

TAMTAM Project
*Exploiting the TIPTOE pIAforM by transferring ECVET and EQF
semAntic tools in a Multi-sectoral perspective*
2011-1-IT1-LEO05-01969 CUP G12F11000600006

WP4.R11. Updated qualification responding to sectoral needs

November, 2012



Exploiting the TIPTOE pIAforM by transferring ECVET and EQF semAntic tools in a Multi-sectoral perspective (2011-1-IT1-LEO05-01969 CUP G12F11000600006) Website: www.tamtam.polito.it

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Lifelong
Learning
Programme

Result:	11	Updated qualification responding to sectoral innovation needs
Work package:	4	Transfer of Innovation
Description:	This document summarizes the activities that have been carried out in the frame of work package 4 to update, with the support of the TAMTAM platform, selected qualifications from the considered sectors by taking into account innovation needs. The document illustrates how the gap with the original qualifications has been unveiled in a transnational perspective, by starting from interviews with stakeholders from the selected sector and exploiting semantic comparison functionalities embedded in the online tool. Detailed results have been also made available through links to the TAMTAM platform on project web space.	
Edited by:	P1. 3s research laboratory	
Contributing partners:	Selected project partners, by carrying out interviews based on qualifications provided and integrated in the platform.	
Public/Confidential:	Public	

Table of contents

1. Updated qualifications responding to sectoral needs (Result R11)	4
1.1. Aims	4
1.2. Methodology and activities for deliverable 11	4
1.3. Structure of this report	4
2. Sectoral data report: ICT	5
2.1. Employment	5
2.2. Entrepreneurship	6
2.3. Innovation, new jobs, new skills	7
3. Sectoral data report: mechanics/mechatronics	9
3.1. Employment	9
3.2. Entrepreneurship	11
3.3. Innovation, new jobs, new skills	12
4. Sectoral data report: fashion/textile	15
4.1. Employment	15
4.2. Entrepreneurship	16
4.3. Innovation, new jobs, new skills	17
5. Sectoral data report: energy efficiency/green building/construction	18
5.1. Employment	19
5.2. Entrepreneurship	20
5.3. Innovation, new jobs, new skills	20
6. Expert interviews	22
7. Updating of selected qualifications with regards to innovation needs	23
8. Discussion of results	25

Annexes

Annex WP4.R11.1: Guidelines for Expert Interviews in English
 Guidelines for Expert Interviews in Dutch
 Guidelines for Expert Interviews in French
 Guidelines for Expert Interviews in German
 Guidelines for Expert Interviews in Italian
 Guidelines for Expert Interviews in Portuguese
 Guidelines for Expert Interviews in Slovenian
 Guidelines for Expert Interviews in Spanish

Annex WP4.R11.2: Transcriptions of Expert Interviews

1. Updated qualifications responding to sectoral needs (Result R11)

1.1. Aims

With the support of the semantic platform, selected qualifications from the considered sectors were supposed to be updated by taking into account innovation needs. Moreover, the gap between the original qualifications was expected to be unveiled in a trans-national perspective, and results were planned to be made available through links to the TAMTAM platform on the project website at the address (<http://www.tamtam.polito.it/>). This document reports on the methodology that has been applied to achieve the above aims.

1.2. Methodology and activities

Implementation process: combination of desk research (sector reports) and expert interviews; 3srl provided sectoral information for the mechanics/mechatronics, ICT and energetic efficiency/green building/construction sectors via desk research. KCH provided information for the fashion/textile sector. 3srl developed interview guidelines for interviews with labour market experts (for inventory of changing needs), IG Metall provided translations of these guidelines; selected partners (Politecnico di Torino, DEKRA, clock-IT-skills for ICT sector, USRV, 3srl and IG Metall for Mechanics/Mechatronics sector) conducted and transcribed interviews and provided results to 3srl in the form of a template; 3srl evaluated results. Profiles in the platform were updated with regards to innovation needs on the basis of this analysis.

For the inventory of **changing market's needs**, the analysis of **innovation needs** and the analysis of **economic situation**, it was necessary to undertake basic desk research on parameters such as employment, innovation, entrepreneurship, new jobs/new skills. It was equally as important to obtain input from the relevant labour market - therefore expert interviews were conducted.

The information about the changing market needs has to led to an overview of trends and innovations, which (may) have an impact on the occupations on the one hand, and on the education system on the other.

The Annexes E, F and G, provided in the Report "Guide on the adapted methodology" (developed in work package 2) were the basis of work package 4, the transfer of innovation.

- Annex E provides the basis for expert interviews, to analyse the current status in the described qualifications (market developments, legislation/government regulations, technological developments, corporate developments, international developments, etc.).
- Annex F provides the basis for analysing the innovation needs by cross-referencing the results from the expert interviews with the descriptions of qualifications (provided via Annex D); within professional activities it is differentiated between competences/skills/knowledge.
- Annex G provides the basis for the analysis of the economic situation on a sectoral level based on desk research (in contrast to the labour market survey which is based on qualifications). Economic situation is analysed with regards to the following parameters: employment, innovation, entrepreneurship, new jobs, new skills.

The annexes E, F and G were the basis for the development of the interview guidelines for the expert interviews and for the desk research in order to obtain sectoral information about the four sectors analysed.

1.3. Structure of this report

This report contains the results of the sectoral data analysis, a description of the methodology of the expert interviews, and a description of how these results were taken into account in updating selected qualifications in the platform with regards to innovation needs. The annexes for this report contain the translated interview guidelines and the transcriptions of the expert interviews.

2. Sectoral data report: ICT

For the purposes of the current overview, the ICT sector is broadly defined as ICT services i.e. *Information and communication*¹. A narrower definition focuses on two selected sub-sectors i.e. *Computer programming, consultancy and related activities* as well as *Information service activities*. The first sub-sector includes writing, modifying, testing and supporting software; planning and designing computer systems that integrate computer hardware, software and communication technologies; on-site management and operation of clients' computer systems and/or data processing facilities; and other professional and technical computer-related activities (division 62, NACE Rev.2). The second sub-sector refers to activities of web search portals, data processing and hosting activities, as well as other activities that primarily supply information (division 63, NACE Rev.2).

2.1. Employment

The reallocation from ICT manufacturing to ICT services has intensified in the recent years. ICT manufacturing employment continues to follow the downward trend initiated by the 2000-2001 crisis; at the same time, there is an increasing growth of employment led by ICT services. This confirms that EU countries are increasingly specialising in ICT and Internet based services while outsourcing ICT manufacturing to non-EU economies. Increases in ICT services employment have outweighed declines in ICT manufacturing employment in most EU countries.

The *Information and Communication* sector contributes to a significant share of total employment in EU 27. In the period between 2008 and 2011 it employed over 6 million people (table 2.1). The negative effects of the 2008-2009 financial crisis, visible in the employment decline during 2009, appeared to have waned by the end of 2010. Among all sub-sectors, *Computer programming, consultancy and related activities* contributes with highest share of employment – in the period from 2008 to 2011 it employed between 2.5 and 2.7 million people (table 2.1). This sub-sector is also characterised by a continuous employment increase. Within it Germany, United Kingdom, France, Spain and Italy showed highest share of employment during 2011.

The decline in employment during 2009 in the sub-sector of *Information service activities* was replaced by a graduate increase, which started in 2010 and continued in 2011 (table 2.1). In this sub-sector Germany, France, Italy, United Kingdom and Romania showed highest share of employment during 2011.

