ESCO handbook

European Skills, Competences,
Qualifications and Occupations

ESCO

ESCO handbook

European Skills, Competences, Qualifications and Occupations

European Commission

Directorate-General for Employment, Social Affairs and Inclusion

Directorate E

ESCO handbook

Comments would be gratefully received and should be sent to:

EMPL-ESCO-SECRETARIAT@ec.europa.eu

Contents

Foreword

ESCO: Connecting people and jobs!

The digital transformation and the great success of information technologies have radically changed the way the labour market is organised. Over the last decade, the use and importance of new online recruitment tools, such as online job platforms and social media, have increased widely. Big data analysis of job vacancies and CVs allows individuals, employers and policy makers to detect new emerging skills, mismatches and gaps, and to react accordingly – for instance, by adapting their career path, designing new training programmes or adopting better services tailored to the labour market reality.

In this digital era, our education and training systems need to modernise to ensure that young people have appropriate skills and are prepared for the jobs in the digital economy. Employers need access to more accurate and up-to-date information about skills and qualifications to better manage their workforce. Recruiters and employment services need to incorporate digital technologies into their operations to better match people to jobs and improve their services. This is particularly important in a context of persistent skills gaps, which are both a barrier to people's employment chances and a risk for economic growth. In fact, despite high levels of unemployment in Europe – particularly among young people – 40 % of employers cannot find people with the right skills to fill their vacancies[1]. Ensuring a fair and well-functioning labour market and making sure people's skills keep pace with change are key priorities of the Commission, as stated in the European Pillar of Social Rights[2].

To meet this challenge, the Commission has developed ESCO, a classification of European Skills, Competences, Qualifications and Occupations available in 26 European languages. As a multilingual digital tool, ESCO connects people with jobs by supporting both employers looking to find the right people for their vacancies and jobseekers looking to find the right jobs for their skills. It connects employment to education by providing a common language. On the one hand, this helps education and training providers to better understand labour market needs and adapt curricula accordingly. On the other hand, it helps employers to have a better understanding of the learning outcomes acquired by jobseekers. Last but not least, ESCO connects labour markets from different Member States by allowing jobseekers and employers to communicate more effectively about skills, training and jobs in any chosen European language.

ESCO is at the heart of several Commission initiatives in the area of skills and qualifications aimed at making labour market and education systems more

---

1 Source: European Company Survey, Eurofund, 2013

2 https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights_en

transparent, stimulating mobility and creating opportunities: the New Skills Agenda for Europe[3], EURES[4], the EQF Recommendation[5], EUROPASS[6] and the EU Skills Panorama[7]. Most importantly, ESCO is the result of a joint effort. I would personally like to thank the commitment of all the stakeholders that have made it possible for ESCO to become a reality: national authorities, social partners, public employment services, labour market experts, sectoral organisations and education institutions, to name just a few. And this is only the beginning: ESCO will be continuously improved and aligned to labour market changes. I invite you to participate in this process, as your commitment will help to keep the classification updated and fit for purpose in the future.

Stay connected!

Marianne Thyssen, European Commissioner for Employment, Social Affairs and Labour Mobility

---

3 http://ec.europa.eu/social/main.jsp?catId=1223

4 https://ec.europa.eu/eures/public/es/homepage

5 http://data.consilium.europa.eu/doc/document/ST-9620-2017-INIT/en/pdf

6 http://ec.europa.eu/social/main.jsp?catId=1266&langId=en

7 http://skillspanorama.cedefop.europa.eu/en

Introduction

The ESCO handbook contains general information about ESCO version 1.0 (ESCO v1), the first fully fledged version of ESCO. It gives a general overview of the different aspects of the classification and is divided in four parts:

- **I. What is ESCO?** ESCO is a common classification language designed to connect people to jobs. In this chapter, you will learn how it works and how it is structured.

- **II. Developing ESCO:** In this chapter, you will find information about the process that led to the publication of ESCO v1 including the actors involved, the governance structure and the different steps in the development of the classification.

- **III. Using ESCO:** ESCO terminology can be used to support job matching, job searching, career management or labour market analysis. In this chapter, you will learn more about the added value of ESCO and examples of how it can be utilised.

- **IV. Keeping ESCO up-to-date:** In this chapter, you will learn how ESCO has been designed to adapt to the evolution of the labour market and the education and training sector, in order to remain fit for purpose.

More detailed, technical and targeted information can be found in the following related publications[8]:

- **The ESCO guidelines:** A document explaining how to develop content for the ESCO classification. It includes definitions of the ESCO concepts, a description of the ESCO content model, a set of rules, constraints, do's and don'ts, as well as methodologies for developing and updating ESCO.

- **The ESCO mapping manual:** A methodology on how to map other classifications to ESCO.

- **The Qualifications Metadata Schema v1.0 and the manual on how to publish information as Linked Open Data:** National authorities and awarding bodies wishing to publish information on their qualifications in ESCO need to structure the data according to this scheme. A manual on how to publish this information will help them understand and apply the process.

- **ESCO technical documentation:** Detailed information on the technical aspects related to ESCO.

- **Continuous improvement document:** A document detailing the continuous improvement process and the different ways stakeholders can contribute to keep ESCO up-to-date.

At any time, the reader can find updated information and all necessary documentation on the ESCO Service Platform: https://ec.europa.eu/esco/portal/home

---

[8] Some of these publications are not available yet. Once ready, they will be published on the ESCO Service Platform.

PART I – WHAT IS ESCO?

ESCO is the multilingual classification[9] of European Skills, Competences, Qualifications and Occupations. The ESCO classification identifies and categorises skills, competences, qualifications and occupations relevant for the European labour market and education and training.

The Commission has developed ESCO with the following aims:

- to improve the communication between the education and training sector and the EU labour market;

- to support geographical and occupational mobility in Europe;

- to make data more transparent and easily available for use by various stakeholders, such as public employment services, statistical organisations and education organisations;

- to facilitate the exchange of data between employers, education providers and job seekers irrespective of language or country;

- to support evidence-based policy making by enhancing the collection, comparison and dissemination of data in skills intelligence and statistical tools, and enabling better analysis of skills supply and demand in real-time based on big data.

26 languages

+350 000 occupations terms

+30 pilot projects

3 888 comments provided in the online consultation

4 103 ratings provided in the online consultation

13 485 skills

ESCO

11 Sectoral Reference Groups

2 942 occupations

3 pillars

1130 experts registered in the online consultation

+514 000 skills terms

---
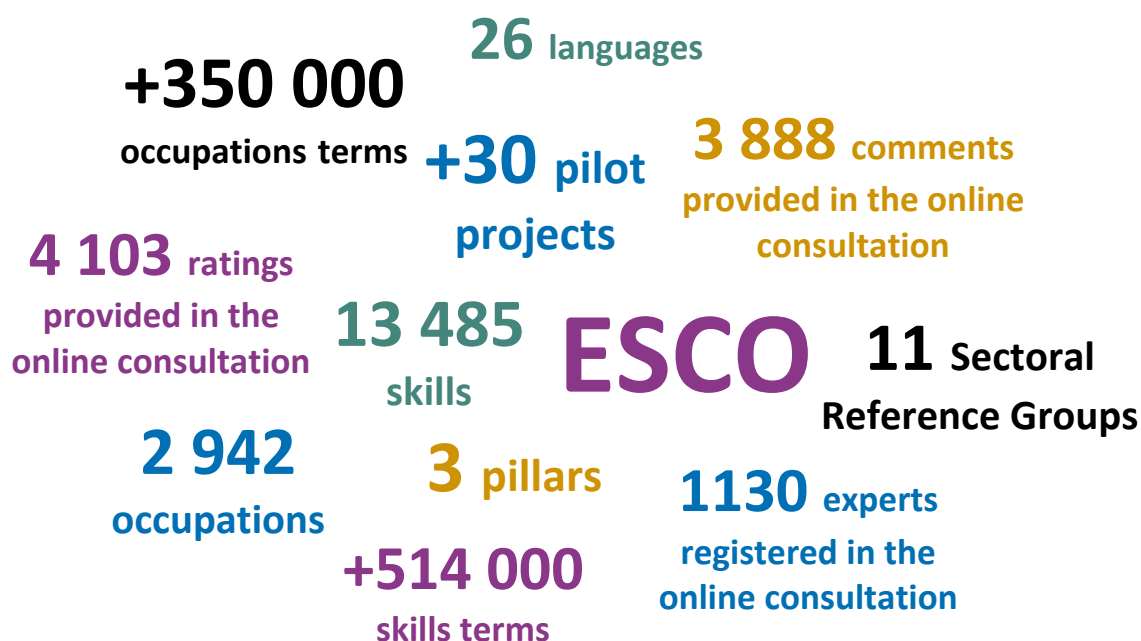
[9] A classification or taxonomy is the systematic arrangement of something into groups or categories according to established criteria (in this case, of occupations, skills, competences and qualifications).

