sector has been working in the last years on the designing and production of environmentally friendly and energy-efficient ships, with the overarching objective of supporting a stable perspective for continuous investment in "greening" the sector. As well as this, the offshore wind energy sector is growing fast, creating both jobs and revenue. Ocean energy could follow a similar path in the coming years, bringing to the creation of more business and jobs for companies that could use their existing knowledge in naval construction, offshore oils & gas or offshore wind to move into ocean energy. The EU has a global lead in this sector: 45% of wave energy companies and 50% of tidal energy companies are based in Europe.

Education and training as well as research and innovation are therefore key to ensure sustainable growth of the marine and maritime sectors. Only by anticipating employment and

[193] SEA Europe, IndustriAll, Joint Position on LeaderSHIP 2015/2020 Review, 2016
[194] European Commission, LeaderSHIP 2020, The Sea, New opportunities for the Future, 2013
[195] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Innovation in the Blue Economy: realising the potential of our seas and oceans for jobs and growth, COM(2014) 254/2

skills needs, will it be possible to address the emerging and future skills gaps and shortages. In this respect, a European Skills Council for the Maritime Technology Sector was established in 2014 to identify skills gaps and create regional and inter-sectoral synergies through social dialogue. It carried out a survey that demonstrated a lack of qualified and available staff on the job market and an expected increase in employment in the next 2-5 years. It delivered a list of the most demanded skills and occupations and showcased best practices. The work needs to continue now to facilitate planning and coordination of activities at European, national and regional level in order to ensure that the educational providers provide the current workforce and future students with the necessary skills and training to meet evolving industry needs and, thus to support the maritime technology sector to stay competitive worldwide.

Space market sector196

The global space sector is a high-technology niche with a complex ecosystem, which employed at least 900 000 persons around the world in 2013, including public administrations (space agencies, space departments in civil and defence-related organisations), the space manufacturing industry (building rockets, satellites, ground systems); direct suppliers to this industry (components), and the wider space services sector (mainly commercial satellite telecommunications and geospatial information providers). But these estimates do not take into account universities and research institutions, which also play a key role in R&D, as receivers of public funding and initiators of much of the space sector's innovation. To give orders of magnitude, around 350 000 full-time employees are active in the United States, 200 000 in the Russian Federation, around 60 000 in Europe.

The space sector needs complementary policies, such as those that boost education and skills, as well as ensuring long-term investments in research and development capabilities, leading to future innovation. When examining human capital, it is important to consider the next generation of employees, who may get involved in space programmes. The majority of jobs available in the space sector can be found in the scientific and engineering fields. At the same time, interdisciplinary and cross-sectors skills focus is a key trend of the EU space data uptake strategy with the aim of answering the needs of different downstream value chains and of devising mechanisms for transferring know-how and experience to practitioners worldwide.

The uptake of the space data delivered by the EU programmes (Copernicus and Galileo) needs to be sustained through appropriate policies and programmes. The already operational Copernicus programme for Earth Observation is targeting achieving training and networking initiatives allowing the matching of university curricula and industry professional profiles, vocational and cross sectorial training and research, networks empowerments, etc.

Recent EU projects have identified for the European geo spatial sector skills, a clear teaching gap with regard to "mobile" competences and a possible teaching gap with regard to "programming" competences and also in the knowledge areas of organisational and institutional aspects, design aspects, analysis methods and data manipulation.

[196] OECD, The Space Economy at a Glance, OECD Publishing, 2014

Finally the recent study "Space market uptake in Europe" (Dec 2015), presented on 28/01/2016 at the ITRE Committee of the Parliament, highlighted that the lack of specialised technical and scientific skills could prevent also private enterprises from exploiting the opportunities offered by the space data and this is a key barrier for the space data market development.

Health Care Sector

With more than 17 million health and social care workers, including more than 13 million women, the health and care sector accounts for an estimated 10% of all jobs in the EU. Health workers are involved in a wide range of essential activities to promote healthy life-styles, to prevent, diagnose and treat ill-health, helping to reinforce the employability of Europe's population and contributing to economic growth[197].

Europe's ageing population is a key driver for employment in the health and social care sector.[198] About 1.8 million new jobs are anticipated in health and social work between 2015 and 2025 y (+7.8%) [199] A cluster of countries are forecast to experience employment growth at more than double the EU-28 average for the health and social work sector, including, Hungary, Cyprus, Croatia and Belgium. New complex care needs, the expansion of e-health information technology and telemedicine will impact on the nature of skills demand in the sector: growing requirement of technical knowledge and e-skills in addition to clinical knowledge and the creation of new roles for medium and lower qualified professionals, for example in geriatric/dementia care and specialised IT/e-health workers in clinical, social care, informatics and administration. Moreover, health professionals increasingly need a broader "soft" skills set (communication, team building) to work multidisciplinary teams. Better use of skills is urgently necessary to meet health threats with serious macro-economic implications such as antimicrobial resistance (AMR).

Yet these significant job creation opportunities in the healthcare sector are hampered by growing shortages, estimated at one million by 2020, due to retirement of the ageing workforce, shortages of specialist skills and inadequate health workforce distribution in many EU countries and regions[200]. Health professionals are already among the top five bottleneck professions in the EU[201] and, according to recent OECD evidence, there is greater level of skills mismatch among health professionals compared to other technical and professional occupations[202].

In addition, demands for long-term and formal care will also increase with an expected reduction in the availability of informal carers with changing family structures.

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[197] European Commission, Investing in Health, Commission Staff Working Document, Social Investment Package, 2013

[198] EU Employment and Social Situation, Health and Social Services, Quarterly Review 2014, http://ec.europa.eu/social/main.jsp?catId=792&langId=en

[199] Cedefop Forecast 2016

[200] European Commission, Action Plan for the EU Health Workforce, Commission Staff Working Document, Towards a job-rich recovery, 2012

[201] Attström K. et al., Mapping and analysing bottleneck vacancies on the EU labour markets, Overview Report, European Commission, 2014

[202] OECD, Health Workforce Policies in OECD countries, Right Jobs, Right Skills, Right Places, OECD Health Policy Studies, OECD Publishing, 2016

This underscores the importance of developing an adequate human resource governance system, better skills anticipation and the rapid adjustment of education and training curricula to ensure a sufficient and skilled healthcare workforce capable of meeting new healthcare demands in Europe.

Cross-sectoral skills shortages

Focus on ICT professionals

Bottlenecks are particularly large for ICT professionals. Rapid uptake of new digital technologies, driven by developments in such areas as big data, Internet of Things, cloud computing, robotics and mobile and wearable technologies, has led to rapidly rising demand for ICT professionals in all sectors of the economy. Employment of ICT professionals has grown by 2 million over the last decade, with more than half of the new jobs being created in the last three years[203]. A significant amount of the demand remains unfilled and it is forecast that the demand-supply gap will nearly double from 365 000 in 2015 to almost 800 000 by 2020.[204] The largest gaps are expected for the UK, Germany, Italy, France, the Netherlands and Sweden. However, gaps will also emerge in many other countries.

A major impediment to filling these new jobs is the lack of new computing graduates. Despite strong demand and above average wages, not enough young people, particularly women, are choosing to study and ultimately graduate in ICT; with graduate numbers even having fallen substantially compared to a decade ago.

The demand for ICT professionals is outstripping supply. The shortage (calculated as the number of open posts) is estimated to reach 756,000 in 2020. This figure can be described as 'demand potential' for ICT jobs. Of these 756,000 there are 530,000 potential additional jobs in ICT practitioner occupations and around 226,000 at ICT management level (see Figure 21).

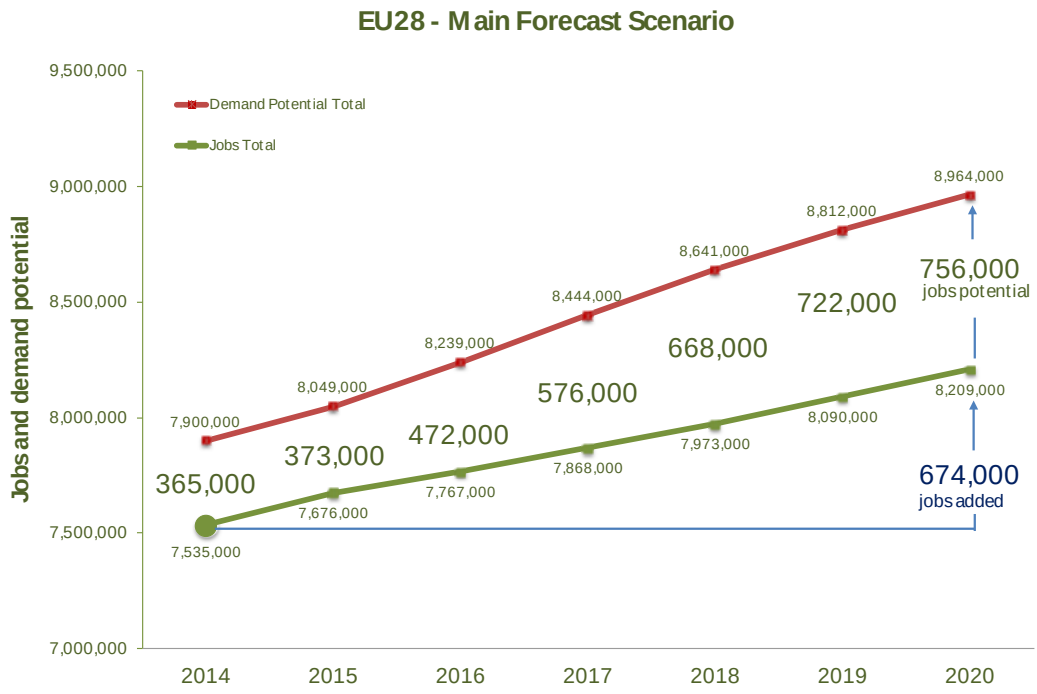
Figure 21: e-Skills Vacancies Estimate- 'Main forecast scenario': Summing-up of National ICT Professional Excess Demand in Europe 2014 – 2020

[203] Eurostat, Employment Statistics, 2015
[204] Hüsing T., Korte W. B., Dashja E., E-skills in Europe, Trends and Forecasts for the European ICT Professional and Digital Leadership Labour Market (2015-2020), Empirica, 2015

EU27	2014	2015	2016	2017	2018	2019	2020
ICT Management	57,000	58,000	143,000	180,000	203,000	218,000	226,000
ICT Practitioners	307,000	315,000	329,000	396,000	465,000	504,000	530,000
Total	365,000	373,000	472,000	576,000	668,000	722,000	756,000
% Growth	+35.2%*	+2.2%	+26.5%	+22.0%	+16.0%	+8.1%	+4.7%