Table 2.1. Employment in ICT sector, EU 27 (1 000)

	2008	2009	2010	2011
Total Employment	217.398,1	213.522,5	212.405,0	213.046,3
Information and Communication	6.154,7	6.042,9	6.080,7	6.172,0
Computer programming, consultancy and related activities	2.463,4	2.503,7	2.527,1	2.662,8
Germany	423,8	454,0	480,1	507,4
UK	539,4	467,8	450,4	482,5
France	252,8	299,4	305,0	329,1
Spain	214,2	215,3	224,0	231,7
Italy	227,5	227,4	208,6	231,6
Information service activities	317,1	309,2	342,4	372,7
Germany	79,8	77,8	75,8	89,8
France	50,0	49,4	54,2	67,8
Italy	34,1	37,9	47,9	51,6
UK	46,5	28,3	34,5	31,1
Romania	7,9	15,0	16,8	20,7

Source: EUROSTAT, LFS². ICT-related activities embedded in other sectors of the economy (e.g. the automotive industry, etc.) are not covered. Figures on employment refer to persons in the age of 15 to 64 years old.

¹ Class J, NACE Rev.2, http://ec.europa.eu/eurostat/ramon/index.cfm?TargetUrl=DSP_PUB_WELC (2012-10-09).

² Employment by sex, age and detailed economic activity (from 2008, NACE Rev.2 two digit level), http://epp.eurostat.ec.europa.eu/portal/page/portal/employment_unemployment_lfs/data/database (2012-10-09).

The *Information and communication* sector is a male dominated sector. In 2008 women accounted for roughly 33 per cent of total employment and in 2011 - for 31 per cent (table 2.2). In the subsector of *Computer programming, consultancy and related activities* the share of women is even smaller i.e. 22 per cent in 2008 and 21 per cent in 2011. It is higher in the subsector of *Information service activities* - 40 per cent in 2008 as well as in 2011.

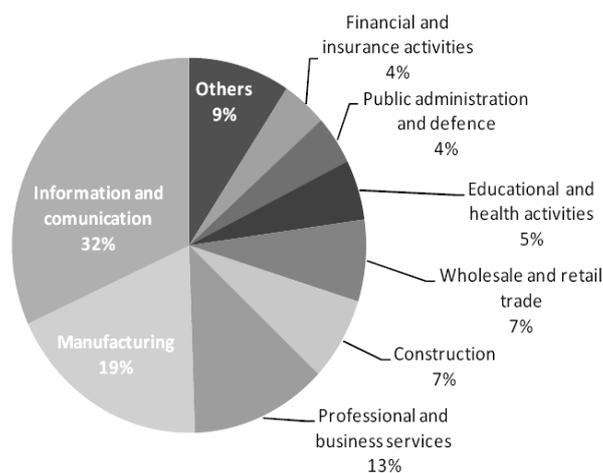
Table 2.2. Share of female employment in ICT sector, EU 27 in per cent (%)

	2008	2009	2010	2011
Information and Communication	32.7%	32%	31%	31%
Computer programming, consultancy and related activities	22%	21%	22%	21%
Information service activities	40%	42%	42%	40%

Source: EUROSTAT, LFS. Figures on employment refer to persons in the age of 15 to 64 years old.

According to an OECD paper on ICT skills and employment, ICT specialists³ are needed in the ICT sector, but increasingly they are also employed across the wider non-ICT economy, for example to produce both ICT products such as software in non-ICT sectors (e.g. financial services) and knowledge- and data-intensive products such as automobile systems with ICTs and in particular software embedded in them (figure 2.1).

Figure 2.1. Share of ICT specialists by sector in OECD Europe 2010



Source: Eurostat LFS⁴

2.2. Entrepreneurship

Most recent data on enterprise births⁵ is available for the period between 2008 and 2009 for almost all EU Member States except for Denmark, Greece and Malta. Therefore, data on the total number of enterprise births excludes these EU countries (table 2.3).

³ Defined as those who have the ability to develop, operate and maintain ICT systems. ICTs constitute the main part of their job. In OECD Digital Economy Paper No.198 (2012): ICT Skills and Employment. New competences and jobs for a greener and smarter economy, http://www.oecd-ilibrary.org/science-and-technology/ict-skills-and-employment_5k994f3prlr5-en (2012-10-09).

⁴ OECD Digital Economy Paper No.198 (2012), p. 15.

⁵ A birth occurs when an enterprise starts from scratch and actually starts activity. An enterprise creation can be considered an enterprise birth if new production factors, in particular new jobs, are created. If a dormant unit is

From 2008 to 2009 the number of new enterprises in the sector of *Information and communication* increased with approximately 9 percent, in the sub-sector of *Computer programming, consultancy and related activities* - with roughly 12 percent and in the sub-sector *Information service activities* it decreased with 0,5 percent (table 2.3).

In 2009 France, United Kingdom, Germany, the Netherlands and Poland were with highest number of new enterprises in *Computer programming, consultancy and related activities*. In the period between 2008 and 2009 the number of new enterprises increased in France and Poland and decreased in Germany, the Netherlands and United Kingdom. In 2009 Germany, Italy, Poland, United Kingdom and the Netherlands were with highest number of enterprise births in *Information service activities*. In the period between 2008 and 2009 the number of new enterprises increased in Poland, United Kingdom and the Netherlands and decreased in Germany and Italy.

Table 2.3. Enterprise births in the ICT sector in EU 27 (1 000)

	2008	2009
Information and communication		
Total number of enterprises	796.778	795.233
Enterprise births	114.682	125.935
Computer programming, consultancy and related activities		
Total number of enterprises	453.279	n/a
Enterprise births	66.547	75.617
France	7.425	21.594
UK	18.130	12.355
Germany	9.535	8.283
Netherlands	5.979	5.399
Poland	4.784	5.054
Information service activities		
Total number of enterprises	102.860	101.000
Enterprises births	17.577	16.723
Germany	6.204	3.584
Italy	2.314	2.244
Poland	1.505	2.046
UK	1.575	1.645
Netherlands	1.009	1.172

Source: EUROSTAT. Data on enterprise births refer to business demography indicators⁶. Data data on number of enterprises refers to annual detailed enterprise statistics for services⁷

2.3. Innovation, new jobs, new skills

The analysis of job openings reveals that *software engineers, computer programmers, systems analysts* and *computer support* are highly in demand across the economy.⁸

According to the OECD Information Technology Outlook 2010, promising areas for new ICT jobs and competences include cloud computing, green ICTs and “smart” applications⁹.

2.3.1. ICT and Green Jobs

Many of the “green jobs”¹⁰ are related, directly or indirectly, to ICTs (e.g. jobs in R&D, production, deployment, maintenance, and use of green technologies such as “smart” electricity grids and wind

reactivated within two years, this event is not considered a birth,

http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Enterprise_birth (2012-10-09).

⁶ http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/special_sbs_topics/business_demography (2012-10-09).

⁷ http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/data/database (2012-10-09).

⁸ OECD Digital Economy Paper No.198 (2012), p. 20.

⁹ OECD Information Technology Outlook 2010. Highlights, <http://www.oecd.org/sti/interneteconomy/46444955.pdf> (2012-10-09).

energy turbines). Thus, demand for ICT-skilled workers will continue to increase not only in the ICT sector, but more rapidly across the wider non-ICT economy, for example, to develop and deploy ICT- and Internet-based products and services such as software in non-ICT sectors (e.g. financial services) or data-intensive products and services such as automobile systems or the “smart grid”. As a consequence, skills for big data management and analytics (e.g. SQL and Apache Hadoop) and the development of Internet-based software applications (e.g. Ajax and PHP) are increasingly in demand. Additionally, network security skills will be in greater demand, particularly as ICTs are increasingly adopted across sectors. In many cases, these skills need to be complemented with sector-specific skills such as business and administration skills or, as in the case of green ICTs, with environmental knowledge. This means that ICT employment will require relatively high levels of experience.

Top areas of green ICT applications include “smart” electricity grids, “smart” transport systems, and “smart” buildings, for improving resource efficiency. The deployment of “smart” grids is expected not only to generate substantial energy-efficiency gains, but also to create new jobs for ICT specialists across the economy and in the ICT sector. Most organisations still lack the knowledge necessary to deploy green ICTs effectively. This creates an opportunity for consulting and service firms, which increasingly offer green ICT services to businesses and the public sector. These services include environmental impact assessments, development and evaluation of green ICT strategies, and optimisation of data centres¹¹.