1. The structure of ESCO

ESCO is organised in three pillars:

- the occupations pillar;
- the knowledge, skills and competences pillar;
- the qualifications pillar.

These three pillars are interrelated with each other, as explained in the following section.

Overall, this three-layered structured approach allows ESCO to organise terminology for the European labour market and the education/training sector in a consistent, transparent and usable way.

Occupations   **Qualifications**

Skills
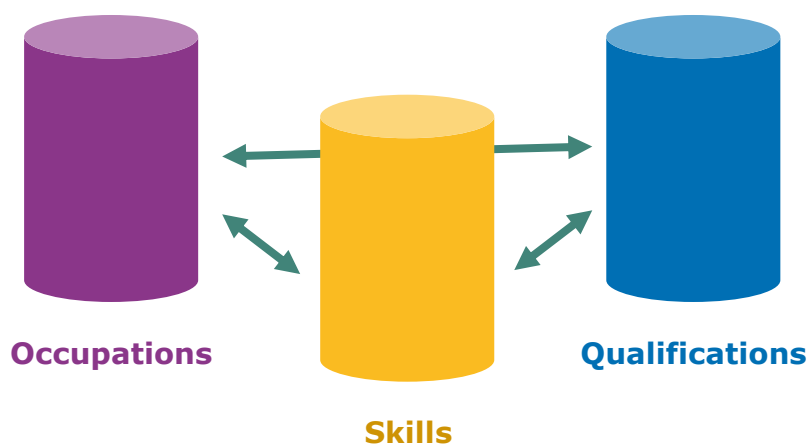
Figure 1: ESCO three-pillar structure

Concepts and terms in ESCO

In the development of ESCO, a distinction has been made between concepts and terms. A *concept* is a thing, idea or shared understanding of something. Concepts are not language dependent. A *term* refers to the linguistic description of a concept and is therefore language dependent.

Example: The idea or shared understanding of a person baking bread and selling it to customers is a concept. Terms that are frequently used to refer to this concept are e.g. "baker" in English or "Bäcker/Bäckerin" in German.

In ESCO, each concept is associated with at least one term in all ESCO languages. In many cases, a language contains more than one term to refer to the same or a very similar concept. ESCO can therefore contain several terms per concept.

Within the ESCO data model, each term is a separate element and all terms always have a relationship with a concept. This is illustrated in the following diagram, which shows a concept-term relationship for eight languages:
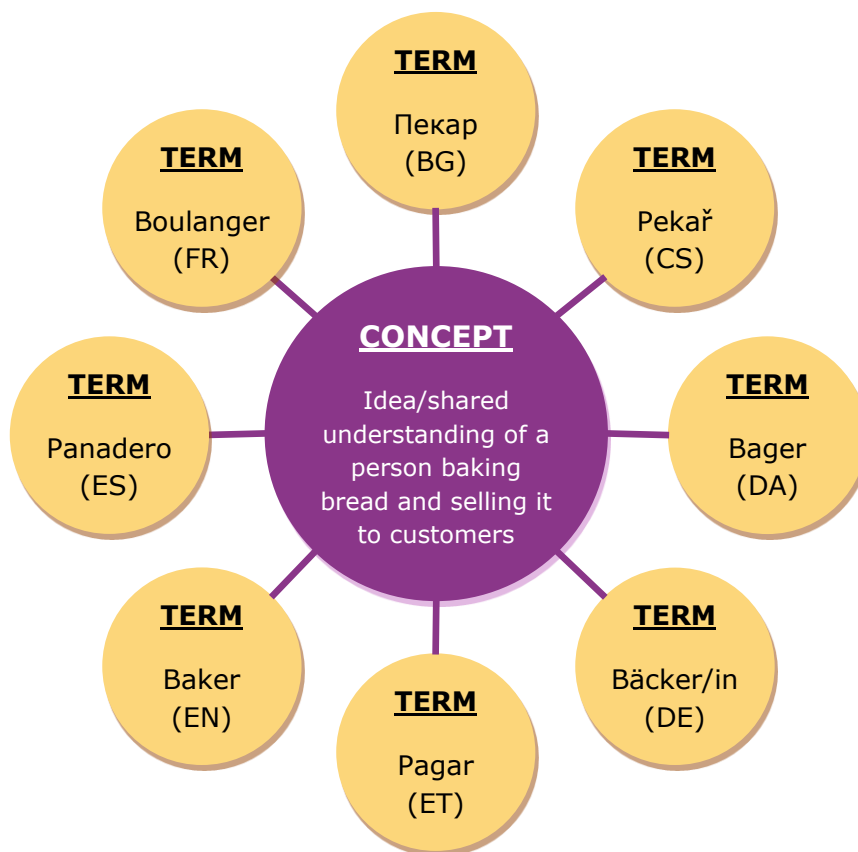
Figure 2: Concepts and terms

In ESCO, three types of terms are used: preferred terms, non-preferred terms and hidden terms.

Each ESCO occupation and skill concept has at least one term for each of the 26 ESCO languages: the **preferred term.** It is not reused for another occupation or skills in the same language and is therefore unique. Out of a group of terms with a similar meaning, the preferred term is the one that best represents the occupation or skill.

As previously mentioned, a language can contain more than one term to refer to the same/a similar concept and ESCO can therefore contain several terms per concept in each language. **Non-preferred terms** can be synonyms (words with similar or the same meanings), but can also be spelling variants, declensions, abbreviations, etc. They are regularly used by jobseekers, employers or education institutions to refer to concepts that are described in the classification with the preferred term.

ESCO also captures terms that are commonly used in the labour market to refer to an occupation, but are also considered outdated, misspelled or politically incorrect. These are referred to as **hidden terms** as they are useful for indexing, searching and text mining purposes, but are invisible to the end users. When searching for a hidden term on the ESCO portal, the user is automatically redirected to the occupation with its preferred term. The hidden term is not displayed.

1.1 The occupations pillar

The occupations pillar aims to describe all occupations relevant for the European labour market. ESCO v1 features 2 942 occupations.

Occupations in ESCO

Occupations are not the same as jobs (which are not covered in ESCO). Their distinction is based on the following definitions:

- **Occupation:** a '*set of jobs* whose main tasks and duties are characterised by a high degree of similarity'[10];

- **Job:** a 'set of tasks and duties carried out, or meant to be carried out, by one person for a particular employer, including self-employment'[11].

> ***Example:*** *Being the "pilot of Boeing 747 aircraft for the route Paris-New York" is a job. "Commercial pilot" or "airline transport pilot" are occupations (i.e. groups of jobs, to which this job belongs). Occupations can be used as job titles. An employer recruiting for the above-mentioned position might entitle the vacancy notice with the name of an occupation, e.g. "airline transport pilot".*

The ESCO occupations include:

- relevant occupations at EU level, regardless of the size of the business;

- self-employed occupations;

- volunteer-based occupations;

- subsistence-based occupations;

- arts and crafts occupations;

- political mandates in case they constitute a job (e.g. mayor).

Occupational profiles

Each occupation concept describes the meaning of the occupation, and provides a number of useful pieces of information about it (metadata[12]).

The core element that defines an ESCO occupation is the main idea or understanding of what the occupation is about and how it differs from other occupations. These are captured in the description and scope note.

---

10 Source: International Labour Organisation, ILO, International Standard Classification of Occupations (ISCO-08) – Conceptual Framework

11 Ibid.

12 Metadata is a systematic method for describing […] resources and thereby improving access to them (source: http://ec.europa.eu/ipg/content/optimise/metadata/index_en.htm)

- A **description** in ESCO is a text field providing a short explanation of the meaning of the occupation and how it should be understood. Most importantly, it clarifies its semantic boundaries. For this reason, a description is always provided for each ESCO occupation.