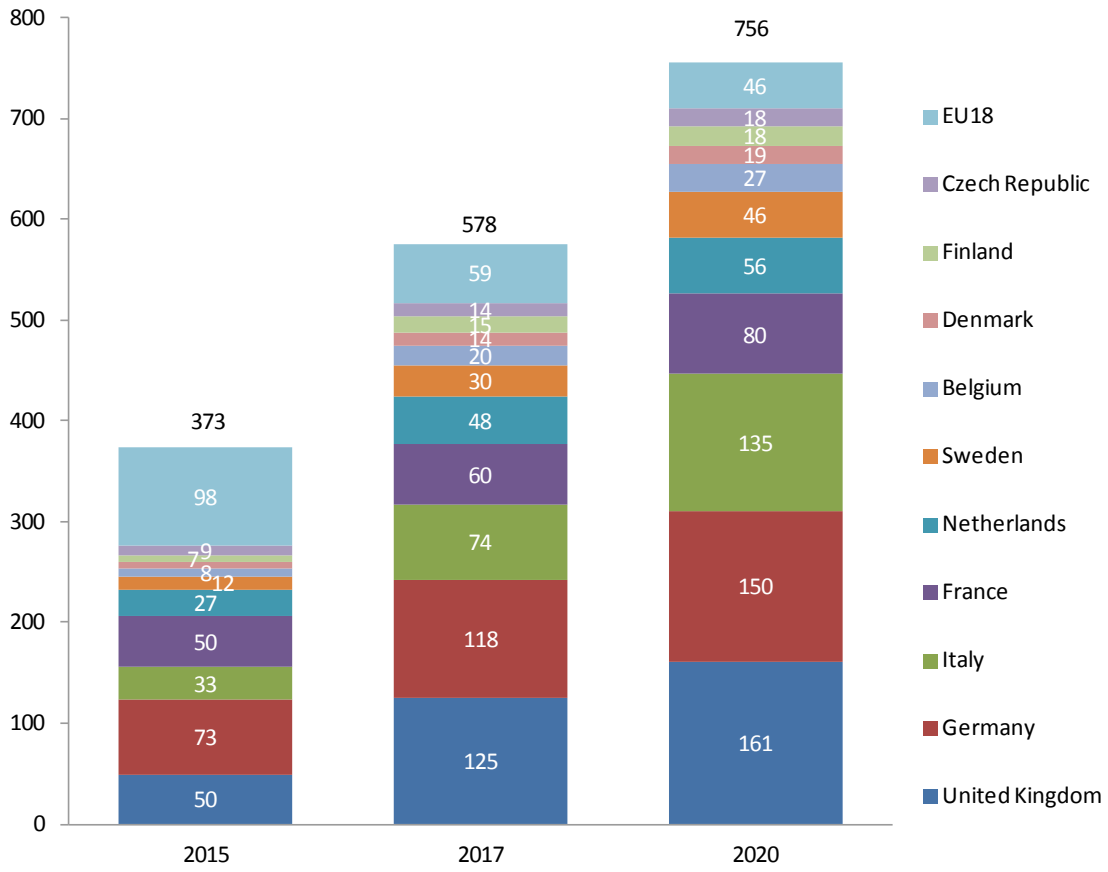
Source: empirica 2015

Figure 21a: Main Forecast Scenario: ICT Professional Jobs and Demand in Europe (EU-27) 2014 – 2020



Source: empirica 2015

Figure 21b: e-Skills Vacancies Estimate- 'Main forecast scenario': Distribution of vacancies per country ('000s)



Source: empirica 2015

Outlook for ICT professionals

Demand for ICT skills keeps growing at a tremendous pace. The trend in core IT jobs has been up to 4% growth p.a., the growth in management jobs up to 8% growth p.a. However, demand for medium level skilled associate and technician jobs is declining. In total, despite the crisis, we have seen new jobs being created in Europe continuously. There is thus a need to continuously increase the quality and the relevance of e-skills. At the same time, although graduate figures seem to stabilise, supply from universities does not seem to keep pace.

Job growth is largest in highly skilled jobs such as management, architecture and analytics positions, and this reinforces the need for more and better e-Leadership skills. The fact that these positions are usually recruited from the pool of seasoned practitioners and other (non-ICT) managers, together with a presumed lack of entry level jobs at medium level skills may evolve into recruitment bottlenecks in the longer term. However, at the same time the pace of change seems to be still increasing in ICT jobs, and new job profiles pop up which naturally cannot yet be fully covered in statistical classification, such as Big Data and Cloud computing specialists. Many of these jobs are not genuinely ICT jobs but will be at a professional level,

for instance in finance, marketing, or consulting – helping new business processes be defined and implemented.

This is a huge opportunity for creation of new jobs generated in all industry sectors, beyond the traditional pathway of ICT studies, but with a strong imperative for ICT to permeate other and new educational trajectories. ICT has traditionally been a field in which outsiders – in terms of formal education or career trajectory – play a crucial role. However, recently increased endeavours are made to reach a higher level of professionalisation of the profession, which increasingly includes formal education requirements. These are not necessarily to be sought in a traditional university or vocational education, but may still be acquired later in the career, a workaround that the ICT profession has maintained like perhaps no other profession for decades. Nevertheless, increasing requirements of formal education make continuous professional education, lifelong learning and executive education even more important. There is an immense opportunity today for new education and research approaches, new modes of delivery, better curricula and learning outcomes, overcoming the current mismatches and contributing to a sustainable market economy.

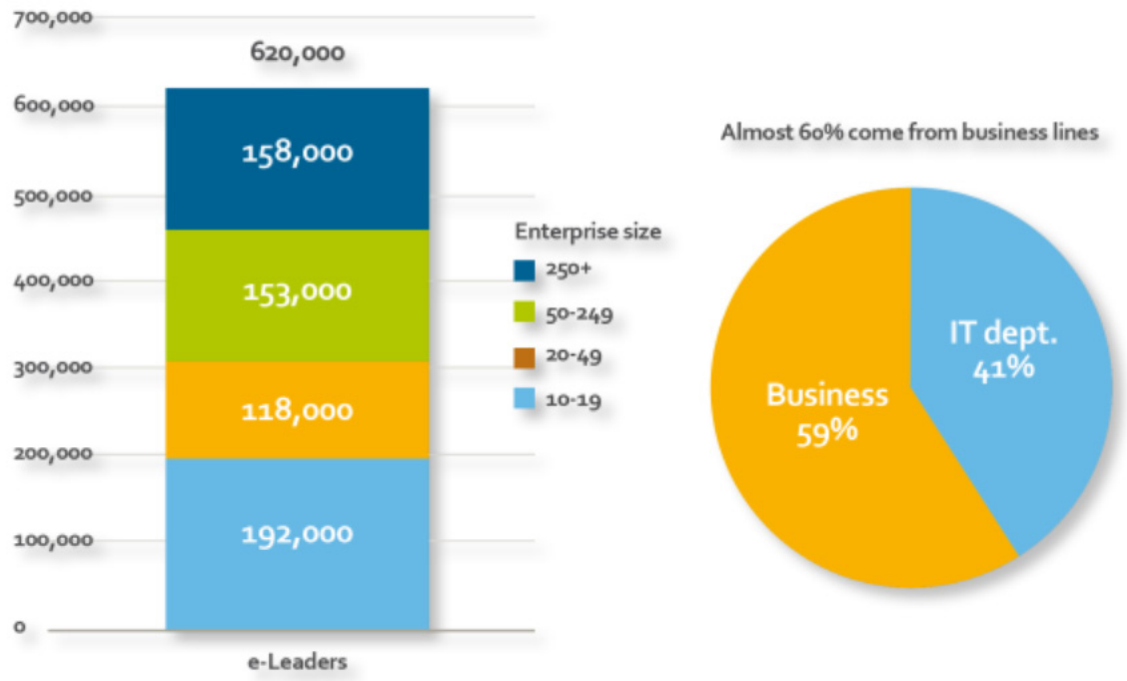
e-Leadership skills shortages

Ensuring ICT-based innovation opportunities are identified, grasped and guided to fruition requires e-leadership at the different stages in the innovation life cycle. It is seen as particularly critical not only to be able to envision an innovation, and to assess its likely success in the organisation, but also to communicate this vision to executive colleagues controlling the resources impacted by the proposed organisational change. This was operationalised as the performance of two key component e-leadership roles.

The first is the role of proposing an innovation project. The success of a proposal was conceptualised as an innovation project resulting from the proposal. Making proposals not leading to a project can be taken as an indicator of failure in e-leadership, having arisen either from inability to assess business outcome appropriately or inability to persuade business colleagues of the probability and value of the business outcome. A second key component of an e-leadership role is seen as that of guiding an innovation project to success. This is not implementation of an IT solution, nor even managing its implementation, but acting as the client for the innovation project - assessing proposals, monitoring conformance to requirements, accepting results etc., including acting as client for delivery of solutions from outside organisations. Both these e-leadership component roles are required ensure that innovative IT applications and services are identified and successfully deployed to improve performance and competitiveness.

In 2015, it is estimated that there are over 620,000 innovation e-Leaders in Europe. A majority of almost 60% comes from the business units in companies and not from IT departments. 158,000 e-leaders are found in large enterprises (see Figure 22).

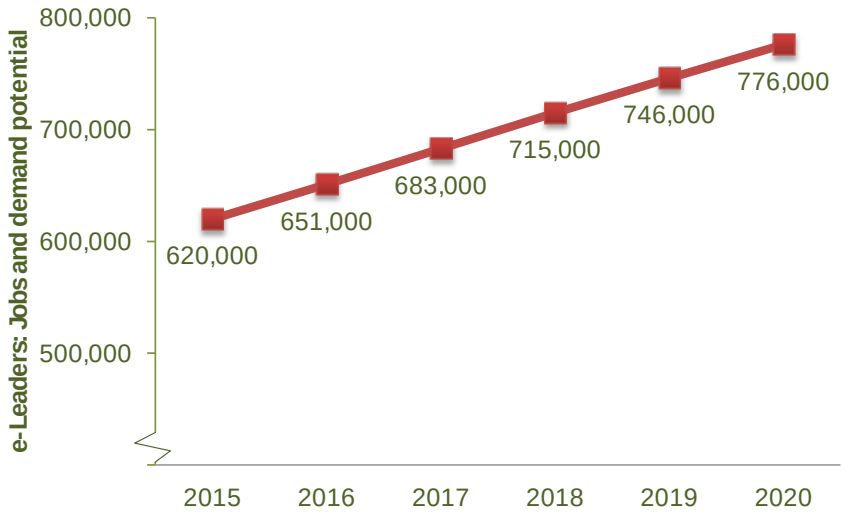
Figure 22: e-Leadership quantification 2015



IDC and empirica have forecast demand for highly skilled ICT occupations[205] to rise by on average 4.6% until 2020. This would result in a demand potential for 776,000 e-leaders in 2020.

Figure 23: e-Leadership forecast, lower bound and upper bound scenario

[205] ICT management, architecture and analysis skills. Demand for these jobs is forecast to rise from 1.94 million (2013) to 2.65 million (2020).



Europe will thus need increase the number of e-leaders by 156,000 until 2020. Taking account of expansion and replacement demand, Europe will so need 200,000 to 250,000 additional innovation e-leaders by 2020, or 40,000 to 50,000 per year.

Outlook for e-Leaders

Recent research demonstrates that there is a significant demand of e-leaders in Europe. First attempts to quantify the existing e-leadership workforce based on company's involvement in ICT based innovation activities result in some 620,000 e-leaders in European enterprises. Around 70% of e-leaders are found in SMEs and interestingly enough, we see 59% of e-leaders outside the IT department, coming from lines of business, and 41% being IT department inhabitants.

Closing this skills gap requires an ecosystem perspective, connecting the demand and supply side stakeholders of e-leadership skills. Responding to the inadequacies in the skills market flagged by stakeholders across the EU, the European Commission has launched the EU e-skills strategy and the "Grand Coalition for Digital Jobs". After responding to requirements for increased professionalism among ICT practitioners, and developing strategies and instruments to bridge the gap between e-skills demand and supply at that level, the new focus is on the skills gap in the e-leadership domain. The first pan-European initiative on e-leadership was launched in 2013 (www.eskills-guide.eu).