2.3.2. ICT and Health

According to the OECD Internet Economy Outlook 2012¹², the use of ICTs in the health sector can provide increased quality of care and efficiency, reduced operating costs and entirely new modes of care. One example is electronic health records (EHRs) which enable timely access and better transmission of medical information across the healthcare continuum, thereby making patient care more responsive and efficient. Telehealth is also increasingly seen as an important tool for enhancing healthcare delivery, particularly in rural and remote areas where healthcare resources and expertise are often scarce or even non-existent. The increased use of ICTs in the health sector has the potential for creating new jobs.

¹⁰ Defined as “jobs that contribute to protecting the environment and reducing the harmful effects human activity has on it (mitigation), or helping to better cope with current climate conditions (adaptation)”, In OECD Digital Economy Paper No.198 (2012), p. 24.

¹¹ OECD Digital Economy Paper No.198 (2012), pp. 28, 29.

¹² Summary is available at: <http://www.oecd.org/sti/interneteconomy/internet-economy-outlook-2012-highlights.pdf> (2012-10-09).

3. Sectoral data report: mechanics/mechatronics

For the purposes of the current overview, *Mechatronics* refers to the following manufacturing industries as defined in class C (NACE Rev.2)¹³.

- Manufacture of paper and paper products (NACE 17)
- Manufacture of rubber and plastic products (NACE 22)
- Manufacture of basic metals (NACE 24)
- Manufacture of fabricated metal products, except machinery and equipment (NACE 25)
- Manufacture of computer, electronic and optical products (NACE 26)
- Manufacture of electrical equipment (NACE 27)
- Manufacture of machinery and equipment (NACE 28)
- Manufacture of motor vehicles, trailers and semi-trailers (NACE 29)
- Manufacture of other transport equipment (NACE 30)
- Repair and installation of machinery and equipment (NACE 33)

3.1. Employment

In the period from 2008 to 2011, the manufacturing industries employed between 37.55 and 33.92 million people between 15 and 64 in EU 27. The financial crisis in 2008-2009 caused a decrease in employment during 2009 and 2010, which was replaced by a gradual increase in 2011 (table 3.1). Currently, manufacturing industries represent approximately 16 per cent of the total employment in the EU 27; in 2008, they represented about 17 per cent.

Table 3.1. *Employment in Mechatronics, EU 27 (1 000)*

	2008	2009	2010	2011
Total Employment in EU 27	217,398.1	213,522.5	212,405.0	213,046.3
Manufacturing	37,551.3	34,727.5	33,690.0	33,925.9
Manufacture of paper and paper products (NACE 17)	734.9	689.1	673.0	660.4
Manufacture of rubber and plastic products (NACE 22)	1,701.5	1,578.5	1,591.6	1,594.8
Manufacture of basic metals (NACE 24)	1,443.2	1,317.6	1,274.7	1,289.5
Manufacture of fabricated metal products, except machinery and equipment (NACE 25)	4,254.8	3,777.5	3,648.5	3,740.9
Manufacture of computer, electronic and optical products (NACE 26)	1,712.0	1,568.1	1,524.6	1,590.5
Manufacture of electrical equipment (NACE 27)	1,556.9	1,406.2	1,382.0	1,420.5
Manufacture of machinery and equipment (NACE 28)	3,290.9	3,087.0	2,942.5	2,952.6
Manufacture of motor vehicles, trailers and semi-trailers (NACE 29)	3,164.9	2,878.9	2,845.3	3,045.9
Manufacture of other transport equipment (NACE 30)	1,114.8	1,037.8	990.9	941.8
Repair and installation of machinery and equipment (NACE 33)	1,077.7	1,232.0	1,210.6	1,207.7

Source: EUROSTAT, LFS - Detailed annual survey data¹⁴; Figures in bold refer to *Mechatronics* industries with highest employment share in 2011.

Among the selected *Mechatronics* sectors, those with highest employment share are *Manufacture of fabricated metal products, except machinery and equipment* (NACE 25); *Manufacture of motor vehicles, trailers and semi-trailers* (NACE 29) and *Manufacture of machinery and equipment* (NACE 28). The developments in these sectors are similar to the developments of the

¹³ Class C, NACE Rev.2,

http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NACE_REV2&StrLanguageCode=EN&IntPcKey=18496334&StrLayoutCode=HIERARCHIC (2012-10-22).

¹⁴ Employment by sex, age and detailed economic activity (from 2008, NACE Rev.2 two digit level),

http://epp.eurostat.ec.europa.eu/portal/page/portal/employment_unemployment_lfs/data/database (2012-10-22).

manufacturing industries as a whole – after a decline in employment during 2009 and 2010; we observe a gradual increase in 2011. These trends are characteristic also for the sectors *Manufacture of rubber and plastic products* (NACE 22), *Manufacture of basic metals* (NACE 24), *Manufacture of computer, electronic and optical products* (NACE 26) and *Manufacture of electrical equipment* (NACE 27).

With lowest employment share is the *Paper manufacturing industry* (NACE 17). The sector shows constant decrease from 2008 to 2011 (table 3.1). Similar developments are observable also for the sectors of *Manufacture of other transport equipment* (NACE 30) and *Repair and installation of machinery and equipment* (NACE 33).

The next paragraph provides more details about the *Mechatronics* sectors with highest employment share.

In the period from 2008 to 2011, the sector of *Manufacture of fabricated metal products, except machinery and equipment* (NACE 25) employed between 4.25 and 3.74 million people between 15 and 64 in EU 27. Germany has the largest share of European employment in the sector followed by Italy, France, Poland, Spain, United Kingdom and Czech Republic (table 3.2). Among these countries, the national importance of the sector is largest in the Czech Republic (approximately 3.7 per cent) followed by Italy, Germany, Poland, Spain, France and United Kingdom.

Table 3.2. *Employment in NACE 25 in 2011, EU 27 (1 000)*

	2011	Share of national employment
Manufacture of fabricated metal products, except machinery and equipment (NACE 25)	3,740.9	
Germany	943.5	2.4%
Italy	595.6	2.6%
France	315.2	1.2%
Poland	308.1	1.9%
Spain	258.9	1.4%
United Kingdom	229.8	0.8%
Czech Republic	177.2	3.7%

Source: EUROSTAT, LFS - Detailed annual survey data.

In the period between 2008 and 2011, the sector of *Manufacture of motor vehicles, trailers and semi-trailers* (NACE 29) employed between 3.16 and 3.04 million people between 15 and 64 in EU 27. Germany has the largest share of European employment in the sector, followed by France, Poland, Italy, Spain, United Kingdom and Czech Republic (table 3.3). Among these countries, the national importance of the sector is largest in the Czech Republic, followed by Germany, Poland, France, Spain, Italy and UK.

Table 3.3. *Employment in NACE 29 in 2011, EU 27 (1 000)*

	2011	Share of national employment
Manufacture of motor vehicles, trailers and semi-trailers (NACE 29)	3,164.9	
Germany	1,182.1	3.0%
France	274.4	1.1%
Poland	223.5	1.4%
Italy	210.3	0.9%
Spain	199.0	1.1%
United Kingdom	182.6	0.6%
Czech Republic	179.4	3.7%

Source: EUROSTAT, LFS - Detailed annual survey data.

In the period between 2008 and 2011, the sector of *Manufacture of machinery and equipment* (NACE 28) employed between 3.29 and 2.95 million people between 15 and 64 in EU 27. Germany has the largest share of employment in the sector followed by Italy, United Kingdom, France, Spain, Poland and Czech Republic (table 3.4). Among these countries, the national

importance of the sector is largest in Germany, the Czech Republic and Italy. In United Kingdom, France, Spain and Poland the sector accounts for 0.8 per cent of the national employment.