- A **scope note** in ESCO is sometimes used to make things less ambiguous. It clarifies specialisms that are considered to be within the scope and it redirects the user to similar occupations that are out of scope of an occupation.

If a formal definition that is either widely accepted or legally binding throughout the EU is available, this is captured in the **definition field.** This particularly includes definitions agreed by social partners at a European level or definitions stipulated by law.

Regulated professions

Employers and jobseekers can use ESCO to gain insights into occupations and skills that are relevant for the labour market. However, they also need to know if there are any legal requirements associated with an occupation. Therefore, the laws that regulate access to professions also need to be taken into account.

ESCO ensures that citizens can easily gather information about how occupations are regulated in each Member State when they are searching for a job. By providing a direct reference to the Regulated Professions Database[13], ESCO increases transparency regarding the legal requirements of these occupations.

Additionally, for occupations that are regulated at European level, ESCO provides a direct link to the Directive 2005/36/EC on the recognition of professional qualifications, as amended by the Directive 2013/55/EC[14].

Knowledge, skills and competences in occupational profiles

Each ESCO occupation is related to essential and optional knowledge, skill and competence concepts:

- **Essential** are those knowledge, skills and competences that are usually relevant for an occupation, independent of the work context, employer or country.

- **Optional** are those knowledge, skills and competences that may be relevant or occur when working in an occupation depending on the employer, working context or country. Optional knowledge, skills and competences are very important for job-matching because they reflect the diversity of jobs within the same occupation.

---

13 http://ec.europa.eu/growth/tools-databases/regprof/

14 Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications, OJ L 255, 30.9.2005, as amended by Directive 2013/55/EU of the European Parliament and of the Council of 20 November 2013 amending Directive 2005/36/EC on the recognition of professional qualifications and Regulation (EU) No 1024/2012 on administrative cooperation through the Internal Market Information System ('the IMI Regulation') OJ L 354, 28.12.2013

Example: waiter/waitress	
Essential skill	Serve beverages
Optional skill	Prepare flambeed dishes

Note that, while indicated as an optional skill for the 'waiter/waitress' occupation, 'prepare flambé dishes' may be essential for a specific job (e.g. for working in a French restaurant that serves Crêpes Suzette).

Occupation blueprint

The image on the next two pages shows an example of the information attached to each ESCO occupation and its relationship to knowledge, skills and competences.

waiter/waitress

Description

Waiters/waitresses supply guests with food and drinks as requested. Waiters/waitresses usually work in restaurants, bars and hotels. This involves the preparation of tables, serving food or beverages and taking payments.

Scope notes

Excludes head waiter/head waitress. \ Excludes bartender.

Alternative label

wait staff

chef de rang

waitress

event server

waiting staff

waiter

table waiter

Regulatory aspect

To see if and how this occupation is regulated in EU Member States, EEA countries or Switzerland please consult the Regulated Professions Database of the Commission. Regulated Professions Database http://ec.europa.eu/growth/single-market/services/free-movement-professionals/qualifications-recognition_en

Hierarchy

- ⌄ Service and sales workers
  - ⌄ Personal service workers
    - ⌄ Waiters and bartenders
      - ⌄ Waiters
        - waiter/waitress

Narrower occupations

sommelier

Essential skills and competences

advise guests on menus for special events

arrange tables

assist VIP guests

assist clients with special needs

assist customers

attend to detail regarding food and beverages

check dining room cleanliness

clean surfaces

comply with food safety and hygiene

identify customer's needs

maintain customer service

maintain personal hygiene standards

maintain relationship with customers

measure customer feedback

prepare alcoholic beverages

prepare hot drinks

prepare the restaurant for service

present menus

process payments

serve beverages

serve food in table service

serve wines

supervise food quality

take food and beverage orders from customers

take payments for bills

welcome restaurant guests

work in a hospitality team

Essential Knowledge

alcoholic beverage products

dietary regimes

food and beverages on the menu

Optional skills and competences

apply foreign languages in hospitality

decant wines

detect drug abuse

dispose waste

educate customers on coffee varieties

educate customers on tea varieties

maintain incident reporting records

prepare flambeed dishes

prepare service trolleys

process reservations

recommend wines

use food cutting tools

Optional Knowledge

laws regulating serving alcoholic drinks

local area tourism industry

sparkling wines

Status

released

The structure of the occupations pillar

Occupations in ESCO are structured through their mapping to the International Standard Classification of Occupations (ISCO-08), which has been developed by the International Labour Organisation (ILO). The ESCO occupations and their ISCO-08 hierarchy make up the ESCO occupations pillar.

ISCO-08 provides the top four levels while ESCO occupations provide the fifth and lower levels. Each ESCO occupation is assigned to one ISCO-08 unit group (even if they are not directly related to it, e.g. if they are at level six or seven).

ESCO provides the translation of ISCO in 24 languages (Icelandic and Irish are not included).
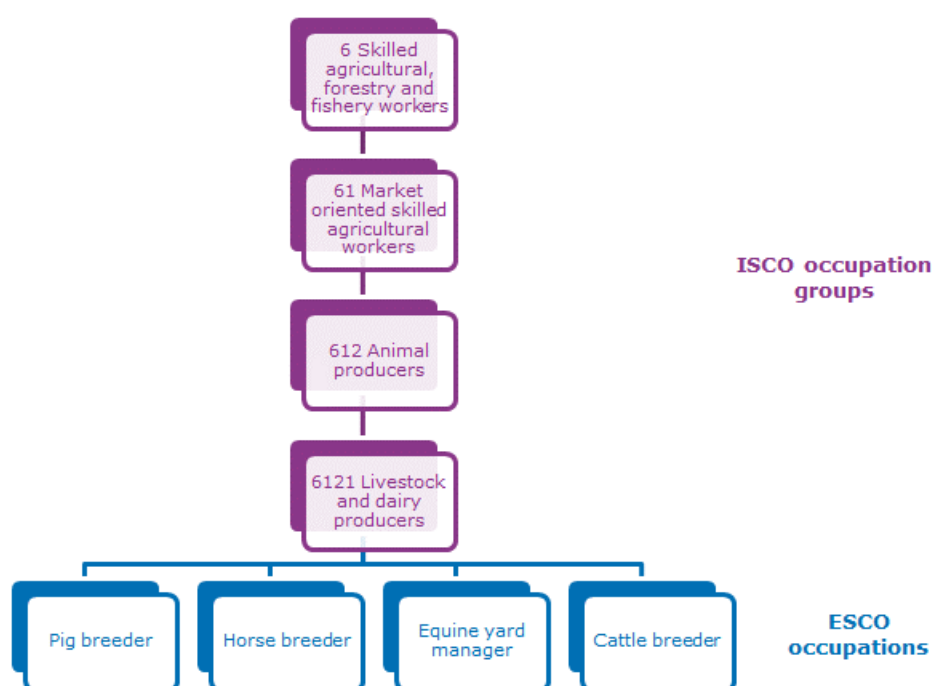
Figure 3: The structure of the occupations pillar

Occupations primary hierarchy

Occupations in ESCO are described at different levels, depending on the language used and requirements of the labour market. However, these may differ between groups of countries (e.g. some Member States may need to cover different types of sommelier, while for others this occupation may have little relevance). In order for ESCO to accommodate both cases, some occupations have broader-narrower relations between them.

However, only the occupations that are relevant for the European labour market are included. Therefore, the more detailed occupations do not necessarily cover the entire scope of the more generic occupation. (e.g. not all types of sommelier are covered under sommelier).
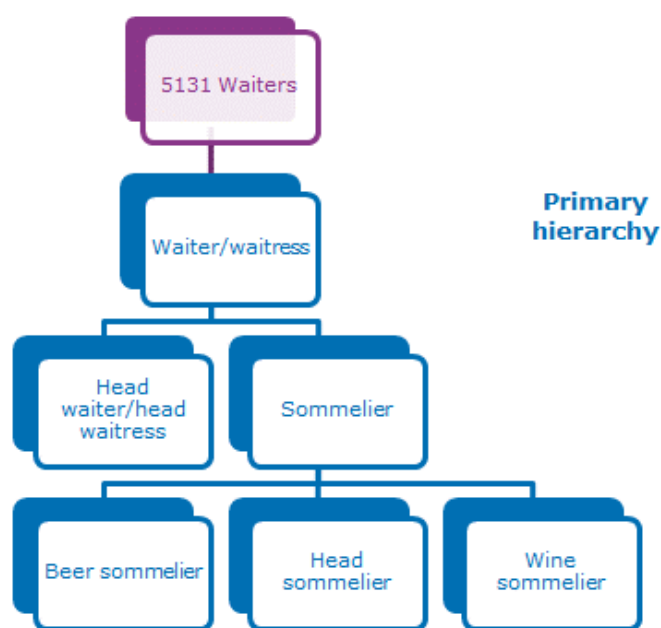
Figure 4: Primary hierarchy

1.2 The knowledge, skills and competences pillar

The knowledge, skills and competences pillar, also referred to as the "skills pillar", provides a comprehensive list of skills that are relevant for the European labour market. ESCO v1 contains 13 485 skills.