A key practical instrument in communicating skills requirements are the new e-leadership curriculum profiles, which specify core skills, learning outcomes, understanding and competences required by e-leaders today, whether they lead innovation teams bringing specialist understanding of topics such as enterprise architecture or take full responsibility for enterprise innovation at C level.

A key element of these curriculum profiles and the guidelines is the requirement for mapping existing programmes onto the skills and competences of the European e-Competence Framework (www.ecompetences.eu). The e-leadership curriculum profiles and guidelines use and applicability has been demonstrated by the universities and business schools directly participating in this initiative in several European countries. Response by the education community is picking up with already more than 20 universities and business schools having evaluated their programmes against the new e-leadership profiles. Further dissemination and substantial stakeholder engagement was achieved through 10 regional cluster events throughout Europe reaching out to more than 1200 stakeholders and experts. The initiative continues to be open to education institutions, industry and associations understanding e-leadership skill requirements in the workplace.

The European Commission launched the complementary e-Leadership Skills for Small and Medium sized Enterprises action in January 2014. This Commission initiative is complementary to the above one on 'New Curricula for e-Leadership' and focusing on entrepreneurs, managers and advanced ICT users in SMEs, start-ups and gazelles (www.eskills-lead.eu). This initiative has developed guidelines for designing e-leadership training and education for SMEs and start-up companies. It has shown the divers pathways to e-leadership for SMEs and demonstrated how five pioneering European universities and business schools have addressed the lack of appropriate e-leadership education through developing and teaching innovative short and longer-term e-leadership courses for this target group.

Focus on Key enabling technologies (KETs)

KETs are a group of six technologies: micro and nanoelectronics, nanotechnology, industrial biotechnology, advanced materials, photonics, and advanced manufacturing technologies. They have applications in multiple industries and help tackle societal challenges. Countries and regions that fully exploit KETs will be at the forefront of creating advanced and sustainable economies. The growth potential of KETs heavily relies on both the quality of skills possessed by the current and future employees, as well as the number of people qualified, available and willing to work in KETs. Therefore, skills imbalances in KETs are likely to significantly diminish KETs growth potential and employment effects. In its report of June 2011, the first HLG recommended that KETs skills should be promoted within the framework of the regional policy through the European Social Fund. In its status Implementation Report, the second HLG invited to put in place a European-wide education and training plan for KETs. The HLG also highlighted the need to ensure a pool of skilled multi-KETs technologists through the Future and Emerging Technologies Programme (FET). The HLG emphasised the need for the EC, Member States and regions to address the current KETs-related skills imbalances in a comprehensive and integrated manner across all technical levels in various KETs domains

To this end in January 2014, the Commission launched an initiative aiming to address the skill requirements for KETs. The report for the "Vision and Sectoral Pilot on Skills for Key

Enabling Technologies[206]" was prepared by Price Waterhouse Cooper (PwC). PwC analysis suggest that the key challenges leading to a mismatch in KETs skills in Europe include: (1) a need for a regular (re-)training of current employees; (2) educational programmes being not fully aligned with industry needs; (3) high replacement needs of employers, or needs to attract new people to replace the outgoing workforce, i.e. both retiring employees and people going to other sectors; (4) low awareness of KETs when students make critical choices; (5) relatively unattractive image of KETs as a field to work in; (6) limited opportunities to study KETs; and (7) 'brain drain' of highly qualified people to other countries.

Demand and supply analysis of KETs skills

Due to an absence of comprehensive and harmonised employment data for KETs, the calculations presented below should be considered as approximate estimates.

- Demand for KETs skills in 2013 equalled an estimated total of 2,234,000 technical KETs professionals and associates. Highly-skilled KETs employment accounts for 55% of total employment, 37% medium-skilled employment and 8% low-skilled employment.
- Between 2013 and 2025 an additional 953,000 KETs professionals and associates will be needed to satisfy demand. On average, between 2013 and 2025, there will be an additional demand of 79,000 KETs workers per year (between 2013 and 2025, an increase in demand for KETs skills of 43% is expected).
- A key share of the extra demand is made up by replacement demand (e.g. due to retirement or moving to other sectors) with a total of 772,000 KETs professionals and associates. Expansion demand (i.e. new jobs) is estimated to be a relatively small share of total additional demand for KETs skills till 2025, with a total of 181,000 KETs jobs.
- Most of jobs related to additional demand (62%) will require highly skilled people, though there is also a relatively strong increase in demand expected for medium skilled people in KETs (30% of additional demand).
- The data show potential for a skills gap, both for high and medium skills: a possible gap in the range of approximately 21,000 to 83,000 highly-skilled KETs employees per year and 10,000 to 44,000 medium-skilled KETs workers per year, depending on how the field develops. Trend analysis shows that medium-level KETs skills potentially face both an increase in demand and a decrease in the number of graduates, which could further aggravate the current situation. Companies facing difficulties in attracting medium-level KETs skills right now are likely to find it increasingly more difficult to attract qualified professionals with these skills in the future.

PwC estimations show that ample supply of STEM graduates is anticipated in the future to satisfy the demand for KETs skills. However, currently, most of these graduates do not flow

[206] KETs have been defined by the European Commission as knowledge intensive technologies associated with high R&D intensity, rapid innovation cycles, high capital expenditure and highly skilled employment. KETs enable process, goods and service innovation throughout the economy and are of systemic relevance. KETs currently include the following six areas of technology: micro-/nanoelectronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced manufacturing technologies.

to KETs, which can partially be explained by a relatively unattractive image of KETs as a field to work in.

In order to reduce the discrepancies between education and industry needs, a European project NanoEIS[207] ("Nanotechnology Education for Industry and Society") has produced model curricula for bachelor, master and doctoral studies that can be used to check contents of existing study offers and to help structure new ones. These model curricula combine the hard core subjects needed in this area with other skills that are in demand by industrial and non-industrial employers. With industry and students both arguing for a stronger consideration of more general topics like health, safety, regulation and environment, it is up to university teachers and administrators to adapt to the needs of industry.

Focus on the shift to a low-carbon economy

Developments in the fields of energy, transport, manufacturing, agriculture and also in land use are key for realising the move towards a sustainable and secure low-carbon economy - meeting the EU climate and energy targets for 2020 and 2030, and addressing the long-term vision towards reducing greenhouse gas emissions to 80-95% below 1990 levels by 2050[208]. With the international COP21 Paris Agreement governments agreed to limit global temperature rise to "well below 2°C" and make efforts to limit the rise to 1.5°C. These goals are ambitious and achieving them will require decarbonisation of the whole economy. To enable this economic transformation, the workforce across a wide range of sectors would need to adapt to new business models and methods and meet the demand for new green skills.

An innovation driven transition towards a low carbon economy offers opportunities for growth and jobs in Europe as new businesses and job profiles will emerge. In particular, growth sectors such as renewable energy or energy efficient products and services provide opportunities for European technological leadership. The EU has pledged to maintain the first mover advantage, notably in renewable energy and energy efficiency. Under the Energy Union strategy, the objective is to create an environment that allows investors and businesses to fully seize these new opportunities, and consequently be able to generate new jobs and growth. Implementing the EU policy objectives in this field is largely dependent on the development and advancement of efficient and cost-effective low carbon energy solutions, a key objective of the EU's Strategic Energy Technology (SET) Plan[209].

An analysis performed for the SET Plan Education and Training Roadmap[210] reveals that in 2012 the main low-carbon energy fields employed around 9 million people.[211] Considering the 2050 vision, the performed analysis shows a projected doubling of the workforce by 2030.

[207] http://cordis.europa.eu/result/rcn/181607_en.html
[208] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions, a Roadmap for moving to a competitive low carbon economy in 2050, COM(2011) 112 final; Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions, Energy Roadmap 2050, COM(2011) 885/2
[209] European Commission website, "Highlights", Research and Innovation
[210] https://setis.ec.europa.eu/setis-output/education-training-roadmap

This transformation also requires restructuring between sectors, with for instance expected negative impacts on traditional fossil fuel extraction industries. Systems of skills formation that foster labour mobility and transfer of existing skills to different sectors, locations and workplaces will facilitate any such transition. A large number of the current workforce in these and adjacent sectors should undergo re-training, making the challenge even more perceptible.

As evolving fields, energy, transport and manufacturing require continuous updating of the knowledge base. Many of the low carbon technology options are not yet mature. Hence, there is a need to systematically update research, education and training programmes at all levels with new research-based and industrial knowledge and to provide adequate interdisciplinary integration of knowledge from relevant fields. This should go in parallel with encouraging and supporting new knowledge creation and basic research developments in universities, including joining efforts along common objectives, as well as developing adequate professional training schemes to provide for shifts in the existing workforce.

Evidence from a number of countries shows that skill shortages have already developed in certain "green" sectors and occupations, which are not well served by traditional training institutions[212]. Such shortages affect, in particular, SMEs, which are often relatively unaware of the technological and operational adaptations required by the low-carbon development. In the manufacturing sector, the shift to greener technologies has generated a significant need for specific engineering skills (e.g. electric engineering of hybrid cars, manipulation of light materials, product design) or for specific occupations (e.g. energy auditors, photovoltaic installers, insulation workers, environmental engineers, sheet metal workers).[213]

The Circular Economy package adopted by the Commission in December 2015 will generate business opportunities and jobs. This applies both to new and expanding sectors, such as recycling and remanufacturing, as well as to innovative services such as product leasing. As an example, full implementation of current waste legislation, together with the proposed new targets, is estimated to lead to the creation of more than 500,000 new jobs in the EU.

2.4.3. Skills intelligence at European level: the Europass framework

Over the years the Commission has launched a range of tools and services on skills and qualifications to offer information and make skills more visible and comparable. These include, i.a.: the Europass framework, a set of documents including a CV, that allows provision of information on people's skills and qualifications in a clear and consistent way[214]; the Learning opportunity and Qualifications Portal (LOQ), which provides information on learning opportunities and qualifications systems; the EU Skills Panorama, which is a central

[211] Within this figure, around 1.2 million are directly engaged within the value chains of low carbon energy supply technologies (up to 2 million if we consider also the bioenergy agriculture and forestry supply chain); around EUR 6.2 million are engaged on the demand side, energy efficient buildings having the highest share; about 900 thousand are employed in the electricity and thermal networks value chains, including energy storage developments.
[212] Strietska-Ilina O. et al.,Skills for Green Jobs, A Global View, Synthesis Report based on 21 Country Studies, Cedefop, ILO, 2010
[213] European Commission, Employment and Social Developments in Europe 2015, Publications Office of the European Union, 2016

[214] In the case of Europass, around 65 million CVs have been created over a period of 10 years.

access point for information on skills and jobs intelligence across Europe. Support services at national level are also offered by networks such as the EQF National Coordination Points, the National Europass Centres and the Euroguidance Centres dealing with skills, qualifications and guidance issues. EURES is a network of employment services and a mechanism for an automated matching of people to jobs through the EURES common IT platform, the European Job Mobility.

These services are underpinned by ESCO, the Classification of European Skills, Competences, Qualifications and Occupations, which offers a common language to makes skills more transparent in the European labour market and the education and training sector.

Evaluations have highlighted limitations associated with these tools including the stand-alone nature of a number of these tools and the need to ensure the tools and developed in line with evolving needs. Implementation and development of the tools and services has suffered from a lack of co-ordination at both EU and national level - the existing tools and services have been developed on a case-by-case basis without formal coordination or communication between their respective governance structures at EU level. National centres have their remit limited to single issues such as the European dimension in guidance, the promotion of Europass documentation tools or the implementation of the EQF, and as such do not reflect the strong inter-dependence of the different tools in how they operate.