Table 3.4. Employment in NACE 28 in 2011, EU 27 (1 000)

	2011	Share of national employment
Manufacture of machinery and equipment (NACE 28)	3,290.9	
Germany	1,091.3	2.8%
Italy	421.5	1.9%
United Kingdom	237.2	0.8%
France	212.8	0.8%
Spain	136.5	0.8%
Poland	128.0	0.8%
Czech Republic	97.8	2.0%

Source: EUROSTAT, LFS - Detailed annual survey data.

3.2. Entrepreneurship

Most recent data on enterprise births¹⁵ is available for the period between 2008 and 2009 for twenty-four EU Member States excluding Denmark, Greece and Malta. Data on the total number of new enterprises is calculated as a sum of the number of enterprise births per country (for the countries with available data, table 3.5).

Among the selected *Mechatronics* sectors, data is not available for the *Paper manufacturing industry* (NACE 17). Furthermore, data for several sectors have been put together i.e. NACE 24-25, NACE 26-27 and NACE 29-30. Separate data is available only for the sectors of NACE 22, NACE 28 and NACE 33 (table 3.5).

Table 3.5. Enterprise births in Mechatronics in EU 27

	2008	2009
Manufacturing	146,397	150,807
Manufacture of rubber and plastic products (NACE 22)	3,875	3,451 ¹⁶
Manufacture of basic metals and fabricated metal products except machinery and equipment (NACE 24+25)	29,340	26,827
Manufacture of computer, electronic and optical products and electrical equipment (NACE 26+27)	5,744	5,747
Manufacture of machinery and equipment (NACE 28)	4,707	4,078
Manufacture of motor vehicles, trailers, semi-trailers and other transport equipment (NACE 29+30)	2,935	2,424 ¹⁷
Repair and installation of machinery and equipment (NACE 33)	14,782	16,717

Source: EUROSTAT. Data on enterprise births refer to business demography indicators¹⁸.

From 2008 to 2009, the number of new enterprises in *Manufacturing* increased with roughly 3 per cent (table 5). Among the selected *Mechatronics* sectors, those with highest number of enterprises are *Manufacture of basic metals and fabricated metal products except machinery and equipment* (NACE 24+25) and *Repair and installation of machinery and equipment* (NACE 33). While the sector of *Manufacture of basic metals and fabricated metal products except machinery and equipment* showed a decrease in the number of new enterprises with roughly 8.6 per cent, the sector of *Repair and installation of machinery and equipment* showed an increase with

¹⁵ A birth occurs when an enterprise starts from scratch and actually starts activity. An enterprise creation can be considered an enterprise birth if new production factors, in particular new jobs, are created. If a dormant unit is reactivated within two years, this event is not considered a birth,

http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Enterprise_birth (2012-10-22).

¹⁶ Apart from Denmark, Greece and Malta, data on enterprise births was not available also for Ireland.

¹⁷ Apart from Denmark, Greece and Malta, data on enterprise births was not available also for Ireland and Spain.

¹⁸ http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/special_sbs_topics/business_demography (2012-10-22).

approximately 13 per cent. These developments are exactly the opposite compared to the employment trends characteristic for these sectors i.e. while *Manufacture of basic metals and fabricated metal products except machinery and equipment* showed an increase in employment for 2011, the sector of *Repair and installation of machinery and equipment* showed a decrease (table 3.1).

In 2009, countries with highest share of enterprise births in the sector of *Manufacture of basic metals and fabricated metal products except machinery and equipment* (NACE 24+25) were Poland, Czech Republic, Italy, Slovakia, Germany, Spain and United Kingdom (table 3.6). From 2008 to 2009, the number of new enterprises decreased for all countries, except for the Czech Republic, which showed a notable increase i.e. in 2008 enterprise births were 979 and in 2009 they were already 3 623.

Table 3.6. Enterprise births in NACE 24-25, EU 27

	2008	2009
Manufacture of basic metals and fabricated metal products except machinery and equipment (NACE 24+25)	29,340	26,827
Poland	4,845	4,487
Czech Republic	979	3,623
Italy	4,505	3,488
Slovakia	4,440	3,213
Germany	2,906	2,295
Spain	2,765	2,042
United Kingdom	1,750	1,540

Source: EUROSTAT. Data on enterprise births refer to business demography indicators

In 2009, countries with highest share of enterprise births in the sector of *Repair and installation of machinery and equipment* (NACE 33) were Poland, France, Italy, Czech Republic, United Kingdom, Spain and Germany (table 7). While the number of enterprise births decreased in Poland, Italy and Spain, it increased in France, Czech Republic, United Kingdom and Germany. The Czech Republic accounted for the most notable increase– in 2008 the number of new enterprises was 176 and in 2009 they were already 1 744.

Table 3.7. Enterprise births in NACE 33, EU 27

	2008	2009
Repair and installation of machinery and equipment (NACE 33)	14,782	16,717
Poland	3,312	3,042
France	1,656	2,842
Italy	2,591	2,301
Czech Republic	176.0	1,744
United Kingdom	815.0	1,380
Spain	2,003	1,005
Germany	535.0	1,002

Source: EUROSTAT. Data on enterprise births refer to business demography indicators.

3.3. Innovation, new jobs, new skills¹⁹

According to the CEDEFOP study on future skill need and skill supply²⁰, there will be a sizeable demand for professionals, technicians and associate professionals (including engineers) towards 2015 across all sectors and persons with technical skills will be in high demand all over Europe.

¹⁹ European data on qualification levels are only available at broad NACE and ISCED levels. Hence, it is not possible to assess the magnitude of changes in job creation or development of (new) occupational profiles in the selected Mechatronics sectors.

²⁰ Cedefop (2009) "Future skill needs in Europe: medium-term forecast. Background technical report", Publications Office of the European Union, Luxembourg, http://www.cedefop.europa.eu/EN/Files/3051_en.pdf (2012-10-22).

A recent study on the Competitiveness of the EU Mechanical Engineering Industry²¹ refers to the results of a survey to associations in *Mechanical Engineering*. Although the study is far from representative, its results may be taken into consideration. For example, asked about short-term demand and supply, the eight associations, which responded to this question, shared concerns about the supply of *engineers* (fig. 1). Two associations see this as a bottleneck, three experience scarcity; only two respondents express that the supply of engineers is sufficient. Even more pronounced is the bottleneck for *Machine operators* (one association experiences bottlenecks, while six see scarcity). This lack is regionally focused and problems have been highlighted above all from representatives of member states which do not offer a formal apprenticeship curriculum²².

Figure 3.1. Short- term demand and supply as perceived by associations

Labour Sufficiency of supply				
	Sufficient	No need currently	Scarce	Bottleneck
Machine operators			1,2,6,7,8	3, 5
Engineers	3,4		2,5,6	1,7
Researcher/scientists	4		3,6	7
Production control/planning	4	1,2	3,7	5

Source: Survey to associations in Mechanical Engineering (ME); Legend: 1: Fachverband Maschinen und Metallwaren Industrie, Austria; 2: European Sectoral Committee Compressors, Pumps, Valves; 3: EUROMOT; 4: Eurovent; 5: VDMA; 6: VDMA-FEM; 7: CECIMO; 8: Federation des Industries Mecanique (FIM)

The associations were also asked about the knowledge and the skills, which would be needed in the companies in the future. Only three companies, one association (VDMA) and a European Sectoral Committee (EUROMOT) answered this question (figure 3.2). The skill type most in demand appears to be linguistic skills. Two out of three companies agree that linguistic skills as well as technical skills will be required for engineers and skilled workers. According to one company, the association VDMA and the Sector Committee, engineers will require management/administrative skills as well.