Knowledge, skills and competences concepts

The skills pillar includes knowledge, skills and competences that are defined as follows[15]:

- **Knowledge:** The body of facts, principles, theories and practices that is related to a field of work or study. Knowledge is described as theoretical and/or factual, and is the outcome of the assimilation of information through learning.

- **Skill:** The ability to apply knowledge and use know-how to complete tasks and solve problems. 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).

- **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.

---

15 Source: Council Recommendation of 22 May 2017 on the European Qualifications Framework for lifelong learning and repealing the Recommendation of the European Parliament and of the Council of 23 of April of 2008 on the establishment of the European Qualifications Framework for lifelong learning https://ec.europa.eu/ploteus/sites/eac-eqf/files/en.pdf

Example: *Working as a "commercial pilot" requires the competence to combine knowledge about "geographic areas" and "air transport law" with skills relating to "read maps" and "execute flight plans".*

While sometimes used as synonyms, the scope of the terms "skill" and "competence" can be distinguished. "Skill" refers to the use of methods or instruments in a particular setting and in relation to defined tasks. "Competence" is broader and refers 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. However, there is no distinction between skills and competences recorded in the ESCO skills pillar.

Content of the skills pillar

As for the occupations, ESCO provides metadata for each concept in the skills pillar including the following:

- A preferred term that is used to present the concept.

- Non-preferred terms (synonyms, spelling variants, declensions, abbreviations, etc.).

- Hidden terms (e.g. outdate, misspelled or politically incorrect terms).

- A scope note that clarifies the semantic boundaries of the concept.

- The skill type: i) skill/competence concepts or ii) knowledge concepts.

- The relationship with ESCO occupations. This shows for which occupations the knowledge, skill or competence is typically relevant including those for which it is essential and those for which it is optional. In some cases, a relationship will show how the knowledge, skill or competence is relevant for other knowledge, skills and competences. The relationship also includes the distinction between essential and optional.

- The reusability level, which indicates how widely a knowledge, skill or competence concept can be applied. This is crucial for supporting occupational mobility. ESCO distinguishes four levels of skill reusability:

  - **Transversal knowledge, skills and competences** are relevant to a broad range of occupations and sectors;

  - **Cross-sector knowledge, skills and competences** are relevant to occupations across several economic sectors;

  - **Sector-specific knowledge, skills and competences** are specific to one sector, but are relevant for more than one occupation within that sector;

  - **Occupation-specific knowledge, skills and competences** are usually applied only within one occupation or specialism.

Transversal knowledge, skills and competences

As mentioned above, transversal knowledge, skills and competences are relevant to a broad range of occupations and economic sectors. They are often referred to as core, basic or soft skills and are the cornerstone for the personal development of a person.

Within the skills pillar, transversal skills and competences are organised in a hierarchical structure with the following five headings:

- thinking
- language
- application of knowledge
- social interaction
- attitudes and values

Both the concepts and hierarchical structure of the transversal knowledge, skills and competences were developed by the Cross-sector Reference Group[16]. The development was based on the analysis of a wide range of existing national and sectoral classifications, the European Dictionary of Skills and Competences (DISCO)[17] and other sources.

Skill contextualisation

Skill contextualisation is a method to create knowledge or skill and competence concepts by analysing how transversal skills, competences or knowledge are applied in the specific context of a sector or an occupation. This allows transversal knowledge, skills and competences that are rather abstract to be brought to a more detailed level so that they can be directly used in occupational profiles.

> **Example:** *The skill "measure" is too abstract to be linked directly to the occupation "metal furnace operator". This relationship would produce too many results if used in competence-based job matching since measuring is relevant for a large number of occupations and sectors.*
>
> *Through skill contextualisation, the skill can be made more specific. A skill named "measure furnace temperature" could, for example, be used in the occupational profile of the "metal furnace operator".*

Structure of the skills pillar

The ESCO v1 skills pillar does not contain a full, top-down hierarchical structure. Instead, the 13 485 elements of the pillar are structured in four different manners:

---

[16] See Part II.1: The governance framework

[17] http://disco-tools.eu/disco2_portal/

- through their relationship with occupations, by using occupational profiles as an entry point;

- through a hierarchy (only for transversal knowledge, skills and competences);

- through relationships indicating how knowledge, skills and competences are relevant to other knowledge, skills and competences (in particular in cases of the contextualisation of skills);

- through functional collections that allow subsections of the skills pillar to be selected, according to the purpose it is going to be used for. For example, an organisation may want to use ESCO to implement an online CV editor where a user can indicate his/her language skills. The organisation would not need all the ESCO skills in that CV section, only the language skills. If a user searches for "Chinese" in this section, the system should suggest "Chinese", "understand spoken Chinese", "understand written Chinese" or "interact verbally in Chinese", but not "traditional Chinese medicine" or "give shiatsu massages". A functional collection would allow the user to pick exactly the skills (or occupations) s/he is looking for. ESCO v1 includes three functional collections: Digital transversal skills (identical to the Digital Competence Framework)[18]; Language skills; Transversal skills.

Skill blueprint

The image below shows an example of the information attached to each ESCO skill.

Essential skill/competence of
ICT environmental manager
ICT business analysis manager
ICT project manager
call centre manager
ICT consultant
software manager
ICT research manager
call centre supervisor

Optional skill/competence of
ICT business analyst
software analyst
radio technician
service manager

Status
released

1.3   The qualifications pillar

The qualifications pillar aims to collect existing information on qualifications[19]. The final objective of the pillar is to provide a comprehensive list of qualifications relevant for the European labour market.

Content of the qualifications pillar

Qualifications in ESCO come from two types of sources:

- National qualifications databases of Member States. These qualifications are included in National Qualifications Frameworks that have been referenced to the EQF. Since 2014, the Commission has been financially supporting Member States and other partner countries (EFTA, EEA and candidate countries) to develop national qualifications databases and to interconnect these with the Learning Opportunities and Qualifications in Europe portal (LOQ)[20] and with ESCO.

- Other qualifications that are directly provided to ESCO by awarding bodies[21]. These are not part of national qualification frameworks but are also relevant for the European labour market. They include private, sectoral and international

---

[19] As defined by EQF Recommendation, a qualification is the 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 (2016): http://data.consilium.europa.eu/doc/document/ST-9620-2017-INIT/en/pdf

[20] https://ec.europa.eu/ploteus

[21] "Body issuing qualifications (certificates, diplomas or titles) and formally recognising the learning outcomes (knowledge, skills and/or competences) of an individual, following an assessment and validation procedure" (Cedefop, 2008)

qualifications[22]. The Commission is currently piloting this approach and will discuss the results and following steps with Member States.

In contrast with the occupations and skills pillars, the qualifications pillar is therefore populated exclusively by external sources, not by data created by the Commission.

Principles

When collecting information on individual qualifications, the Commission applies the following principles:

- **Subsidiarity:** The competences of Member States, their different education and training system traditions, and where applicable, the autonomy of the awarding bodies are fully respected.

- **Learning outcomes approach:** ESCO follows the learning outcomes approach, which expresses what someone knows, understands and is able to do on completion of a learning process.

- **Bridging the communication gap:** Information on qualifications can be interlinked with the skills pillar, supporting closer cooperation between employment and education/training.

- **Transparency:** Information on qualifications needs to be fully transparent. This includes information that is required by market actors to assess the quality and trustworthiness of a qualification.

- **Up-to-date:** Data on qualifications needs to be up-to-date, reflecting the actual qualifications landscape in Europe.

- **Non-discriminatory:** Transparent information, including on quality assurance, is provided, but no judgement on the quality of qualifications is made by the Commission.

- **Complementarity between ESCO and the EQF:** The qualifications pillar of ESCO is developed in full compliance and complementarity with the EQF.