To respond to this issue efforts are required to both modernise and ensure the relevance of the available tools but also to ensure they are offered in a more comprehensive, streamlined way. One effect of this would be to offer tools and services for skills documentation (e.g. Europass) and skills needs anticipation (e.g. Skills Panorama) through a single tool. Connecting such instruments with information on cross-border qualification recognition practices, links between national qualifications with the European Qualifications Framework (EQF), learning and career opportunities (both at home and abroad) and current job vacancies (EURES) would provide a valuable integrated bundle of information services on skills and qualifications that citizens can access at any point when making career or employment decisions.

2.5. EU funding opportunities for skills

The most competitive economies invest a higher share of their GDP in education and register a higher propensity of employee training by the private sector[215]. The workforce that possesses the right skills and is able to acquire the necessary new ones quickly and easily is a strategically important asset of the EU. To this end, a number of funding resources have been set up at the EU level to help Member States and social and economic actors to invest in human capital development. These include (see Appendix 1 for more details):

- The European Structural and Investment Funds:
  - The European Social Fund (ESF)

[215] European Commission, Employment and Social Developments in Europe 2014, Publications Office of the European Union, 2015

    - The European Regional Development Fund (ERDF)
    - The Youth Employment Initiative (YEI)
    - The European Agricultural Fund for Rural Development
    - The European Maritime and Fisheries Fund (EMFF)
- Erasmus+
- Horizon2020
- The European Fund for Strategic Investment (EFSI)
- Other:
    - The EU Programme for Employment and Social innovation (EaSI)
    - The European Investment Bank's "Skills and Jobs' loan programme"
    - COSME – Europe's Programme for SMEs
    - The European Globalisation Fund (EGF)
    - The LIFE Programme

The ESF in particular remains the major EU fund supporting investment in skills, education, training and lifelong learning, by investing over EUR 27 billion in these areas during the 2014-20 programming period. In addition, over 34 billion of ESF 2014-20 support go towards promoting sustainable and quality employment and labour mobility, measures largely based on upskilling and the acquisition of qualifications.

Some of the above funds provide innovative ways to finance human capital development (e.g. financial engineering via the ESF or the EFSI), which may not be immediately taken up by the beneficiaries used to a more traditional "grant-type" financing.

In the light of the current economic situation, financial instruments are expected to play a stronger role in cohesion policy in the 2014-2020 programming period as a mechanism to deliver e.g. ESIF actions on the ground.

3. What is the view of stakeholders?

In December 2013, the Commission launched a public consultation on the possible launch and development of a European Area of Skills and Qualifications (EASQ) to collect the views of stakeholders on the problems faced by Europeans with regard to the transparency and recognition of their skills and qualifications when moving within and between EU Member States, on the adequacy of the related European policies and instruments and on the potential benefits of developing a "European area of skills and Qualifications. The consultation remained open until 15 April 2014. Overall, the consultation respondents confirmed that an EASQ should support mobility for both work and education, employability and quality education and modernisation of the education systems. More specifically, it was concluded that it should:

- Pursue coherence, simplification, ease of use, transparency and understanding of the current tools, including by ensuring that the same terminology is used. The relationship and synergies between the tools should be clear and where necessary the governance of the single tools should be reviewed, ensuring representation of all stakeholders.
- Focus on the individual and on the end-users of the tools (e.g. employers, teachers, assessors, practitioners, education providers, etc.). This means also effective communication, availability of information, guidance and training.
- Promote permeability within different sectors of education and training and forms of learning, while respecting sector specificities, thus support flexible learning pathways tailored on the individual.
- Support the development of relevant skills.
- Pursue full implementation of the learning outcomes approach across all tools and policies.
- Firmly anchor the EASQ within the Europe 2020 strategy, the European Semester and the Education and Training 2020 strategy.

As most of the results of this EASQ consultation are relevant to the skills agenda, we have taken them into account.

Subsequently, in late 2015 and early 2016, a series of in-depth stakeholder consultations were run on the overall EU Skills Agenda and concrete actions. The aim of these consultations was to hear the views of as many of the representative stakeholder groups as possible: Social partners[216], European civil society organisations[217], national Public Employment Services[218],

[216] ETUC, ETUCE, CESI, HOTREC, EFEE, CEEP, EUROCHAMBRES, UEAPME, BUSINESSEUROPE, EFIP, Uni Europa and ETNO.
[217] Lifelong Learning Platform, European Youth Forum, EPA, ESN, EFIL, ECSWE, EARLALL, EAEA, EADTU, SOLIDAR, WOSM, EucA, Telecentre Europe, Reading and Writing Foundation, European Schoolnet, SALTO T1C RC/JUGEND fur Europa.
[218] National Public Employment Services of AT, BE, BG, HR, CZ, DE, HU, IT, LV, NL, PL, PT, SI, SE.

European Social Fund Managing Authorities[219], policy networks (EQF, Europass, Euroguidance)[220], European cities[221], education and training providers[222], national education and training policy makers[223] voiced their views on the upcoming Skills Agenda. Welcoming the European Commission's initiative to take action to tackle low skills and the skills mismatch in Europe, they offered suggestions to ensure the most effective outcomes at local, national and European levels. Main results of the public consultation on the EU's modernisation agenda for higher education have fed into the Skills Agenda and are summarised in a separate document (cf. Annex II).

In addition, two policy debates were organised by the Dutch presidency in 2016, in the EYCS (Education, Youth, Culture and Sport) Council on 24 February and in the EPSCO (Employment, Social Policy, Health and Consumer Affairs) Council on 7 March. The Presidency's aim was to facilitate a debate as a basis for timely input by ministers to the Skills Agenda. Secondly, the aim was to raise awareness, too underline the urgency of the issues regarding skills and to encourage an exchange about national policy developments in the area.

Moreover, in their Resolution of 24 February 2016 on "promoting socio-economic development and inclusiveness in the EU through education: the contribution of education and training to the European Semester 2016", the Council and the Representatives of the Governments of the Member States, invited the Commission to present a proposal for a new skills agenda for Europe supporting Member States, which could consider, inter alia, ways of boosting skills development and knowledge acquisition in a lifelong learning perspective.

1. Increasing educational attainment levels, acknowledging that completing upper secondary level or equivalent tends to be considered as the minimum requirement for ensuring a successful transition from education to the labour market and for gaining access to further learning;
2. Improving the provision of key competences which are crucial for lifelong learning, employability and active participation in society and democratic life;
3. Enhancing Europe’s capacity to anticipate future skills requirements and tackling skills gaps as well as skills mismatches, underlining the shared responsibility of the worlds of education and work, and building on initiatives from both sectors;
4. Promoting better transparency and use of available skills and qualifications of mobile EU workers and learners;
5. Renewing the process of modernising higher education in Europe.

3.1 Views on the overall Skills Agenda

The scope of the Skills Agenda was very much discussed. Some stakeholders, such as national ministries and civil society, argue that the scope of the Skills Agenda should not be

[219] ESF managing authorities of CZ, DK, EE, EL, FI, IT, LV, MT, NL, SI, SE.
[220] Policy networks from CZ, EE, ES, FR, IT, LU, SE and EU level.
[221] Gent, Antwerp, Göteborg, Jonava, Pécs, Turku, Cork, Cádiz, Dubrovnik which attended a Territorial Impact Assessment Workshop in Brussels in March 2016 to collect their views on the urban and territorial dimension of the Skills Agenda. The workshop followed the ESPON TIA Quick Check tool to assess potential territorial impacts of the various proposals.
[222] EUproVET, ECVET, Association of VET providers, Neth-ER.
[223] EQF AGS (AT, BE (Wallonia-Brussels), IE, LU, NL, NO + ESU, ETF, EUA), BFUG

limited to fostering employability. In the light of the Paris Declaration of March 2015 promoting citizenship and the common values of freedom, tolerance and non-discrimination through education and of the ET2020 Strategy, some feel that education and training outputs for personal development and social inclusion should also be key messages of the upcoming Skills Agenda. Others, such as the employers, argue that given the recent economic crisis and today's and tomorrow's technological and economic trends and challenges, it is essential to tackle Europe's skills mismatch to foster employability and growth.

Stakeholders call for a focus on transversal and digital skills and for promoting 21st century learning methods. Stakeholders agree that in addition to ensuring a minimum level of literacy and numeracy for all, education and training curricula and providers should focus on developing 21st century sustainable skills, including transversal skills (entrepreneurship, social and civil responsibility, cultural awareness, critical thinking, creativity, etc.) and digital skills (ICT skills, media literacy, etc.). In this regard, civil society organisations insist on the relevance of the Key Competences Framework and that its revision should ensure its broader implementation and not undermine its purpose. Stakeholders also insist on the importance of innovative learning and assessment methods from early childhood education and care to adult education (team-work, learner-centred classrooms, etc.) and suggest fostering cooperation between formal and non-formal education and training providers. This plea goes hand in hand with a call for a learner-centred approach to education and training, including targeted outreach policies (including migrants and refugees), fostering learning communities, developing guidance services and supporting transitions to enable flexible learning pathways. Moreover, the European cities also consider it important to develop entrepreneurial skills from a very early age as well as effective communication with the companies. Overall, the Skills Agenda could provide a framework for better understanding of the skills required in the labour market and support the cooperation between the private sector and local policy makers.

Improving the image and ensuring the quality of VET and work-place learning is supported by all (cf. European Quality Charter for Internships and Apprenticeships of the European Youth Forum). There is more debate on the financing of VET. Trade unions, for example, are against any system of financing solely based on performance stating that it may foster inequality between schools and students. There is also a lack of consensus on this topic among VET providers themselves.

Opinions converge on the need to include a broad spectrum of stakeholders (social partners, NGOs, public employment services, education and training providers, private sector, etc.) in the elaboration of national Skills Strategies. Their long-standing experience and solid understanding of the issues at stake make them key players not only in designing, but also in implementing targeted education and training policies on the ground. Moreover building stakeholders' platforms at local and national level is crucial in identifying real skills needs, ensuring the involvement of each actor in the provision of these skills and developing successful and recognised validation of non-formal and informal learning practices.

Stakeholders expect the Skills Agenda priorities to be integrated into EU tools and policies. For instance, ESF managing authorities call for the new Country Specific Recommendations to be aligned with the Skills Agenda since ESIF Operational Programmes support the policy priorities set out in the CSRs.

3.2 Views on the revision of Europass

Stakeholders welcome the revision of EUROPASS. Stakeholders consider that the tool is today technologically outdated and faces difficulties in coping with changing educational, training and labour market conditions (e.g. it has no means to record non-formal learning outcomes). In this regard, civil society calls for the European Commission to stress the value of self-assessment and Open Badges. Also, stakeholders call for more coherence and interoperability between EUROPASS and other EU initiatives (Erasmus+ documentation, ESCO, EQF, etc.).

Concerning governance and the streamlining of services, stakeholders express concerns. Many believe that every network has developed its specific competence depending on the activities carried out. Some policy networks state that they have long-standing experiences of regular cooperation between each other (organising promotional events, sharing information and materials, peer group work, etc.) and do not believe that modifying their structural organisation would be necessary or beneficial. Moreover, they point out that their cooperation activities go beyond the three policy networks and also include ECVET, EQAVET, ESCO, EURES, Eurodesk, ENIC/NARIC, and other instruments that are not included in the Revision proposal. Finally, the policy networks foresee difficulties in writing joint working plans since their activities, target groups and working partners differ. In order to reduce the administrative work-load and to set long term strategic objectives, policy networks suggest the introduction of multi-year contracts.