Figure 3.2. Skills required to a larger extent over the next 3-5 years in different jobs in ME

Job type	Management/administrative staff	Scientists/ academics	Engineers	Skilled workers
ICT skills	C1	C1, C2	C1, C2	C1
Linguistic skills	C1, C2, C3	C1, C2, C3	C1, C3, E	C1, C3, A
Cultural issues	C1, C2		C1	
Management skills			C1, A, E	
Marketing/sales skills	C1, C2	C1	C1	C1
Communicative skills	C1, C2, E	C1	C1	C1
Technical skills	C1	C1, C2	C1, C2	C1, C2

Source: Survey to associations in ME; Legend: C1: Kalfrisa, company producing heat recovery equipment etc.; C2, VanDerLande Industries, company producing baggage handling equipment; C3: Imedexsa, company producing metallic structures (towers); A: VDMA; E: EUROMOT.

²¹ An introduction to Mechanical Engineering: Study on the Competitiveness of the EU Mechanical Engineering Industry (2012), http://ec.europa.eu/enterprise/sectors/mechanical/files/competitiveness/comp-mech-eng-2012-frep_en.pdf (2012-10-22).

²² An introduction to Mechanical Engineering: Study on the Competitiveness of the EU Mechanical Engineering Industry (2012), p. 241.

The EU association of European Machine Tool Industries (CECIMO) calls for education of engineers to include more practical subjects like information about standardisation, compliance as well as use of engineering tools such as IT programmes (example Pro Engineer, Solidworks); environmental and energy efficiency issues should be also included in the curriculum²³.

3.3.1. Future skills profiles

A Danish foresight study²⁴ identified three job profiles for skilled workers in Mechanical Engineering 2020.

1. “Opter”

A linguistic merger between ‘machine tool operator’ and ‘setter’; it is expected that production of long series in facilities with a low level of automation will disappear over the next decade. In this type of production, operators have traditionally played a major role. The main tasks of ‘Opters’ will be conversion, maintenance, commissioning and quality control - and possibly prototype production. Where long series are still produced, machines will be replaced by equipment requiring less manual operation (increased automation and use of industrial robots). Employees with the ‘Opter’ profile will have to handle far more machines and focus on programming them, i.e. setting and changing settings as production varies. There will be a move away from ‘one man, one machine’, towards teams of ‘Opters’ operating a facility or an assembly of machines. Hence, communicative and collaborative skills will be a requisite at this level.

2. “Blacksmith/welder – the creative craftsman”

Production of long series will be taken over by welding robots, but there will be two essential job functions for an employee with a smith/welder profile in the future:

- Production of large unique structures
- Production of smaller products in short series

Instead of producing many identical products, blacksmiths will move over the next decade more towards a role as creative craftsman. The job function is characterised by varied tasks and the employee must be able to independently select the appropriate professional techniques and materials and not be dependent on the existence of drawings or instructions (...). On the technical side, the blacksmith/welder will be required to operate with more materials. The technical requirements to welding will increase because of the introduction of new materials. In all, fewer, but more specialised blacksmiths/welders are required in the sector.

3. “Fitter” (Assembler)

The automation of long lines will lead to a decreasing demand for assemblers. Assembly work will continue to be relocated to low wage countries, and high volume productions will only take place at highly integrated plants with limited need for manual assembly. There will however still be a demand for fitters for production for the European markets. In addition, fitters will be needed in operations being prepared for outsourcing or relocation. In this case, the task of the fitter will be to develop, test and commission various production processes. These tasks will require both analytical skills and adaptability. In some cases, automation and technical solutions means that the customer can take care of final assembly. However, relocation may also require that fitters accompany the equipment to the new location, with associated increased demands on language and communication skills²⁵.

²³ An introduction to Mechanical Engineering: Study on the Competitiveness of the EU Mechanical Engineering Industry (2012), p. 243.

²⁴ Industriens Uddannelser (2010). New Insight: Fremtidens jobprofiler i industrien 2010. (“Future job profiles in manufacturing”), Copenhagen, <http://viewer.zmags.com/publication/ad47d33d#/ad47d33d/1> (2012-10-22).

²⁵ Translated by the authors of “An introduction to Mechanical Engineering: Study on the Competitiveness of the EU Mechanical Engineering Industry (2012), pp. 246-247.

4. Sectoral data report: fashion/textile

For the purposes of the current overview, the fashion / textile sector is defined in class C (NACE Rev.2)²⁶ as the following divisions:

- Manufacture of textile (NACE13)
- Manufacture of wearing apparel (NACE14)

This division of the manufacture of textile includes preparation and spinning of textile fibres as well as textile weaving, finishing of textiles and wearing apparel, manufacture of made-up textile articles, except apparel (e.g. household linen, blankets, rugs, cordage etc.). The division of manufacture of wearing apparel includes all tailoring (ready-to-wear or made-to-measure), in all materials (e.g. leather, fabric, knitted and crocheted fabrics etc.), of all items of clothing (e.g. outerwear, underwear for men, women or children; work, city or casual clothing etc.) and accessories. There is no distinction made between clothing for adults and clothing for children, or between modern and traditional clothing.

The structural changes in the textile and clothing industry were driven by the global realities in the sector, dominated by factors including stiff competition and the major importance of wage costs, particularly in the clothing industry. In the course of these structural changes, the textile and clothing industry has become more international and flexible and has oriented itself towards higher-quality and innovative products. In particular, the sector has taken the international lead in the field of so-called technical textiles, which are linked with a high level of research activity.

4.1. Employment

In the period between 2008 and 2011 a constant decline is observed in mostly all countries considered. Especially the decrease of employment between 2008 and 2010 is conspicuous in most of the countries (see table 4.1).

Table 4.1. Employment in Fashion/Textile, EU 27 (1 000)

	2008	2009	2010	2011
Total Employment in EU 27	217.398,1	213.522,5	212.405,0	213.046,3
Manufacturing	37.551,3	34.727,5	33.690,0	33.925,9
Manufacture of textiles (NACE 13)	926,3	771,3	730,3	731,9
Germany	110,0	108,3	95,7	103,1
UK	80,8	65,2	56,2	56,6
France	49,9	48,9	45,3	50,6
Spain	78,3	59,4	55,6	52,9
Italy	180,3	154,6	141,8	140,5
Portugal	64,3	49,2	60,8	61,1
Austria	12,9	10,4	10,8	11,6
Netherlands	11,2	11,6	10,7	8,0
Manufacture of wearing apparel (NACE 14)	1.709,2	1.507,5	1.355,2	1.306,4
Germany	81,1	75,9	71,4	68,7
UK	52,4	33,7	35,2	34,2
France	74,2	60,4	54,5	48,0
Spain	85,4	65,5	62,5	58,3
Italy	276,8	245,7	224,6	216,0
Portugal	129,2	119,4	99,2	96,7
Austria	10,5	9,6	7,6	7,5
Netherlands	4,6	4,4	4,8	4,4

Source: EUROSTAT, LFS - Detailed annual survey data²⁷

²⁶ http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NACE_REV2&StrLanguageCode=EN&IntPcKey=18496334&StrLayoutCode=HIERARCHIC (2012-10-31)

²⁷ Employment by seks, age and detailed economic activity (NACE Rev.2 two digit level)

http://epp.eurostat.ec.europa.eu/portal/page/portal/employment_unemployment_lfs/data/database (2012-10-31)

The observed division of manufacture of textiles is more or less equally divided in male and female employees. The observed division of manufacture of wearing apparel is on the other hand a female dominated field of work. As stated above this division is focusing on tailoring and clothing whereas the division of manufacture of textiles focus on fibres and textile (see table 4.2).

Table 4.2. Division in male and female employees in Fashion/Textile, EU 27 (1 000)

	2008	2009	2010	2011
Manufacture of textiles (NACE 13)	926,3	771,3	730,3	731,9
male	440,7	372,7	351,7	348,1
female	485,5	398,6	378,6	383,8
Manufacture of wearing apparel (NACE 14)	1.709,2	1.507,5	1.355,2	1.306,4
male	317,1	253,6	240,1	244,1
female	1.392,1	1.253,9	1.115,1	1.062,4

Source: EUROSTAT, LFS - Detailed annual survey data²⁸

4.2. Entrepreneurship

For the division manufacture of textile no significant decrease is visible for the period between 2008 and 2010. For some countries the year 2009 has been struggling, but in 2010 the numbers were stable like in 2008. For the division manufacture of wearing apparel a slight decrease can be noticed for the period between 2008 and 2010.