Information about qualifications in ESCO

The qualifications pillar supports the understanding of the individual qualifications needed by employers, public and private employment services, learners, workers, jobseekers, education and training providers, and other actors. This information should be as complete and transparent as possible to meet their needs. Information on qualifications in ESCO follows the elements for data fields for the electronic publication of information on qualifications included in Annex VI of the EQF Recommendation.

---

[22] As defined by the EQF Advisory Group (2017), an international qualification is a qualification awarded by a legally established international body (association, organisation, sector or company), or by a national body acting on behalf of an international body, that is used in more than one country and that includes learning outcomes assessed with reference to standards established by an international body.

Therefore, only qualifications data that includes the following core information will be displayed in ESCO[23]:

Qualifications data: core information	
Title	Exact title of the qualification (without translation).
Field	Based on ISCED Fields of Education and Training 2013[24].
Country/region	Based on the European nomenclature of territorial units for statistics (NUTS)[25].
EQF level	Only relevant for qualifications that already have an EQF level assigned through the referencing process of national qualifications frameworks to the EQF.
Awarding body or competent authority	Name of the awarding body, location and hyperlink to the website.
Description of the qualification expressed in learning outcomes	Description of what the learner is expected to know, understand and be able to do. This description shall consist of open text fields, with no prescribed use of standard terminology and no obligation for the Member States to translate the description into other EU languages.

Other fields:

- credit points/ notional workload needed to achieve the learning outcomes
- internal quality assurance processes
- external quality assurance/regulatory body
- further information on the qualification
- source of information
- link to relevant supplements
- URL of the qualification
- information language (code)
- entry requirements
- expiry date (if relevant)
- ways to acquire qualification
- relationship to occupations or occupational fields

Information on other fields is optional and should be included if available, as this complementary information increases the transparency of the qualifications for users.

---

23 Based on Annex VI of the EQF Recommendation (2016)

24 http://www.uis.unesco.org/Education/Documents/isced-fields-of-education-training-2013.pdf

25 http://ec.europa.eu/eurostat/web/nuts/overview

In particular, information on quality assurance adds an important element of transparency that will enhance trust in the published qualifications.

Qualifications will only be displayed in ESCO if they comply with these core data requirements.

> **The Qualifications Metadata Schema**
>
> Information can only be comparable throughout Europe if all Member States and other actors have a common view on the attributes that all qualifications share such as the title, the awarding body, the EQF level, the description of the learning outcomes, etc. This common understanding or common language is structured in an agreed 'metadata schema'.
>
> A schema is a logical plan showing the relationships between metadata elements, normally by establishing rules for the use and management of metadata. The schema tells IT systems, search engines and web portals (such as the LOQ portal or the ESCO Service Platform) how to search for information and what kind of information to look for on qualifications. Using a schema for qualifications makes it easier to integrate information with classifications like ESCO and it enables qualifications to be linked and integrated easily with other structured metadata published on the Internet. The current version of the schema (Qualifications Metadata Schema v1.0) is available on the ESCO Service Platform.
>
> Member States and other stakeholders wishing to publish information on their qualifications in ESCO need to structure their data according to the qualification metadata scheme (QMS) and upload it in the Qualifications Dataset Register (QDR), a central platform that manages the exchange of qualification data between different stakeholders and European portals (in particular LOQ and ESCO).
>
> In the framework of the Erasmus+ programme, the Commission has made funding available to support any EU Member States and partner countries (EFTA, EEA and candidate countries) wishing to create or upgrade their national qualifications databases according to the QMS and link them to European portals (ESCO and LOQ). Calls for proposals have been published for this purpose on a yearly basis since 2014.

Linking qualifications to other pillars
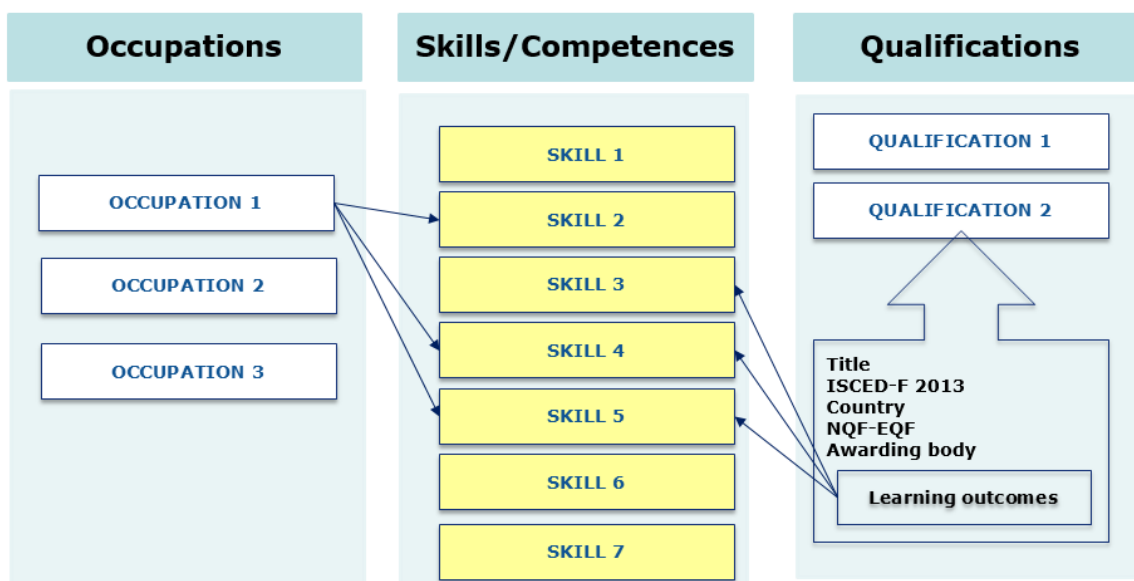
Figure 5: Linking qualifications with the occupations and skills pillars

Links with the occupations pillar

Direct relationships between qualifications in ESCO and the occupations pillar are only displayed if they already exist at national level. It is up to Member States to decide if they develop such data. The relationship can indicate, for instance, if a qualification is a requirement in order to work in an occupation in the specific Member State.

Otherwise, the relationship between occupations and qualifications is indirect, via the skills pillar, as shown in Figure 5.

Links with the skills pillar

Organisations that provide data on qualifications can annotate learning outcomes descriptions with ESCO skills terminology: they can add knowledge, skills and competence concepts in the skills pillar that correspond to the learning outcomes description of the qualification.

This additional information will help people better understand the content of the qualification. For example, educational experts might prefer to look at the learning outcomes description created by the awarding body to understand the content, but an employer in another Member State might find it easier to look at the ESCO skills (which are available in 26 languages). Interlinking learning outcomes descriptions of qualifications with the skills and competences concepts will enable better understanding of the scope of qualifications and their relevance to the labour market.

In the example below, the skill "maintain a vessel's weather and watertight integrity" corresponds to the ESCO skill "ensure watertight integrity".

Unit title: Vessel Construction and Stability

Learning outcomes:

- Know the main construction features of different vessel types.

- Understand vessel stability and flotation.

> LO as defined by the Scottish Authority

> Assess stability of vessels - Evaluate the two kinds of stability of vessels, namely transversal and longitudinal.

> Additional data provided by related ESCO concept

Example of annotation of the qualification "Diploma in maritime studies-sea fishing", UK-Scotland, Scottish Qualifications Authority. Source: pilot project with the Scottish Qualifications Authority, February 2017.

2. ESCO in relation to other classification systems and frameworks

The Commission is publishing ESCO v1 as Linked Open Data[26] so that it can be connected to a range of external knowledge sources such as classification systems, controlled vocabularies and frameworks, databases, syntactical standards or tools that make use of ESCO to provide services.