3.3 Views on the revision of the EQF

Many stakeholders call for an increased permeability between educational and research sectors and hence increased synergies between the existing tools (EQF, ECVET, ESCO, validation tools, etc.). Nevertheless, stakeholders underline that the EQF is not a recognition, but a transparency and reference tool. Also, stakeholders consider that the existing tools and mechanisms for validation should be better implemented before developing new ones.

There is no consensus on the issue of the extension of the EQF to third countries. On the whole, social partners and the EQF national authorities state that the EQF is not mature enough and that Commission's efforts should first focus on ensuring that the EQF is a functioning tool for comparability and transparency of qualifications in the EU. Civil society and cities defend an opposite view and call for enhanced cooperation in this area. It is suggested to improve the promotion of the EQF through the Lisbon Recognition Convention Committee and the ENIC-NARIC network.

Stakeholders' views also diverge on the proposal of referencing international sectorial qualifications to the EQF. While employers strongly welcome the proposal, national authorities in charge of the EQF believe that these qualifications must first be referenced to National Qualification Frameworks in order to ensure transparency and trust. This view is supported by civil society organisations, who believe the EQF is not ready to be opened up to such qualifications.

EQF national authorities consider that a further conceptualisation of quality assurance to that covered in Annex III in the EQF recommendation is necessary. They argue that quality assurance should go beyond the quality of education and training and also cover the quality of referencing processes, levelling procedures, monitoring and review of referencing over time.

3.4. Views on the Skills Guarantee

Stakeholders welcome an initiative for tackling the low skills gap for people of working age and many emphasised the importance of digital skills in this context. They call for a balanced approach between improving the basic skills for the low-skilled and providing labour market relevant skills ensuring that workers stay competitive and keep pace with labour market needs.

Stakeholders underlined that validation of non-formal and informal learning was crucial to give more visibility to individuals' competences and knowledge, and should be applied consistently to support the upskilling of the low-skilled (learning happens all the time).

The need to combine preventive and repair measures was emphasised. Initial education and training systems have the duty to equip people with skills for a lifetime, but at the same time the current stock of low skilled individuals which have been failed by the system needs to be catered for.

The challenge of motivating adults to engage in upskilling and reskilling was emphasised, as was the need to overcome it by greater flexibility of the education and training provision and support measures such as tailored approach and guidance.

Social partner organisation on both sides expressed broad support for the initiative and a willingness to work together to tackle the challenge of low skilled adults, without ignoring the need also to focus on middle- and high- end skills.

Trade Unions stress that they perceive basic skills as a fundamental right and would wish to see the establishment of a guarantee to this effect. They argue, however, that Member States should have flexibility over the precise level of each of the basic skills that would be the minimum required. They consider that skills should not be seen in isolation but rather set in the context of the individual’s life, in which important choices may have to be made. They believed that employers need more encouragement (possibly in national legislation) to allow workers time off for training. They underline the importance of guidance for all.

Employer organisations are more cautious about a "skills guarantee", in particular if the burden is to be put on companies to compensate for the basic skills not achieved in compulsory education. They note that the acquisition of basic skills is a Member State responsibility, and believe that costs must be covered by Member States.

Some see the issue in a wider perspective and believe that the initiative should focus on all skills, whilst others consider that the results of PIAAC are sufficiently worrying to merit a focus specifically on low-skilled adults. They see digitalisation as a key challenge and that therefore digital skills must be considered one of the basic skills. The relevance of skills to companies' needs should guide the process.

3.5. Key messages from stakeholder groups

Social Partners

- The European Qualifications Framework is not yet mature for being upgraded into a recognition tool or for cross-referencing with third countries. However, employers welcome the opportunity to reference international sectorial qualifications to the EQF.
- Trade Unions are against any system of financing vocational education and training based solely on performance (because it may foster inequality between schools and students) and propose the need-based funding for VET schools.
- Employers strongly believe that basic skills training for the workforce falls within the responsibility of the governments, while trade unions call for the establishment of a Professional Skills Guarantee to ensure effective access to training for low-skilled workers and unemployed people and for a greater emphasis of the right to paid training leave
- The Skills Agenda should target migrants' and refugees' integration into the labour market, focusing *inter alia* on auditing and validating their skills and on language and citizenship/civic training.

Civil Society Organisations

- The Skills Agenda needs to insist on the learner-centred approach. This involves: fostering a strong learning culture within the communities and the work-places and motivation among the learners, ensuring the outreach of the policies in order to include people from disadvantaged groups and migrants and refugees, supporting transitions to make flexible pathways a reality, developing innovative learning and assessment methods and new learning provisions (e.g. short online modules in HE).
- The Skills Agenda should aim to prepare citizens to adapt to the needs of the future and not only to giving them the skills needed at a certain place and time in order to have a long-term effect and avoid the obsolescence of skills. This puts the emphasis on transversal skills (in curricula and teacher-training)

European Social Fund Managing Authorities

- The Skills Agenda should focus on streamlining and simplifying the existing EU tools and services on skills and qualifications. In doing so, it is essential to link tools aimed at improving the transparency of qualifications (EQF, Europass and validation tools) with those aimed at the development/improvement of competences (incl. on basic and transversal skills).

- For the Skills Agenda's ambitions to be realised, long-term national reforms of the educational systems need to be implemented while improving linkages with employment and social service planning and delivery. The ESF can support both short-term and longer-term reforms and challenges; in reality not all reforms have a financial impact. There is a need for comprehensive reforms across the education/learning cycle
- The new Country Specific Recommendations (CSRs) should be aligned with the Skills Agenda since ESIF Operational Programmes support the policy priorities set out in the CSRs.

European cities and local authorities

- The priorities identified in the Skills Agenda are relevant for the regional and local level. A clear focus demanded by cities is on enhancing transversal and digital skills, and entrepreneurship. On the other hand cities can play an important role in better linking the skills available and local business` needs, particularly in fast evolving sectors. Partnerships should be promoted (between local authorities, educational institutions and companies). Skills development should start already in kindergarten and school systems should be more responsive to labour market needs. Issues to tackle are also the low motivation, limiting conditions or lack of knowledge of citizens to improve their own skills.
- There is a need to develop and use data and forecast systems on labour market needs for future vocational trainings can be very useful but due to incomparability of databases and privacy rules quantitative data can be often fragmentary and incomplete, and information surveys do not asses effectively the needs of local SMEs.
- A more comprehensive EU framework for qualifications is needed, for example by introducing an integrated skills system to create the possibility for third-country nationals to measure their skills within an European framework and to help local authorities with tools facilitating the comparison of foreign and national qualifications.

Public Employment Services

- The focus of the Skills Agenda should be on the low skilled in order to increase their employability on the labour market.
- More priority should be given to workplace learning as a pillar of lifelong learning in order to ensure the employees' adaptation to new challenges and technologies.
- Tailor-made education and training is essential for adult education to be efficient. Education and training should depend on the learner's skills (importance of skills audit and validation) and on the specific needs of a labour market sector at a given moment.

VET Providers

- There is a need to better reference VET to the EQF. VET providers ask NQFs to better reference higher VET at levels 5 and 6 because there is still some resistance

from the traditional university systems. This will allow for more flexible pathways and permeability between Education and Training sectors.

- There is a lack of consensus on performance based financing systems in VET. Moreover, it may not be applicable in countries that do not depend on public financing (e.g. German dual system that relies on companies and chambers contributions).
- To improve **VET attractiveness** it is important to showcase its **social utility** and to ensure high quality and good return on investment, VET providers should monitor the outcomes and impact of their provision by looking at some key indicators.

Networks implementing policy

- Welcomed a European initiative addressing the low skilled people and stressed that guidance, outreach, awareness raising as well as effective policy coordination are key in successful delivery of such an initiative.
- The idea of one centre at national level to implement EQF, Europass and guidance policies is inspirational but might be difficult to implement at national level if countries are not given the appropriate flexibility. Although many agree that the audiences of Europass, EQF and Euroguidance are similar, which often results in overlapping promotional activities at national level, they believe that every network has developed its specific competence depending on the activities carried out.
- In the case of a common budget for the 3 policy networks, stakeholders ask for the grants to be earmarked for each network (with specific work plans).
- Multi-year contracts should be introduced. This would enable the setting of long term strategic objectives and give more time for discussions between stakeholders.

EQF Advisory Group

- Priority should not be given to international actors (third-country qualifications and private sectorial qualifications). Furthermore, the principle of subsidiarity makes it impossible for international sectorial bodies to be directly linked to the EQF through a "European Qualifications body" and that it should be demonstrated in the SWD how all these proposals comply with the EU guidelines on Better Regulation.
- While the EQF can facilitate recognition, it cannot become a recognition tool or support credit accumulation across different types of education and training.
- Tackling the remaining strong challenges for the development of National Qualification Frameworks such as the lack of trust between the stakeholders, the very theoretical image it has and of its shortcomings for including non-formal qualifications and supporting recognition, should be a priority. They suggest a better linkage with academic recognition, to systematically describe programmes in terms of learning outcomes and developing methods for horizontal comparisons.

Think-tanks

- It is essential to internationalise and regionalise VET. More should be done to enable regions/countries to share information about their skills needs and demands and to reduce administrative practicalities between border regions.
- Lifelong learning should be at the heart of the Skills Agenda. It is the only way for employees to keep up-to-date with the latest research and technological developments of their sector.

Table 1. Overview of consultations with key stakeholders on the overall EU Skills Agenda and the proposed concrete actions

Type of partner	**Type of consultation**
EYCS Council, 24 February	**Policy debate**
EPSCO Council, 7 March	**Policy debate**
Social partners	Dedicated hearing (20-21/01/2016), written contributions
Civil society organisations	Event (15/03/2016), written contributions
EQF Advisory Group (+ EQF National Coordination Points and education attaches)	Meeting (19/01/2016), written contributions
Public Employment Services	Written contributions
ESF Technical Working Group	Written contributions
Cities (via Eurocities)	Online survey
National Europass Centres, EQF National Contact Points, Euroguidance Centres	Meeting (29/02/2016), written contributions
Expert group on VET providers	Meeting (24/02/2016), written contributions
Advisory Committee on Vocational Training	Meeting (12/2015), written contributions
Directors General of Vocational Education and Training	Meeting (17/02/2016)
ECVET Users Group	Meeting (25/02/2016)
National coordinators for adult learning	Meeting (7 April 2016), written contributions
BFUG (Bologna Follow-up Group)	Written contributions
Think-tanks (Neth-er)	Written contribution

APPENDICES

Appendix 1. Skills glossary

For the purpose of this Communication and accompanying Staff Working Document, the term "skills" is used in a broad sense and refers to what a person knows, understands and is capable of doing. However, under this broad definition, in the vast literature on skills, many different and more precise definitions and concepts are used to describe different kinds of skills.