Table 4.3. Number of enterprises in fashion / textile sector, EU 27 (1 000)

	2008	2009	2010	2011
Manufacture of textiles (NACE 13)	63.570	60.000	62.000	
Germany	3.723	3.859	3.809	
UK	4.255	4.068	3.936	
France	4.180	4.126	4.975	
Spain	7.346	6.556	6.344	
Italy	18.351	17.256	na	
Portugal	3.897	3.620	3.539	
Austria	655	623	612	
Netherlands	1.341	1.421	na	
Manufacture of wearing apparel (NACE 14)	138.863	128.389	129.375	
Germany	2.612	2.932	2.922	
UK	3.826	3.572	3.396	
France	8.055	6.805	8.895	
Spain	11.751	10.483	9.778	
Italy	37.449	34.657	na	
Portugal	11.290	10.050	9.729	
Austria	752	725	729	
Netherlands	1.341	1.383	na	

Source: EUROSTAT. Data on number of enterprises refers to the annual detailed enterprise statistics for industry²⁹

²⁸ Employment by seks, age and detailed economic activity (NACE Rev.2 two digit level)

http://epp.eurostat.ec.europa.eu/portal/page/portal/employment_unemployment_lfs/data/database (2012-10-31)

²⁹ http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/data/database (2010-10-31)

4.3. Innovation, new jobs, new skills

The textile and clothing sector is heavily globalised. As far back as the 1960s, firms in industrial countries began to build factories in countries with lower wage costs, or to have goods made there (outward processing). This was particularly true of the clothing industry. Over the years, the (labour-intensive) sections of textile manufacture have followed. Later it became necessary to follow the consuming sectors abroad: an important driver of internationalisation. In Europe, with their high domestic wage costs, were some of the first to take advantage of the international division of labour. In contrast, firms in southern Europe, including Turkey, still make more use of domestic production plants. These differing strategies by individual EU countries are a reason for divergent interests in some parts of the EU trade policy.

The strategy of internationalisation will continue to contribute to the success of manufacturers of textiles and clothing: there is enormous unsatisfied demand in the emergent economies in Asia and Latin America, populations there are growing and European brands are very popular. Foreign demand for technical textiles will also increase. It is therefore important for manufacturers that politicians improve the conditions for successful involvement abroad. Further liberalisation of the markets is advisable. Domestic production could experience differing trends in the future. While production in the clothing sector could continue to fall – from its already low level – due to unavoidable structural problems, in the textile industry an increasing proportion of technical textiles could halt or even reverse the long-term decline in local production. In any case, technical textiles will remain the most dynamic segment. The problematic access to textile raw materials and their increasing prices are current challenges for the sector. In the medium to long term, there should be increased efforts to recruit adequate numbers of qualified personnel and to maintain the good market position of the innovative technical textiles segment.³⁰

³⁰ Deutsche Bank Research http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD000000000275381/Textile+and+clothing+industry%3A+Innovation+and+internationalisation+as+success+factors.pdf (2012-10-31)

5. Sectoral data report: energy efficiency / green building / construction

For the purposes of the current overview, the sector of Energy Efficiency, Green Building and Construction focuses on the following economic activities *Construction of buildings*; *Specialised construction activities* as well as *Architectural and engineering activities*; *technical testing and analysis*.

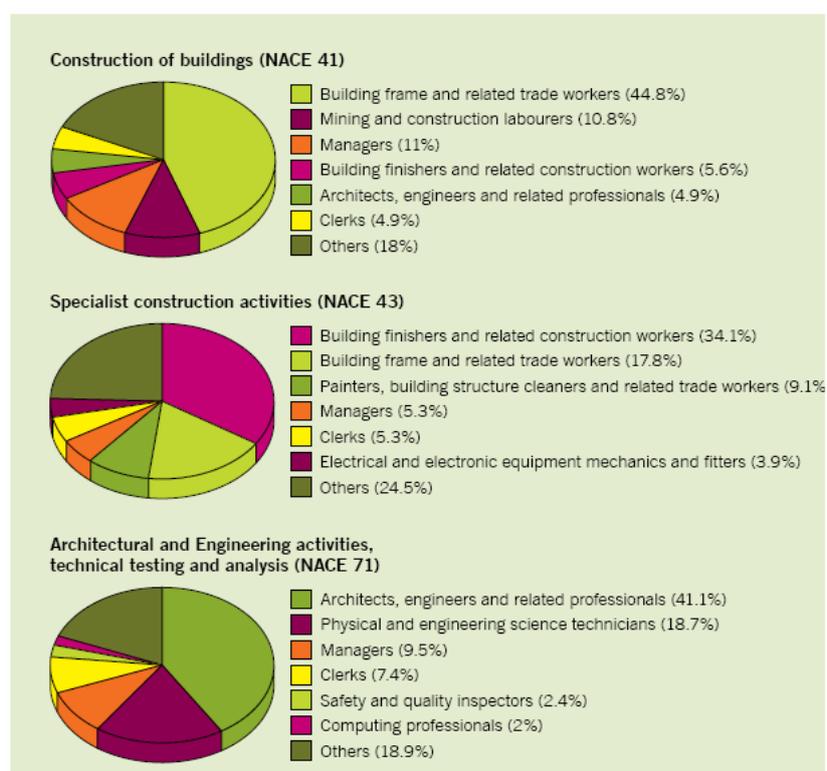
Construction of buildings refers to general construction of buildings of all kinds including new work, repair, additions and alterations, the erection of pre-fabricated buildings or structures on the site and also construction of temporary nature. It refers to the construction of entire dwellings, office buildings, stores and other public and utility buildings, farm buildings, etc (division 41, NACE Rev.2).

Specialised construction activities encompass construction of parts of buildings and civil engineering works or preparation therefore as well as installation of all kind of utilities that make the construction function as such (division 43, NACE Rev.2)³¹.

Architectural and engineering activities include the provision of architectural, engineering and drafting services, building inspection services and surveying and mapping services as well as the performance of physical, chemical, and other analytical testing services (division 71, NACE Rev.2).

Of note is that not all occupations in NACE 41, 43 and 71 are relevant for the sector of Energy efficiency, green building and construction i.e. different occupations have different extent of relevance (figure 5.1).

Figure 5.1. Most important jobs in sectors most associated with green building in EU 25, 2010³²



Source: ILO analysis of extraction from LFS provided by EUROSTAT

³¹ http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=DSP_NOM_DTL_VIEW&StrNom=NACE_REV2&StrLanguageCode=EN&IntPcKey=18507824&IntKey=18508334&StrLayoutCode=HIERARCHIC&IntCurrentPage=1 (2012-10-09).

³² ILO Research Brief 2011: Greening of the building sector is held back by skill shortages, p. 5, http://www.uncsd2012.org/rio20/content/documents/skills_research%20brief_building%20sector.pdf (2012-10-09).

5.1. Employment

In the period between 2008 and 2011 is observed a constant decline in employment for the sector of *Construction and building* and *Special construction activities* (table 5.1). The sector of *Architectural and engineering activities* showed an employment increase between 2008 and 2009, followed by a decrease in 2010 and an increase in 2011. Since not all occupations in the observed sectors are relevant for energy efficiency, green building and construction it is difficult to make a reliable conclusion about employment.