Interested parties can reference their classification to ESCO. This is typically done by creating mapping tables that establish a relationship between each concept in their classification to a concept in ESCO. As a result, each party that uses ESCO v1 or a classification that is mapped to it can exchange information across systems and language barriers.
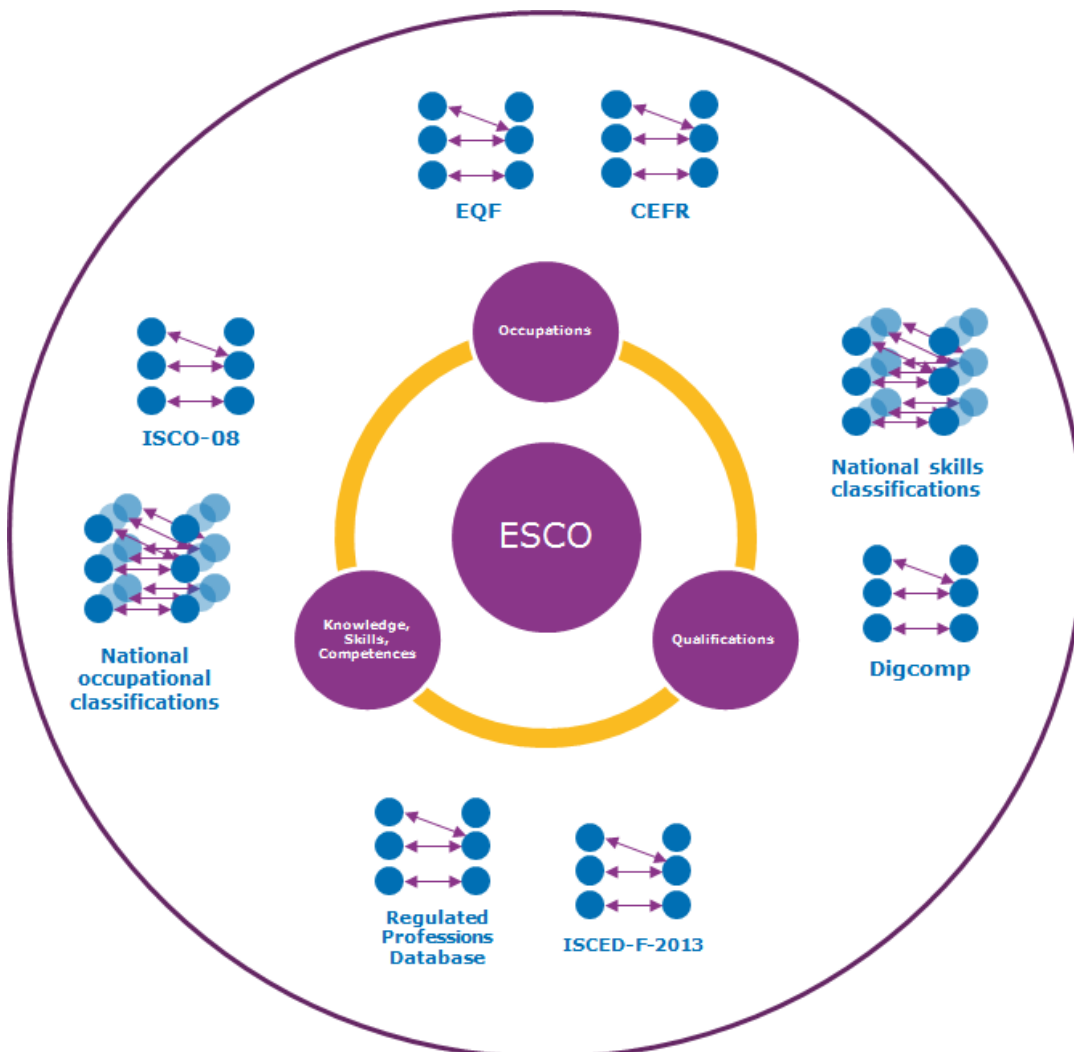
Figure 6: ESCO interoperability map

---

[26] See Part I.3: Publishing ESCO as Linked Open Data.

Some of the classification systems and frameworks related to ESCO v1 are detailed below.

ISCO-08

ISCO-08, developed by the ILO, provides a system for classifying and aggregating occupational information obtained by means of statistical censuses and surveys, as well as from administrative records. It is a four-level hierarchically structured classification that allows occupations to be classified into 436 unit groups.

Since each ESCO occupation is mapped to one ISCO-08 unit group, the two classifications are interoperable. This allows ESCO to build on the international acceptance of ISCO. This is particularly important because most national occupational classifications are currently mapped to ISCO-08. This will also make it easier to map[27] them to ESCO. Additionally, since ISCO-08 is currently used to enhance the international comparability of statistical data, it makes ESCO an interesting tool to support labour market statistical reporting.

National classifications

Some EU Member States developed and currently use occupational classifications to deliver labour market services at national level. The Commission services used several of these classifications as reference during the development of ESCO.

The EURES Regulation (EU) 2016/589 lays down, inter alia, principles and rules on cooperation of the Member States and the Commission regarding interoperability and automated matching between job vacancies and job applications and CVs via a uniform system to enable an efficient search and matching of the data provided and by using common standards and formats for the data to be exchanged.

The Regulation envisages that:

Member States:

- cooperate on interoperability;

- support technical work on an European classification (aka ESCO) contents and updates;

- will create an inventory of their national, regional or sectoral classifications listing occupations, skills and competences;

- will adopt the European classification (ESCO) or map their national occupational classifications to it within three years;

- that have classifications of skills and competences will map them to the skills and competences of the European classification (ESCO). If this is not the case, by mapping their national occupational classifications to ESCO, Member States will gain access to a skill classification in their own language.

---

[27] See Part III.3. Mapping classifications to ESCO

The Commission:

- informs Member States about the European classification (ESCO);

- adopts & updates the European classification (ESCO), by Implementing Act(s);

- integrates inventories and updates into Portal and Network functioning.

It should be noted that the support in this context, whether it is of a technical or financial nature, is limited to the mapping, i.e. the creation, updating and publishing of correspondence tables, or to the work of replacing a national classification with the European classification. It does not involve development or adaptation of IT systems related to the exchange of Job vacancies and Job seeker profiles for the purposes of EURES in accordance with the technical standards and formats of the uniform system adopted under the provisions of Article 17 of the Regulation.

European Qualifications Framework (EQF)

The EQF, originally adopted in 2008 and replaced by the Council Recommendation on the EQF for lifelong learning of 22 May 2017[28], is a common reference framework that helps learners, graduates, education and training providers and employers to understand and compare qualifications awarded in different countries and acquired in different qualification systems in Europe.

The main goals of the EQF is to facilitate lifelong learning and promote people's mobility between countries. It consists of eight common European reference levels[29], described in terms of learning outcomes that the learner should acquire through the completion of a learning process. Each level is formulated in terms of knowledge, skills, responsibility and autonomy and should be attainable though a variety of educational and career paths. Using learning outcomes as a common reference point, the EQF facilitates comparison and transfer of qualifications among countries, systems and institutions and is therefore relevant to a wide range of users at European and national levels.

National databases of qualifications, which provide their data to the ESCO qualifications pillar, provide information on the EQF level of the qualifications they contain, therefore fostering transparency and comparability.

ISCED-F 2013

The International Standard Classification of Education (ISCED) is a framework developed for assembling, compiling and analysing cross-nationally comparable statistics on education. It belongs to the United Nations International Family of Economic and Social Classifications. ISCED Fields of Education and Training (ISCED-F) has been designed principally to describe and categorise fields of education and training at the secondary, post-secondary and tertiary levels of formal education.

---

[28] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615(01)&from=EN

[29] https://ec.europa.eu/ploteus/content/descriptors-page

Qualifications published in the qualifications pillar of ESCO need to be mapped to ISCED F-2013. This will ensure better comparability and transparency of qualifications across Member States and organisations.

Digital Competence Framework (DigComp)[30]

The DigComp 2.0 provides a vocabulary of digital competences at European level. It is developed by the Institute for Prospective Technological Studies (IPTS)[31] of the Commission's Joint Research Center (JRC)[32]. DigComp 2.0 structures 21 competences in 6 competence areas.

The Commission integrated the competences of DigComp into the ESCO list of digital transversal skills.

---

30 https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/digcomp-20-digital-competence-framework-citizens-update-phase-1-conceptual-reference-model

31 https://ec.europa.eu/jrc/en/about/jrc-site/seville

32 https://ec.europa.eu/jrc/en

3. Publishing ESCO as Linked Open Data

The Semantic Web

In the last few years, digitalisation has changed the way information is exchanged in the labour market: it is now mainly organised through electronic means. In addition to this, computing power has increased so much that information technology can process large amounts of data, which becomes accessible to employers through the increased use of social media. This changes the traditional, prevalent recruitment model, in which employers explain their requirements and wait for the right candidate to apply. Employers are now increasingly looking for candidates themselves and active sourcing has become an important recruitment strategy. This requires employers to understand the skill profiles of potential candidates and use this information in their search.