BASIC SKILLS; Skills that form the foundation for further learning, working and living in contemporary society. (Fundamental skills in Literacy, Numeracy, Science and Technology and fundamental Digital Competences).	
Sources:	
Cedefop	The skills needed to live in contemporary society, such as listening, speaking, reading, writing and mathematics.
Recommendation on key competences for lifelong learning	Fundamental basic skills of language, literacy, numeracy and in information and communication technologies
Skills Guarantee	For the purposes of the Skills Guarantee, basic skills are defined as literacy, numeracy and basic digital skills

TRANSVERSAL SKILLS Skills which have been learned in one context or to master a special situation or problem but apply to more contexts in daily life, study or work environment.	
Sources:	
ET 2020 Working Group on Transversal Skills	Skills such as the ability to think critically, take initiative, problem solving and work collaboratively, skills which are relevant for individuals as citizens and in employment in today's varied and unpredictable career paths.
Cedefop	The skills individuals have which are relevant to jobs and occupations other than the ones they currently have or have recently had. These skills may also have been acquired through non-work or leisure activities or through participation in education or training. More generally, these are skills which have been learned in one context or to master a special situation/problem and can be transferred to another context.
ESCO	Skills and competences relevant to a broad range of occupations and sectors. They are often referred to as core skills, basic skills or soft skills, the cornerstone for the personal development of a person. Transversal skills and competences are the building blocks for the development of the "hard" skills and competences required to succeed on the labour market. ESCO has developed a classification for transversal skills with the following skills groups: Thinking (e.g. Evaluate information), Language (Mother Tongue, Foreign language), Health and safety (e.g. Follow hygienic work practices); Information and communications technology (e.g. Create electronic content); Numeracy/mathematics (e.g. Carry out work-related calculations); Working environment (e.g. Apply quality standards); Social interaction (e.g. Accept constructive criticism); Attitudes (e.g. Demonstrate willingness to

	learn) and Values (e.g. Follow ethical code of conduct)
Rethinking Education	Ability to think critically, take initiative, solve problems and work collaboratively, entrepreneurial initiative, digital skills and foreign languages

KEY COMPETENCES Those competences which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment : 1) Communication in the mother tongue; 2) Communication in foreign languages; 3) Mathematical competence and basic competences in science and technology; 4) Digital competence; 5) Learning to learn; 6) Social and civic competences; 7) Sense of initiative and entrepreneurship; and 8) Cultural awareness and expression.	
Sources:	
Recommendation on key competences for lifelong learning	Those competences which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment : 1) Communication in the mother tongue; 2) Communication in foreign languages; 3) Mathematical competence and basic competences in science and technology; 4) Digital competence; 5) Learning to learn; 6) Social and civic competences; 7) Sense of initiative and entrepreneurship; and 8) Cultural awareness and expression
Cedefop	Sum of skills (basic and new basic skills) needed to live in contemporary knowledge society.
Transversal Working Group Key Competences	The competences identified as necessary for personal fulfilment, active citizenship, social cohesion and employability through lifelong learning in a knowledge society. OJEU (2006)

KNOWLEDGE The outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual.	
Sources:	
EQF	The outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual;
ESCO	The outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study." Both skills and competences rely on factual and theoretical knowledge, the difference lies in the way this knowledge is applied and put into use

SKILLS The ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).
Sources:

EQF	The ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments);
ESCO	The ability to apply knowledge and use know-how to complete tasks and solve problems". They can be described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments). The term skill refers typically to the use of methods or instruments in a particular setting and in relation to defined tasks.

COMPETENCE The proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development.	
Sources:	
EQF Recommendation	The proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development.
ESCO	The proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. The term competence refers typically to the ability of a person - facing new situations and unforeseen challenges - to use and apply knowledge and skills in an independent and self-directed way.
TWG Key Competences	A combination of knowledge, skills and attitudes applied appropriately to a context in order to achieve a desired outcome. OJEU (2006)
Recommendation on key competences for lifelong learning	Combination of knowledge, skills and attitudes appropriate to the context

LEARNING OUTCOMES Statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence.	
Sources:	
EQF	Statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence;

QUALIFICATION A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards.	
Sources:	
EQF	A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards;
Cedefop	Qualification covers different aspects:

	•Formal qualification: the formal outcome (certificate, diploma or title) of an assessment process which is obtained when a 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. a qualification can be a legal entitlement to practise a trade (OECD); •Job requirements: knowledge, aptitudes and skills required to perform specific tasks attached to a particular work position (ILO).

SKILL GAP Situation where an individual does not have the level of skills required to perform his or her job adequately. Skill gaps can be analysed at individual level (using a skills audit), at company/sector level, or at regional, national or international levels; Skill gaps can be linked to an insufficient level of qualification; They may also refer to situations where the workforce has the right level of qualification but lacks specific types of skills (such as management skills) or experience required to perform a task or a job adequately.	
Sources:	
Cedefop	Situation where an individual does not have the level of skills required to perform his or her job adequately. Skill gaps can be analysed at individual level (using a skills audit), at company/sector level, or at regional, national or international levels; Skill gaps can be linked to an insufficient level of qualification; They may also refer to situations where the workforce has the right level of qualification but lacks specific types of skills (such as management skills) or experience required to perform a task or a job adequately

SKILL MISMATCH Situation of imbalance in which the level or type of skills available does not correspond to labour market needs. Skills mismatch can be a surplus or a lack of knowledge, abilities and competences; skill mismatch can be analysed at different levels (individual, enterprise, sectoral, economy); experts distinguish between vertical mismatch (the level of education/skills is higher or lower than required) and horizontal mismatch (the level of education/skills matches job requirements, but the type of education/skills is inappropriate for the current job).	
Sources:	
Cedefop	Situation of imbalance in which the level or type of skills available does not correspond to labour market needs. Skills mismatch can be a surplus or a lack of knowledge, abilities and competences; skill mismatch can be analysed at different levels (individual, enterprise, sectoral, economy); experts distinguish between vertical mismatch (the level of education/skills is higher or lower than required) and horizontal mismatch (the level of education/skills matches job requirements, but the type of education/skills is inappropriate for the current job).

Appendix 2. Overview of EU funding instruments for skills

1. European Structural and Investment Funds (ESIF)

During the 2014-2020 programming period[224], the ESIF will provide substantial support investment in education and training by Member States. Funding will be concentrated on i) preventing early school leaving and promoting equal access to good quality early childhood, primary and secondary education. (ii) improving both the relevance of education and training systems and the transition from education to work and life-long learning; (iii) modernising higher education; (iv) developing vocational education and training, apprenticeships and traineeships; (v) upgrading education infrastructures. It is expected that:

- 4.1 million young people will benefit;
- 2.9 million people will gain a qualification;
- 400 000 people will start education or training after receiving support;
- 6.8 million young people will be able to use new or improved childcare or education facilities in 15 Member States.

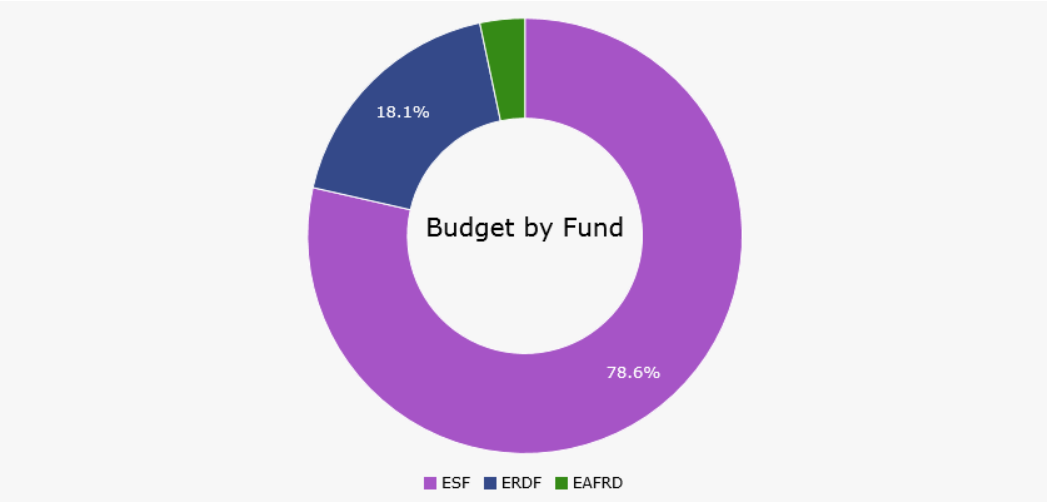
In addition, investment in education infrastructure is aimed at improving access to high-quality education and to a decrease in early school leaving, as well as improved and modernised education and training systems needed for updating skills and qualifications, up-skilling of the labour force, and the creation of new jobs.

The main source of investment in human capital is provided by the European Social Fund (ESF) and for education infrastructure by the European Regional Development Fund (ERDF).

Investment in training, retraining and upskilling is also provided through the European Agriculture and Rural development Fund (EAFRD). As regards specifically investment in education and training in the 2014-20 period the ESF allocations amount to over €27 billion. ERDF support for education infrastructure comes up to over €6 billion, and EAFRD investment in training is just over €1 billion.

Figure 24: 2014-2020 ESIF budget for education and training, by Fund

[224] http://ec.europa.eu/contracts_grants/pdf/esif/invest-progr-investing-job-growth-report_en.pdf



2. The European Social Fund (ESF)

Results of the ex-post evaluation 2007-2013

Preliminary results of the ex-post evaluation of the ESF 2007-2013 programming period show that in the area of human capital, generally, all Member States addressed both the strategic objectives of improving the quality of education and training systems and increasing the participation in education and training.

The strong targeting allowed a significant proportion of the population in key priority groups to be reached, with a clear focus on young people, employed workers and people with lower educational attainment levels

In the area of human capital, the ESF investment involved substantial additional resource leading to a significant increase in the number of participants in human capital interventions (49.7 million, equally split between men and women and with few gender-based differences in results). This investment proved particularly important in the context of the economic crisis as it effectively reached new groups of learners. In addition the ESF human capital investment has contributed significantly to promoting new measures, approaches and innovative teaching methodologies, including improvements in the quality of and participation in measures to improve teacher training development of new curriculum and the introduction of new management and evaluation methods in initial education. This included the establishment of successful partnerships. When it comes to the net effects of vocational training measures under evaluation, the employment rate of ESF participants increased between 4 to 11 percentage points in one country, and between 10 and 20 percentage points around one to two years after the start of the training in another country.

During the current programming period 2014-20, significant funding is allocated to each of the education and training-related investment priorities under Thematic Objective 10 as

illustrated by the table below. Yet, it should be noted that ESF-relevant investment priorities such as those related to access to employment, integration of young people on the labour market and active inclusion also directly support basic education (e.g. for young early school leavers or adults without the necessary qualification levels allowing for direct labour market integration support) and dual learning, notably through apprenticeships. This is of direct importance to the Skills Agenda initiatives, in particular those linked to improving basic skills and literacy.

Furthermore, the 2014-20 cycle is marked by an increased use of financial instruments in the delivery of ESIF. As regards mobilisation of ESF specifically through financial instruments, the Commission's initial estimates indicate that approximately EUR 865 million of the ESF overall allocations are expected to be channelled via financial instruments in at least 12 Member States. Out of this total, the share of investment in education, training and vocational training for skills and lifelong learning is estimated at around EUR 24 million, while around EUR 432 million would go towards promoting sustainable and quality employment and supporting labour mobility – measures largely based on upskilling and the acquisition of qualifications.