Table 5.1. Employment in sectors most associated with green building, EU 27 (1 000)

	2008	2009	2010	2011
Total Employment, EU 27	217.398,1	213.522,5	212.405,0	213.046,3
Construction of buildings	6.109,1	6.058,9	5.554,7	5.141,3
Specialised construction activities	10.761,5	9.228,6	9.071,9	9.003,2
Architectural and engineering activities	2.657,4	2.700,2	2.633,5	2.699,8

Source: EUROSTAT, LFS³³. Figures on employment refer to persons in the age of 15 to 64 years old.

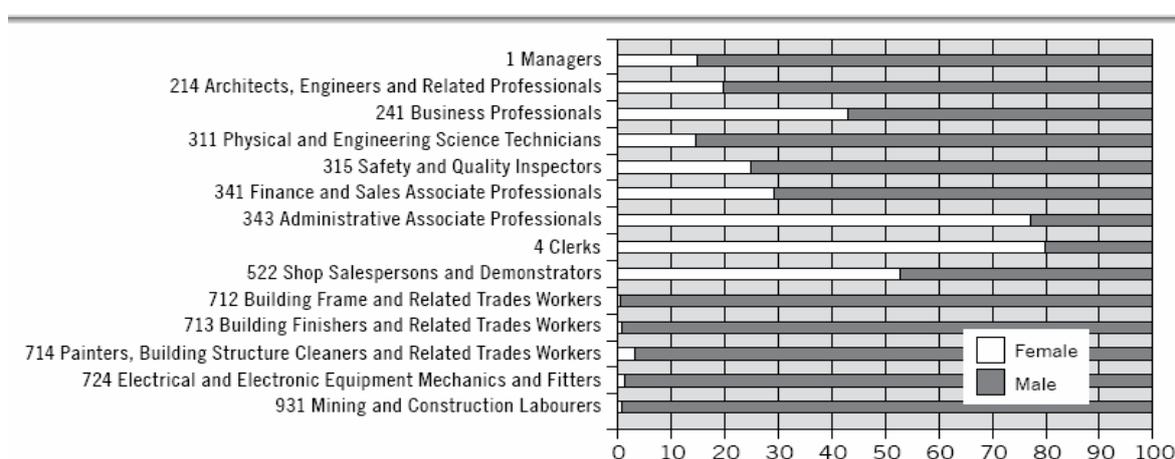
The observed sectors are largely dominated by men with somewhat higher share of female workers in *Architectural and engineering activities* (table 5.2).

Table 5.2. Share of female employment in sectors most associated with green building, EU 27 (%)

	2008	2009	2010	2011
Construction of buildings	9.6%	9.2%	9.2%	9.6%
Specialised construction activities	8.6%	8.3%	8.4%	8.6%
Architectural and engineering activities	30%	30%	30%	30%

Source: EUROSTAT, LFS. Figures on employment refer to persons in the age of 15 to 64 years old.

Figure 5.2. Share of female and male workers in selected occupations across NACE 41, 43 and 71, EU 25 (in per cent)³⁴



Source: Analysis of extraction from Labour Force Survey data provided by Eurostat.

³³ Employment by sex, age and detailed economic activity (from 2008, NACE Rev.2 two digit level), http://epp.eurostat.ec.europa.eu/portal/page/portal/employment_unemployment_lfs/data/database, (2012-10-09)

³⁴ ILO 2011: Skills and Occupational Needs in Green Building, p. 133, http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_166822.pdf, (2012-10-09)

5.2. Entrepreneurship

In the period between 2008 and 2009 there was a decrease in the number of enterprises in the sector of *Construction buildings* and *Specialised construction activities*. An increase showed the sector of *Architectural and engineering activities* (table 5.3). The number of enterprise births in this sector, however decreased.

Table 5.3. Number of enterprises in sectors most associated with green building EU 27 (1 000)

	2008	2009
Construction buildings	939.323	874.371
Enterprise births	n/a	n/a
Specialised construction activities	2.246,184	2.201,918
Enterprise births	n/a	n/a
Architectural and engineering activities	916.136	940.327
Enterprise births	81.982	81.471

Source: EUROSTAT. Data data on number of enterprises refers to annual detailed enterprise statistics for services³⁵. Data on enterprise births refer to business demography indicators³⁶ and the total number does not include Denmark, Greece and Malta (since data for these countries is not available).

5.3. Innovation, new jobs, new skills

Due to deployment of selected green technologies in energy efficient building the demand for occupations such as architects, engineers, electricians, heating/air conditioning installers, carpenters, construction equipment, operators, roofers, insulation workers, carpenter helpers, industrial truck drivers, construction managers and building inspectors will increase.

5.3.1. New skills

Green building brings new construction techniques, and although most roles can still be filled by skilled workers from existing occupations many workers require an upgrade in their skills. *Electricians*, for example, are likely to need to be able to install and wire in photovoltaic solar panels. *Architects, engineers and consultants* will need technical skills (understanding of passive design techniques and renewable energy technologies), but also softer skills (environmental awareness and an ability to communicate), *construction company managers* will need skills such as leadership, innovation and risk management. The impact on skills needs can be qualitative as well as quantitative: for example, an expansion of retrofitting (addition of new technology or features to older systems) will not necessarily require many new skills from trained carpenters, but it may well require an increase in the total number of trained carpenters³⁷.

5.3.2. Emerging jobs

Energy efficiency analyst and *energy auditing* are among the newly emerging occupations. Analysts require an understanding of heating, ventilation and air conditioning systems, solar thermal and photovoltaic technologies, and the energy efficiency characteristics of materials. Energy auditors help prevent energy waste by inspecting buildings to find areas of air leakage and advising customers on how to fix and prevent leaks³⁸.

5.3.3. Examples of recent initiatives

Skills shortages are mainly a consequence of the rapid greening of building activity and of advances in techniques and technologies which change skill requirements faster than education

³⁵ http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/data/database (2012-10-09).

³⁶ http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/special_sbs_topics/business_demography (2012-10-09).

³⁷ ILO Research Brief 2011: Greening of the building sector is held back by skill shortages, p. 3.

³⁸ *Ibid.*

and training systems can respond. In Latvia, Riga Technical University has integrated principles of green building into basic courses for architects and engineers. In Denmark, Bachelor degree students in Architectural Technology and Construction Management can specialise in Energy Efficient Sustainable Design and Construction. In Spain, the curriculum for a new advanced technical degree in energy efficiency and solar thermal energy was developed in 2010³⁹.

³⁹ ILO Research Brief 2011: Greening of the building sector is held back by skill shortages, p.7, 8, 9.

6. Expert interviews

3srl provided guidelines for the expert interviews and a more detailed guideline for the desk research. IG Metall translated the interview guidelines into languages of the project partner countries. The partners conducted and transcribed the interviews and provided the results to 3srl in form of an template (created by 3srl). Expert interviews focused on analysing the current status and future needs in the described qualifications.

The key questions in the survey focused on specific developments in the sector within the next five years, on the possible impact on occupations and qualifications needs, and the necessary impact on education.

- Which specific developments can be detected in the sector? [differentiation of market developments, legislation/government regulations, technological developments, organisational/regional/national/ international developments]
- What impact have these developments had on occupations? [especially occupations on EQF-level 5]
- What impact should these developments have had on the education? [especially education on EQF-level 5]
- Please look at the qualification of ... [please refer to the qualification] and the professional activities which refer to this qualification.
- Please use the table “Analysis of innovation needs of the labour market” to add missing competences, skills, knowledge and professional activities and their description for the qualification.

The descriptions of the qualification/s which were analysed through expert interview were sent to the participant ahead of the interview.

As the survey focused on selected qualifications from the relevant sectors that would be updated by taking into account innovation needs, expert interviews were conducted for three of the four sectors, as shown below.

Fashion/Textile sector

- Interviewers: Politecnico di Torino
- Interviews: 2 for 1 national profile

ICT sector

- Interviewers: DEKRA, clock-it-skills
- Interviews: 1 (DEKRA) and 2 (clock-IT-skills) for 1 national profile

Mechatronics/Mechanics sector:

- Interviewers: USRV, 3srl, IG Metall
- Interviews: 2 interviews each for 1 national profile

The expert interviews provided the basis for the analysis of the innovation needs by cross referencing the results from the expert interviews with the descriptions of qualifications. The results of the expert interviews are documented in the annex of this report.