However, different actors on the labour market need to describe what they are offering or what they are searching for through characteristics that are often intangible (e.g. team spirit, social skills, leadership skills). Semantic technologies enable the readability of these terms across various IT systems.

Semantic interoperability[33] allows IT systems to use and integrate information from different sources and databases. To achieve semantic interoperability, both sides must use a common language for information exchange. This creates opportunities to reuse existing data for new and diverse purposes. Additionally, it allows new insights and knowledge to emerge from the integration of multiple data sources. The virtual space where this data is linked and reused is known as the Semantic Web.

In the Semantic Web, data that is opened for re-use can be linked across applications, organisations and community boundaries. This enables public administrations and governments to publish their data.

The European policy framework

One of the Commission's ten priorities put forward by President Juncker[34] is to remove barriers to a Digital Single Market in Europe. The public sector, which accounts for over a quarter of total employment and contributes to approximately a fifth of the EU's GDP through public procurement, plays a key role in this market as a regulator, services provider and employer.

The Communication on a Digital Single Market Strategy for Europe[35] recognises interoperability as a prerequisite for "efficient connections across borders, between

---

[33] Semantic interoperability is the ability of organizations to process information from external sources in a meaningful manner (European Interoperability Framework)

[34] A New Start for Europe: My Agenda for Jobs, Growth, Fairness and Democratic Change, Political Guidelines for the next European Commission, Opening Statement during the European Parliament Plenary Session, Strasbourg, 15 July 2014.

[35] https://ec.europa.eu/digital-single-market/en/news/digital-single-market-strategy-europe-com2015-192-final

communities and between public services and authorities" and calls for the revision and extension of the existing European Interoperability Framework.

This revision and extension was undertaken through the New European Interoperability Framework (EIF)[36], which is part of the Communication (COM(2017)134) from the European Commission, adopted on 23 March 2017. The framework gives specific guidance on how to set up interoperable digital public services.

It offers 47 concrete recommendations to public administrations on how to improve governance of their interoperability activities, establish cross-organisational relationships, streamline processes supporting end-to-end digital services, and ensure that both existing and new legislation do not compromise interoperability efforts.

Successful implementation of the EIF will improve the quality of European public services and will create an environment where public administrations can collaborate efficiently.

In addition to this, the Commission's work in the area of open data is focussing on generating value through re-use of a specific type of data – public sector information, sometimes also referred to as government data. That is all the information that public bodies produce, collect or pay for. Examples are: geographical information, statistics, weather data, data from publicly funded research projects, and digitised books from libraries.

The Commission supports open data for four reasons:

1. Public data has significant potential for re-use in new products and services;

2. Addressing societal challenges – having more data openly available will help discover new and innovative solutions;

3. Achieving efficiency gains through sharing data inside and between public administrations;

4. Fostering participation of citizens in political and social life and increasing the transparency of government.

The Directive on the reuse of public sector information[37] sets out the general legislative framework at European level for government data. Its revision in June 2013[38] further improved this framework by introducing the default rule that public information will be available for free or at very low cost and it expands the scope to other institutions (museums, archives and libraries). The reuse of public sector data,

---

[36] https://ec.europa.eu/isa2/sites/isa/files/eif_brochure_final.pdf

[37] http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32013L0037

[38] http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32013L0037

whether for commercial or non-commercial purposes, should fully respect EU and national privacy legislation as well as the intellectual property rights of third parties.

The Commission has allowed the reuse of its own documents for commercial and non-commercial purposes at no charge under Decision 2006/291/EC[39] on the reuse of Commission information.

Linked Open Data

Linked Open Data is a methodology used in the Semantic Web to literally ''link'' data that is ''open''. This means that data needs to be ''opened up'' first – so that others can use it – and then it can be ''linked'' to other data on the web. This methodology requires that individuals and companies publish data using a model that ensures:

- there is no ambiguity in the semantics (and the meaning) thanks to the use of dedicated ontologies and vocabularies;

- backwards compatibility through versioning schemes;

- data is uniquely identifiable in the whole world.

Linked Open Data is a methodology to publish data that helps users to:

- easily integrate data into existing IT systems;

- link to other data;

- ensure that the content (data) is well managed and quality-assured before publication;

- ensure that continuous updates of the data do not lead to high administrative overhead.

ESCO as Linked Open Data

ESCO is published as Linked Open Data, meaning that developers can use it as a building block in applications providing services such as job matching, career guidance and self-assessment tools to citizens.

The ESCO classification is available in different formats (SKOS-RDF, CSV) in order to allow users to integrate it into their applications and services. Additionally, ESCO provides a Local API and a Web Services API, so that applications and web services can query the classification in real time[40].

Following the Linked Open Data methodology, ESCO is developed and published using a data model that complies with the following principles:

---

[39] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32006D0291

[40] See Part III.2. Implement ESCO within systems

Scope disambiguation

The scope of each occupation, knowledge, skill and competence in ESCO is clearly established in its description. Any potential ambiguity is resolved in the scope notes, which help to distinguish the concept from others in the classification (using an inclusion or exclusion statement). Additionally, the occupations pillar is structured into a mono-hierarchical tree: this means that each concept can only have one broader concept. This provides consistency and avoids semantic ambiguity.

Uniqueness of concept identifiers

Each occupation, knowledge, skill and competence in ESCO is identified by a string of characters that follows a specific syntax: the Unique Resource Identifier (URI). A URI is a crucial component of the Semantic Web. Each URI:

- is unique over the web (universal);

- allows data from different sources to link to it;

- is persistent (see 'backward compatibility' below for more information).

In the same way as a web address link (URL), if a URI is inserted in a browser, it points to the website where the resource is located. However, the difference between them lies in the fact that the URI is machine-readable.

For example, the URI http://data.europa.eu/esco/occupation/528f90ed-e250-48bd-aacc-ffb7b1de5654 identifies the occupational profile "Textile specialised seller".

Backward compatibility

According to W3C policy[41], organisations that publish as Linked Open Data commit to making their URIs persistent. The Commission will abide by this policy (i.e. the URIs in ESCO will not change). As the data is made open and re-usable, third parties re-use it in their applications and services. In the same way as an old book will remain on the shelf of a public library or medical and legal documents are matters of record, a certain level of confidence is needed that the resources (the URIs) will remain available. This helps parties to link their data.

This does not mean that the ESCO classification cannot itself be changed. When an occupation or a skill concept becomes obsolete or changes, a history note explains that the resource is obsolete or redirects to one or more resources that replace it. This ensures backward compatibility of linked data sets (e.g. the national classifications mapped to ESCO). The versioning scheme that the Commission adopted for ESCO is further described in Part IV section 2.

---

[41] https://www.w3.org/

PART II – DEVELOPING ESCO

The Commission has led the development of ESCO with the support of the European Centre for Development of Vocational Training (Cedefop), and has counted on the involvement of different stakeholders, to provide strategic and technical advice and to directly contribute to the development of the content. Key stakeholders include:

- employment services;

- social partners;

- education and training organisations;

- statistical organisations, researchers and big data analysts;
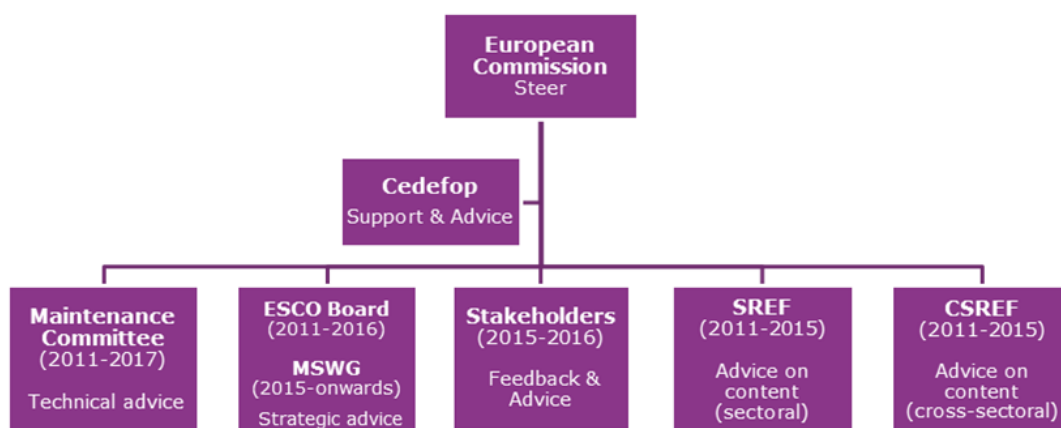
- skills councils and networks.