ESF programming 2014-2020[225]

Priority	Budget allocation (€)
Reducing and preventing early school-leaving and promoting equal access to good quality early-childhood, primary and secondary education including formal, non-formal and informal learning pathways for reintegrating into education and training;	7,982,377,964
Improving the quality and efficiency of, and access to, tertiary and equivalent education with a view to increasing participation and attainment levels, especially for disadvantaged groups;	5,111,014,282
Enhancing equal access to lifelong learning for all age groups in formal, non-formal and informal settings, upgrading the knowledge, skills and competences of the workforce, and promoting flexible learning pathways including through career guidance and validation of acquired competences;	7,235,336,265
Improving the labour market relevance of education and training systems, facilitating the transition from education to work, and strengthening vocational education and training systems and their quality, including through mechanisms for skills anticipation, adaptation of curricula and the establishment and development of work-based learning systems, including dual learning systems and apprenticeship schemes	6,757,070,578
TOTAL Education and training ESF:	27,085,799,090

In addition, the ESF also supports transnational cooperation on areas such as youth employment, learning and skills.

[225] Open Data Platform, https://cohesiondata.ec.europa.eu/themes/10

Box. ESF 2014-20 Transnational cooperation on learning and skills

Transnational cooperation (TNC) in the ESF helps develop better and more effective employment and social policies and improve the delivery of reforms, essentially by enabling people to learn from experiences and good practice in other countries. In the 2014-2020 period the TNC implementation framework is based on common themes, including learning and skills. Cooperation is aimed towards further sub-themes, namely combating early school leaving, vocational education and training, accreditation (of prior learning) lifelong learning, transitions within and between school and work. Currently, 12 member States are involved in the dedicated 2014-20 TNC network on learning and skills.

3. European Regional Development Fund (ERDF)

The ERDF supports the objectives of the skills agenda in various ways, mainly by funding education infrastructure investments which help the modernisation of education and training systems, reduce early school leaving, promote better access to good quality education, enhance access to lifelong learning, strengthen vocational education and training systems, and improve the labour market relevance of education. These measures are meant to upskill the workforce across Europe and build better links between educational systems and the labour market, in order to ensure that skills match companies' needs, today and in the future. To fully develop the labour market relevance of education and training, a more integrated approach between ESF (with employment, training, social inclusion issues) and ERDF (innovation, SME, circular economy, digital growth and entrepreneurship) should be developed. Smart specialisation strategies can provide a strategic setting for this. Smart Specialisation strategies set out the agendas for economic transformation in the Member States and regions. These strategies were developed following an entrepreneurial discovery processes involving not only business and research, but also other societal actors, to identify a limited number of future fields for growth and competitiveness specific for each region of country. ERDF innovation funding will be concentrated on these fields. Many Smart Specialisation Strategies stress the need for investing in specific skills related to their priority fields and plan to draw also on ESF funding for this purpose. The Commission is setting up thematic Smart Specialisation Platforms in European strategic priority areas, such as energy transition, digital agenda, industrial modernisations or circular economy, bringing together national and regional innovation actors from different countries along new European value chains. These thematic platforms may result in the identification of needs for joint skills development, staff mobility, etc.

It is estimated that current ERDF funding to support infrastructure and equipment for education and training comes to €8.3 billion[226]. However, there are more "hidden" ERDF skills investments under Article 98(2) of the Common Provisions Regulation that are linked to e-government, SME support, research and innovation activities, eco-innovation, circular economy projects etc, but the programmes did not have to specify that these were skills-related investments.

[226] DG REGIO estimate

4. The Youth Employment Initiative (YEI)

The YEI was launched in 2013 and was budgeted in 2014 and 2015 to help achieve targeted results in responding to high youth unemployment in the EU regions which at the time were affected the worst by youth unemployment. The current budget runs until the end of 2018. 20 Member States are eligible for the YEI, which has been integrated into 34 ESF mono- or multi-fund programmes.

Member States will use funding allocated to the YEI to invest in quality apprenticeships, traineeships and jobs that could help bring about lasting labour market integration and increase the employability of young people. This will support a key EU policy objective in this area, set out in the Council recommendation on Establishing a Youth Guarantee (2013). The peak of YEI implementation, i.e. in terms of both financial progress and results in relation to the participants, is expected to take place in 2016-18.

Implementing the YEI is expected to:

- help 2.3 million unemployed or inactive participants complete a YEI project.
- help 1.1 million unemployed or inactive participants receive an offer of employment, continued education, apprenticeship or traineeship once the YEI support has ended;
- support 1.1 million unemployed or inactive participants to take part in education/training, gain a qualification, or find employment, including self-employment.

Despite the early eligibility of expenditure under the YEI (1 September 2013), most Member States started implementation in 2014 and 2015. Financial liquidity was identified as a problem and was addressed by an increase to 30% pre-financing from the YEI budget line in 2015.

First results of YEI implementation show that across countries the YEI is implemented using the range of measures supported under the YEI, yet there is a strong focus on the provision of traineeships and apprenticeships, as well as first job experience, which is implemented by 75% of MAs who have started implementation. Other frequently implemented measures include VET courses (69%), job and training mobility measures (56%) and start-up support for young entrepreneurs (56%). The vast majority of MAs implement three or more types of measures under the YEI, offering a menu of support for young people.

5. The European Agricultural Fund for Rural Development (EAFRD)

The EAFRD supports employment, competitiveness and economic development through a number of actions in the fields of lifelong learning, vocational training, skills development, social inclusion and job creation.

EAFRD-funded 2014-2020 rural development programmes are supporting knowledge transfer and information actions, demonstration activities, innovation projects, training of advisors, start up support and training of young farmers to achieve generational renewals and knowledge transfer and information actions benefitting migrants. The development of ICT infrastructure in rural areas will enhance digital learning, improving skills and promote jobs.

In addition to contributing to the skills agenda, the EAFRD targets in particular in 2014-2020 3.9 million training places and ensures that around 18 million citizens in rural areas would benefit from improved ICT infrastructure and services. Furthermore, 3.9% of total EAFRD expenditure is planned to be spent on knowledge transfer, advice and cooperation support.

6. The European Maritime and Fisheries Fund (EMFF)

The EMFF finances the Common Fisheries Policy and the Integrated Maritime Policy for 2014-2020 either directly or in the context of shared management with Member States[227].The objective of the fund includes the support and financing of projects that create new jobs and improve quality of life along European coasts. In order to support job creation and social dialogue, the EMFF may support activities such as professional training, lifelong learning, joint projects and the acquisition of new professional skills. Under the EMFF Work Programme 2016 (direct management), €3.4 million have been allocated to launch call for proposals on "Blue Careers in Europe". These grants aim at strengthening the collaboration between educational providers and business of the maritime and marine sectors at local and regional level in order to better reply to the labour market needs.

7. Erasmus+

Under Key Action 1, mobility is encouraged for apprentices, as well as teachers and trainers in VET. Up to 650.000 VET students are set to benefit from a learning mobility experience abroad in the period of 2014-2020.

In addition, Key Action 2 addresses exchange of good practice and innovation. The Strategic Partnership action aim to reinforce the cooperation between educational institutions, youth organisations, enterprises and other organisations to develop, transfer and implement innovative practices to improve quality and relevance in all fields of education, training and youth, as well as to make them more inclusive. The Sector Skills Alliances specifically aim to address skills gaps in the VET field by developing vocational skills in line with labour market needs through enhanced cooperation between education and employment. Previously Sector Skills Alliances (SSAs) addressed only curricula development but the new SSA instrument has now integrated the activity of the previous Sector Skills Councils (previously funded the EaSI programme) namely the identification of skills gaps and needs. Knowledge Alliances foster innovation in higher education by stimulating entrepreneurship, equipping students and higher education staff with entrepreneurial skills, and by facilitating the exchange, flow and co-creation of knowledge between higher education institutions and enterprises.

[227] EMFF Regulation No 1303/2013

With regard to Key Action 3 to support policy reform, the Commission has launched two specific calls, one for national authorities in 2014, and one in 2015 to set up support structures for SMEs, and in particular those SMEs that have not trained apprentices before. Key Action 3 also supports Forward-looking Cooperation Projects and Policy Experimentations by Member States aiming to develop, test and implement innovative policies in all fields of Education, Training and Youth.

The Thematic Network on Work-based learning (NetWBL) involving 29 National Agencies is continuing to work on an online tool to promote work-based learning, including apprenticeships, at all levels.

Under Key Action 3 to support policy reform, the Commission has launched specific call encouraging policy makers to assessment the effectiveness of adult learning policies. The final outcome should be thorough evaluation of national policies and how they are implemented in systems; provide evidence on what works and shortcomings/gaps for further policy development.

8. Horizon2020

The 2014-2015 Horizon 2020 Work Programme - **Europe in a changing world: inclusive, innovative and reflective societies** funded research actions (EUR 2.5) in the field of Lifelong learning for young adults (YOUNG-3-2015 call). The aim was to review the situation of adult education in Europe and look for ways to take the most out of the numerous initiatives taken by a large number of often isolated actors. The policy and programme learning will address young people, in particular those with low levels of basic and functional literacy, those not in education or training or those in situations of near social exclusion, who could be helped much more effectively if adequate adult education policies were designed. Similarly, the 2016-2017[228] Work Programme will fund research in the field of education and skills in connection to young innovators (Co-Creation-1-2017, EUR 2.5 million). The goal is to improve learning and teaching in innovation-related skills for young boys and girls at the age of primary and secondary education through the design and piloting of new innovative ways of skills education, including technologies, processes and relations.

Horizon 2020 has an opportunity to encourage closer links between innovation and educational systems. For example, under the Horizon 2020 Societal Challenge 'Secure, Clean and Efficient Energy', topics concerning demonstration projects encourage opening up the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange. The objective is to build joint education and training programmes, projects and exchanges among research infrastructures/industrial installations and relevant education and training providers, ensuring quality education, providing a platform for practice oriented education on all levels (students, engineers, researchers, etc.) and speeding up the process of technology development, market uptake and replication, providing the respective technology field with additional attractiveness for creative and entrepreneurial scientists, researchers, engineers and other professionals.

H2020 is also funding projects applying the latest digital technologies to learning and skills development. Moreover, some PPPs and specific support projects are exploring which skills are necessary for new technologies and how to boost learning and training possibilities to acquire these skills[229].

9. European Fund for Strategic Investment (EFSI)

The EFSI Regulation was adopted in June 2015. The Commission, together with the EIB, has set guidelines to help implementing the new Fund. The Investment Plan for Europe, that will be supported by the EFSI, aims to mobilise at least €315 in additional investment over the next 3 years to finance infrastructure and innovation projects as well as SMEs. Investments in intangible assets as human capital, social innovation and administrative capacity are strategic investments for the growth of the economy as a whole. Mobilisation of private capital is a key feature of EFSI and currently represents about 80% of the total expected investment value.

An essential step to ensure jobs and growth creation is the EFSI's strategic orientation towards sector diversification. According to the ILO, if EUR 15 billion, i.e. less than 5% of the overall funds mobilised by EFI supported the improvement of skills, were reallocated towards measures to support improvement in skills, this would increase the job creation impact to 2.1 million.

The EFSI also offers an opportunity to support promising projects for universities and education, including educational infrastructures, student loan schemes, and the financing of the "knowledge triangle": Innovation, Business and Higher education.

Under the EFSI, universities can potentially benefit from the EU guarantee for revenue generating projects which they carry out or promote. For instance, technology transfer initiatives where the technology is conceived and developed in the university premises and subsequently passed on to a private operator could be eligible for EIB financing under the EFSI. In addition, projects for research labs that would be used by the private sector, and thus generating revenues, might be considered for EFSI supported financing. This of course, concerns only universities that can take debt.