7. Updating of selected qualifications with regards to innovation needs

With the support of the semantic platform, selected qualifications from the considered sectors were updated by taking into account innovation needs.

The implementation process of updating innovation needs for selected qualifications included a combination of desk research (see the sector reports) and expert interviews. Regarding the desk research, 3srl provided sectoral information for mechanics/mechatronics, ICT and energetic efficiency/green building/construction sector. KCH provided information for fashion/textile sector. For the interviews to be conducted with labour market experts from the single occupational fields, 3srl developed interview guidelines. In a next step, IG Metall provided translations of these guidelines.

Three sectors were chosen for conducting the expert interviews. The partners DEKRA and clock-IT-skills were in charge for the interviews for the ICT sector, Politecnico di Torino conducted interviews for the fashion/textile sector, whereas the partners USRV, 3srl and IG Metall were responsible for interviews in the mechanics/mechatronics sector. In detail, the partners conducted and transcribed the expert interviews and then provided the results to 3srl in form of a template. 3srl evaluated the results and summarized them in order to make them adaptable to the project results. The profiles in the platform were therefore updated with regards to innovation needs on the basis of this analysis.

On the platform, innovation needs are shown separately from the current needs described for a qualification. They are also featured in learning outcomes following the same type of descriptors expressed in competences, skills and knowledge. When entering a qualification at the platform, the option to show the innovation needs is given on the top of the page. If the option is chosen, innovation needs are shown below.

As an example for this feature, the innovation needs for one profile (Mechatronic engineer, Austria, from the mechanics/mechatronics sector, profile provided by 3srl) are described in detail. Tasks and activities which are based on the original national profiles include:

- Maintaining and assuring the reliability of mechatronic systems
- Installing and dismantling mechatronic systems and facilities
- Installing and adjusting mechatronic components in systems and production lines
- Designing, adapting, and building mechatronic systems and facilities on the basis of client needs and site plans

Each of these tasks/activities feature different subunits. For the task/activity “Maintaining and assuring the reliability of mechatronic systems” the subunits are for example as followed:

- Perform the basic scheduled maintenance on mechatronic machines and systems
- Master the maintenance procedures for mechatronic systems
- Use preventive maintenance to assure the troublefree operation of mechatronic systems
- Develop the necessary procedures for maintenance of mechatronic devices and systems

All of the other tasks/activities are also divided into such subunits. The subunits themselves are then again described in learning outcomes (CSK). The learning outcomes for the subunit “Perform the basic scheduled maintenance on mechatronic machines and systems” are as follows.

- Competences: He/She can perform the basic scheduled maintenance on mechatronic machines
- Skills: He/She can adhere to the equipment maintenance plans
- Knowledge: Basic knowledge mechatronic machines; Knowledge maintenance plans

The image below shows an overview on the two tasks/activities “Maintaining and assuring the reliability of mechatronic systems” and “Installing and dismantling mechatronic systems and

facilities” including their subunits. In order to show the learning outcomes of a single subunit it has to be opened by clicking on it.

In the example below the learning outcomes are shown for the subunit “Perform the basic scheduled maintenance on mechatronic machines and systems”. It is possible to see the CSK as described above.

Qualification: ■ Mechatronic engineer (Mechanics/Mechatronics) INNOVATION NEEDS CHANGE QUALIFICATION LOGOUT

Professional activities ADD ACTIVITY

- + + Maintaining and assuring the reliability of mechatronic systems ADD SHARED ACTIVITY ✎ ✕
 - Units/Sub-units** ADD UNIT
 - + + Perform the basic scheduled maintenance on mechatronic machines and systems. ADD SUB-UNIT ADD LO ROW ASSIGN LAs 0 EQF ✎ ✕

Competence	Skill	Knowledge
ADD C	ADD S	ADD K
<ul style="list-style-type: none"> + + He/She can perform the basic scheduled maintenance on mechatronic machines. ✎ ✕ 	<ul style="list-style-type: none"> + + He/She can adhere to the equipment maintenance plans. ✎ ✕ 	<ul style="list-style-type: none"> + + Basic knowledge mechatronic machines ✎ ✕ + + Knowledge maintenance plans ✎ ✕
 - + + Master the maintenance procedures for mechatronic systems. ADD SUB-UNIT ASSIGN LAs 0 EQF ✎ ✕
 - + + Use preventive maintenance to assure the troublefree operation of mechatronic systems. ADD SUB-UNIT ASSIGN LAs 0 EQF ✎ ✕
 - + + Develop the necessary procedures for maintenance of mechatronic devices and systems. ADD SUB-UNIT ASSIGN LAs 0 EQF ✎ ✕
 - + + Installing and dismantling mechatronic systems and facilities ADD SHARED ACTIVITY ✎ ✕
 - Units/Sub-units** ADD UNIT
 - + + Use written instructions to install and dismantle individual components. ADD SUB-UNIT ASSIGN LAs 0 EQF ✎ ✕
 - + + Master the installation and dismantling of mechatronic systems ADD SUB-UNIT ASSIGN LAs 0 EQF ✎ ✕
 - + + Provide independent mechatronic solutions for the construction of production lines ADD SUB-UNIT ASSIGN LAs 0 EQF ✎ ✕

The option to additionally show innovation needs can be found at the top of the page. For the specific profile used here as an example, two tasks/activities were identified: “Applying diverse forms of technologies“ and “Multiple and micro processor technique”. These tasks/activities are also expressed in learning outcomes (CSK). The display of the innovation needs is situated just below the display of the original profile.

Innovation needs UPDATE QUALIFICATION

Professional activities ADD ACTIVITY

- + + Integrated technologies ADD UNIT ✎ ✕
 - Units/Sub-units** ADD SUB-UNIT ADD LO ROW ✎ ✕
 - + + Applying diverse forms of technologies

Competence	Skill	Knowledge
ADD C	ADD S	ADD K
<ul style="list-style-type: none"> + + He/She is able to apply diverse forms of technology in an integrated way ✎ ✕ 	<ul style="list-style-type: none"> + + He/She is able to translate between different technical terminologies ✎ ✕ + + He/She is able to combine different forms of technology by taking into account the overall aim ✎ ✕ 	<ul style="list-style-type: none"> + + Knowledge technical terminologies ✎ ✕ + + Knowledge bridge technologies ✎ ✕
 - + + Multiple and micro processor technique

Competence	Skill	Knowledge
ADD C	ADD S	ADD K
<ul style="list-style-type: none"> + + He/She is able to work on micro processors ✎ ✕ 	<ul style="list-style-type: none"> + + He/She is able to micro- and macro processors in an integrated way. ✎ ✕ 	<ul style="list-style-type: none"> + + Knowledge micro processors ✎ ✕ + + Knowledge multiple processors ✎ ✕

The image shows the status of the platform when both of the innovation needs features for this profiled are opened by clicking on it. For the first of the two innovation needs the featured learning outcomes are as follows.

- Competences: He/She is able to apply diverse forms of technology in an integrated way
- Skills: He/She is able to translate between different technical terminologies; He/She is able to combine different forms of technology by taking into account the overall aim
- Knowledge: Knowledge technical terminologies; Knowledge bridge technologies

8. Discussion of results

The TAMTAM platform offers the possibility of taking information about new skills and new jobs into account. It therefore features a section of “innovation needs” for each profile shown on the platform.

An initial phase of integrating innovation needs originated in the results of the expert interviews. Innovation needs are therefore also expressed in Competences, Skills and Knowledge in order to ensure their comparability with the original profiles. Through this the profiles featured on the platform will be open for further expansion in the future.

The interview partners appreciated the opportunity to update information on the qualifications included on the platform.