10. Other EU funding opportunities for skills development

10.1. The EU Programme for Employment and Social Innovation (EaSI)

The objective of one of the three axes of the Commission-managed programme EaSI, namely the PROGRESS axis, is to provide support to the policy-making and implementation process through production of policy evidence, organisation of information sharing and mutual learning activities, funding social policy experimentation projects and providing capacity-building support to EU and national organisations.

[229] For instance, the European Data Science Academy (EDSA) designs curricula for data science training and education;. http://edsa-project.eu/

In 2014[230], in the area of employment of the PROGRESS axis, the largest investment through EaSI was put into improving anticipation of skills needs, analysis of skills supply and labour market needs. Under this thematic section, the largest amount of funding (EUR 7 073 611) in 2014 was committed to develop the Classification of European Skills, Competences, Qualifications and Occupations (ESCO). This was also the largest overall analytical output funded by EaSI in 2014. The ESCO classification was judged by stakeholders as the most helpful analytical output in the policy area of employment.[231]

Box. Classification of European Skills, Competences, Qualifications and Occupations (ESCO)

ESCO is a multilingual classification of European Skills, Competences, Qualifications and Occupations and is part of the Europe 2020 strategy. ESCO was launched by the Commission in 2010. DG EMPL, DG EAC and Cedefop jointly coordinate its development. ESCO classification identifies and categorises skills, competences, qualifications and occupations relevant for the EU labour market as well as education and training. It systematically shows the relationships between the different concepts. ESCO, which has been developed in an open IT format, is available for use free of charge by everyone and can be accessed via the ESCO portal. The first version of ESCO was published on 23 October 2013. This release marked the beginning of the pilot and testing phase, including the ESCO mapping pilot. The classification will be completely revised by 2017. The final product will be launched as ESCO v1.

EaSI has also funded the Sector Skills Councils, is a sector-driven initiative, bringing together in a network the existing bodies producing labour market intelligence on employment and skills at sectoral level. The ultimate aim is to reduce the skills gap faced by companies and jobseekers and allow them to be in possession of more and better information on the evolution of their sector in terms of skills and employment. This means above all to collect and analyse the information – data- about the skills needs, gaps and mismatches in the sector.

10.2. The EIB's "Skills and Job's loan programme"

The European Investment Bank (EIB) offers the 'Skills and Jobs – Investing for Youth'[232] programme since 2013. It consists of two pillars:

1. **'Investing in Skills'** - aimed at investments into human capital (e.g. job-related skills and on-the-job-training, as well as vocational training, student loans and mobility programmes),
2. **'Jobs for Youth'** - provides access to finance linked to the employment of young people in SMEs and midcaps.

The Commission should also aim to ensure sufficient visibility to the initiative, potentially

[230] http://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=7824&type=2&furtherPubs=yes
[231] As from 2015, the European Sectoral Skills Council instrument (under Progress 2007-13) has been integrated into the new Sector Skills Alliances instrument and is now funded under Erasmus +. In 2016 EASI still finances the ESCO IT project and ESCO technical assistance.
[232] http://www.eib.org/projects/priorities/skills_and_jobs/index.htm

developing it as a joint COM/EIF programme. The Commission should also clarify with EIB to the extent they are obliged in their programme to target only young people or a broader target group for the programme could be envisaged.

The Jobs for Youth pillar of the EIB's programme has had two phases. In its first phase (from July 2013 and still running), the programme targeted loans to firms located in EU regions with youth unemployment rates of 25% or more. In the second phase (from January 2014 and still running), final Beneficiaries (FBs) of EIB funding can be located anywhere in the EU but FBs in regions with youth unemployment rates below 25% need to comply with stricter conditionality regarding youth employment or training, i.e.:

- have hired a number of young persons in the last six months or plan to do so in the coming six months, or
- offer vocational training or internships/training programmes for young people and demonstrate a recent track record of young people benefiting from these trainings, or
- have an active cooperation agreement with a technical school or university to employ young persons (e.g. during summer internships) and demonstrate a recent track record of young people benefiting from these cooperation agreements.

Between July 2013 and December 2015, over **EUR 26 bn** has been allocated to beneficiary SMEs, with **EUR 1.2 bn** earmarked for this second phase.

During the 2013-2014 period, the EIB signed almost **EUR 5 bn** via the 'Investing in Skills' pillar of the EIB programme. In 2015 a further **EUR 1.9 bn** in signatures was added.

The EIB is planning to extend the 'Jobs for Youth' part through a third 'sustainable recruitment' phase. It would consist of risk sharing with financial intermediaries on the loans to SMEs. The current proposal for the third phase is to make the conditionality stronger by requiring firms to recruit a minimum number of employees. This minimum would depend on the size of the company. The specific instrument under discussion with the EIB would combine a first loss piece structured finance instrument, which would allow relaxing the risk threshold of loans provided to SME's, thus increasing the number of eligible companies that could receive EIB provided loan and/or more attractive loan conditions. Those loans in addition could also be combined with certain performance/selection criteria in line with the Commission skills policy priorities.

The EIB aims at blending its own resources with those of the EU and Member States. In its own proposal, the EIB estimates that with the EU contribution of EUR 100m in a first loss piece, it could create a leverage of 4-5 and then double this leverage at the level of intermediaries (banks). This would result into an estimated EUR 1bn of new loans (for each EUR 100m of first loss piece).

10.3. COSME

COSME[233] is the EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises running from 2014 - 2020 with a planned budget of EUR 2.3 billion. In addition to Improving access to markets for SMEs (notably through the services provided by the Enterprise Europe Network, COSME supports SMEs in three areas which include investment in skills development:

- Facilitate access to finance in all phases of the SMEs lifecycle – creation, expansion, or business transfer. Thanks to EU support, businesses have easier access to guarantees, loans and equity capital.
- Improving framework conditions for the competitiveness and sustainability of Enterprises. Inter alia, COSME supports businesses to be competitive by encouraging them to adopt new business models and innovative practices. This complements actions in areas with high growth potential such as the Tourism sector. For example, capacity building schemes for destination managers and entrepreneurs in the area of accessible tourism were funded through a COSME call for proposals in 2014[234]
- promoting entrepreneurship (also through the Erasmus for Young entrepreneurs Scheme) education, mentoring, guidance and other support services. Actions support specific groups who may find it difficult to reach their full potential, such as young people, women and senior entrepreneurs. The programme also aims to help businesses access opportunities offered by digital technologies.

Moreover, the COSME programme also funds the Erasmus for Young Entrepreneurs[235] programme. This cross-border exchange action gives new or aspiring entrepreneurs the chance to learn from experienced entrepreneurs running small businesses in another European country. The exchange of experience takes place during a stay with the host entrepreneur, which helps the new entrepreneur acquire the skills needed to run a small firm or to strengthen a new business. The host benefits from fresh perspectives on his/her business and gets the opportunities to cooperate with foreign partners or learn about new markets.

WORTH project

WORTH Pilot Project (2013-2015), launched in 2013 under the CIP Programme (Competitiveness and Innovation Framework Programme), tested a range of soft measures to support the integration of skills and competences in consumer goods sectors (e.g. textile, footwear, accessories, furniture, etc.). The measures tested were the following:

- exchange of skills and knowledge for companies (SMEs) - design, technical skills, crafts, and specialised skills

[233] http://ec.europa.eu/growth/smes/cosme/
[234] http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=7700&lang=en&tpa_id=0&displayType=fo&fosubtype=p&nl_id=1039
[235] http://www.erasmus-entrepreneurs.eu/

- upgrading and creating higher value-added design-based products and processes
- promotion of design, various crafts and professions.

The Worth Pilot Project turned out to be very successful and it was decided it will be continued as Worth Project under the COSME Programme.

One of the pillars of the COSME Programme is to encourage entrepreneurship. The entrepreneurship mind-set is relatively underdeveloped in Europe, lagging behind the United States for example: latest figures from the 2012 Eurobarometer on Entrepreneurship showed that in Europe 37% of citizens prefer to be self-employed, while in the USA this proportion is 51%. Against this background, the COSME Regulation specifies that an indicative 2.5% of the total budget has to be devoted to promote entrepreneurship and entrepreneurial culture.

To this purpose, COSME backs the implementation of the Entrepreneurship 2020 Action Plan through a wide range of activities. These include mobility exchanges, research, best practices diffusion and pilot projects in areas such as entrepreneurship education, mentoring or the development of guidance and support services for new and potential entrepreneurs, including young, women and senior entrepreneurs. A special focus is given to digital entrepreneurship and e-skills to help European businesses drive their digital transformation and reap the benefits of digital technologies. Also, the European mobility programme *Erasmus for Young Entrepreneurs* helps new entrepreneurs acquire and build entrepreneurial skills and knowledge and to further develop their business activity by learning from experienced entrepreneurs. This mobility programme started in 2009 as a pilot but it generated a lot of interest and positive feedback. Today, more than 1,700 exchanges have been supported. Under COSME, it should reach more than 2,000 exchanges per year. Next to this COSME is also supporting SMEs to "*go international*", by helping developing skills and gather know how that will make their international activities sustainable in time.

10.4. European Globalisation Adjustment Fund (EGF)

The EGF was established in 2006 to show solidarity with, and provide support to, workers who had lost their jobs in large scale redundancies resulting from changes in global trade patterns. The rules were amended in 2009 to respond more effectively to the global financial and economic crisis. The EGF co-finances projects including, inter alia, measures such as education, training and retraining. In the 2014-2020 period, a derogation clause allows Member States to include support to young people not in employment, education or training (NEET) in EGF measures in the affected regions. This derogation clause is running out at the end of 2017.

The implementation of EGF cases takes the form of coordinated packages of active labour policy measures aimed to support the final beneficiaries, the dismissed workers. Possible support measures include a range of services to dismissed workers, such as information, advice and guidance through individual case management; specific training measures; employment and recruitment incentives; including, to a certain extent, mobility and subsistence allowances (while undergoing training). The majority of outputs are used on individual case management and training and retraining.

The EGF supplements national labour market measures in situations where sudden collective redundancy processes - due to their large scale and their impact on the local economy - put the public employment services under extraordinary pressure and can provide a more personalised and targeted approach to the most vulnerable redundant workers. These interventions help increase the re-employment rates achieved in the short and medium term.

10.5. The LIFE programme

Since 1992, LIFE has co-financed thousands of targeted innovative environmental and climate-related projects with an impact on jobs and skills. LIFE projects have created many "green jobs", with most of these meaning a topping up of skills or ‘greening’ existing knowledge. In addition, LIFE has contributed to greening the EU job market through the dissemination of green skills by means of training courses and practical guidelines.

10.6. The Health Programme

Health Programme 2014-2020 complements, adds value and supports the policies of Member States aimed at improving the health of Europe's citizens. A key objective is to contribute to innovative, efficient and sustainable health systems and to provide support to the sustainability of the EU health workforce by promoting effective forecasting and efficient recruitment and retention strategies. The Health Programme has co-financed the EU Joint Action on health workforce planning and forecasting, including innovative "horizon scanning" methodologies and co-funds OECD studies on skills mismatches and skills needs in the health sector.

ANNEXES

ANNEX I – TACKLING LOW SKILLS: THE SKILLS GUARANTEE

ANNEX II – RESULTS OF THE PUBLIC CONSULTATION ON THE EU's MODERNISATION AGENDA FOR HIGHER EDUCATION

ANNEX III - ENHANCING THE TRANSPARENCY OF QUALIFICATIONS: THE EUROPEAN QUALIFICATIONS FRAMEWORK (EQF)