Figure 7: ESCO contributors

1. The governance framework

Five main bodies have provided either technical or strategic advice to the Commission throughout the development process of ESCO v1.

ESCO Maintenance Committee

The ESCO Maintenance Committee provided advice on the technical and conceptual development of ESCO. It formulated opinions on the approach for technical implementation, on the tools and techniques used for content development and on quality control principles. Additionally, the committee advised the Commission on the usability of ESCO for concrete use cases. Members were appointed on the basis of their technical expertise and included representatives from public employment services, statistical organisations, chambers of commerce, the ILO and other key stakeholders. The first ESCO Maintenance Committee was active from 2011-2013 and the second one from 2014-2017. The Commission intends to establish a new expert group that continues the work of the Maintenance Committee in the near future.

ESCO Board

The ESCO Board was composed of high-level experts that provided strategic guidance to the Commission. In particular, it supported the Commission in the definition of the strategic framework, overall concept and communication strategy for ESCO. Members of the board were appointed on the basis of their personal expertise and did not officially represent organisations or Member States. In the composition of the board, the Commission aimed for a good geographical balance and a diverse stakeholder representation including public and private employment services, social partners and education and labour market experts. The first ESCO Board was active from 2011-2013 and the second one from 2014-2016.

Member States Working Group on ESCO

The Member States Working Group on ESCO, created in 2015, is composed of representatives from Member States. Each Member State appoints up to two national experts in employment and education and training affairs as members of the group. In addition, European Economic Area (EEA) and candidate countries, as well as European social partners are invited to appoint one observer to the group. It advises and supports the Commission on the implementation and development of ESCO and its compliance with the EURES Regulation.

Sectoral Reference Groups

Sectoral Reference Groups consisted of experts for a specific sector of the economy. They included representatives from social partners, employment services, employers, professional associations, sector skills councils, education and training institutes, statistical offices and others. They provided input into the development of ESCO v1 between 2011 and 2015. The full list of Sectoral Reference Groups is provided in Annex I.

Cross-sector Reference Group

The Cross-Sector Reference Group consisted of experts in employment and education, related standards and classifications, and those with an up-to-date knowledge of relations between education and training and the labour market. It dealt with cross-sectoral skills and competences, the consistency of the skills pillar, and the links to the qualifications pillar. It provided input between 2011 and 2015.

Others stakeholders

Other stakeholders (public employment services, social partners, education and training organisations, etc.) were consulted online and provided feedback on occupational profiles in 2015 and 2016.

2. ESCO content development process

Desk research

The development of the ESCO classification started from scratch. Together with the stakeholders representing different sectors of economic activity, the Commission developed the occupations and the skills pillars of ESCO from the angle of the labour market. To this end, they analysed a wide variety of existing sources, such as studies, national, regional and sectoral classifications, and relevant international classifications and standards.

Types of sources	
Sectoral classifications	Regulations
National classifications	International classifications
National observatories publications	Scientific articles
Sector skills councils publications	Job descriptions
Occupational standards	Job vacancies
Qualification standards	Other sources
Learning outcome descriptions	

The most important sources used were national occupation classifications from Member States (such as Berufenet, ROME, the Czech National System of Occupations and the UK NOS), classifications with a European scope (such as NACE and EurOccupations) and classifications with an international scope (such as ISCO). They were selected following different criteria including typology (classification, qualification standards, etc.), scope (European, national, etc.), quality and richness of the information.

The rationale behind the use of existing sources was to build on the information of existing national and sectoral classifications, to ensure a good geographical coverage, reflect labour market reality and facilitate the mapping to national classifications.

To ensure that the ESCO terminology is fit for use in the education and training sector, the Commission and the stakeholders involved complemented these sources with information extracted from learning outcomes descriptions of qualifications.

Developing occupational profiles in five major steps

The classification was built in several major phases, which are detailed below.

1. Collecting the occupations	• Collect a broad list of occupations from the reference sources and through desk research.
2. Refining the list of occupations	• Clean-out the list by searching for similarities among concepts. • Initial attribution of preferred terms (PT) and the non-preferred terms (NPT).
3. Development of the sectoral breakdown	• The flat list of occupations needed to be organised. ISCO and NACE were used to structure the work.
4. Development of the occupational profiles	• The occupational profiles were further developed with a completed description and provisioning of the knowledge, skills and competences.
5. Coverage validation	• Review of the correspondence with existing classifications. • Review of the job market reality through sample tests against job vacancies on the European labour market.

Creating the content

The approach for developing occupational profiles varied depending on the sector. For some sectors of economic activity, expert groups (the Sectoral Reference Groups) developed the entire classification or, in some cases, they worked on the basis of a draft provided by the Commission. For other sectors, the Commission developed a draft classification and submitted it for an online consultation with different stakeholders.

Between 2011 and 2015, Sectoral Reference Groups developed the draft content for 11 sectors. Their work resulted in a draft classification that was subsequently submitted for clean-up and quality improvement steps.

Example of content creation by a Sector Reference Group: developing ESCO in the wholesale, retail trade and rental and leasing sector

Employment in the wholesale and retail trade sector accounts for about 13% of the total rate of employment[42]. This sector represents a wide range of occupations, encompasses both retail and distribution of goods, and provides an important link between manufacturers and consumers.

The relative importance of this sector in the economy had to be captured when developing the classification. This is why a group of approximately 10 sectoral experts coming from different organisations (government administrations, national training institutes, national industrial associations and private companies) met for the first

---

[42] Source: Eurostat.

time in June 2012 with the main assignment of developing a detailed list of occupational profiles for the sector. The members had the opportunity to work closely with the European Skills Council for Commerce to refine some of the occupational profiles.

A core project team of 6 experts developed the occupational profiles and provided continuous and permanent contributions either in face-to-face meetings or by virtual discussions during the complete project period.

The group of experts finished their work in June 2015. It resulted in a list of 57 occupational profiles and a conceptual representation of the economic sector under three main sub-sectors: wholesale trade, retail trade, and rental and leasing activities.

▼ trade

   ▶ rental and leasing activities

   ▶ wholesale trade

   ▼ retail trade

      ▶ retail sale in specialised stores

      ▶ retail sale in non-specialised stores

      ▶ multichannel sales

      ▶ sale, maintenance and repair of motor vehicles

      ▶ retail sale via stalls, markets and direct sales

When reviewing the occupational profiles, the group of experts had to overcome multiple challenges and take into account diverse sector trends. As a matter of fact, the skills requirements are constantly evolving across the sector: employers require more refined strategic methods, which include new skills in marketing, merchandising and human resources, as well as more expertise in ICT and skills related to effective communication. Aspects such as internationalisation, e-commerce, the greening of economies and multi-channel retailing not only provoke the appearance of new emerging occupations in the sector, but also the demand for new skills. In the case of e-commerce for example, emerging trends lead to the increasing integration of the retail sector and distribution services sector, and point out the importance of occupations such as e-merchandisers, IT developers or web analysts.

Between October 2015 and April 2016, the Commission developed the content of a draft classification for the 16 remaining sectors and consulted experts through an online platform that allowed them to review the different concepts, either by rating them or by suggesting improvements.

1130 stakeholders registered in the consultation and 500 participated actively. These stakeholders represented professional associations, education and training institutes, private companies, industrial associations, trade unions, etc. Participants from all EU Member States were involved, ensuring a good geographical and sectoral coverage.

The Commission received around 3 900 comments. The experts' comments were mainly suggestions about adding more skills or occupations, completing or improving the descriptions and merging concepts that were considered duplicates. The Commission took the comments and suggestions into consideration, assessed them in light of the guidelines and compared the content with the existent national classifications.

Example of content creation by the Commission and submitted to the online consultation: developing ESCO in the construction sector.

The list of 89 occupational profiles for the construction sector developed by the Commission was submitted to the online consultation together with 15 other sectors. 55 experts provided 247 comments on the draft classification for the construction sector.

The draft classification reflected the current trends in the construction sector, where new jobs are emerging, mainly in management and associated technical occupations. There is an increasing demand for project management skills, new technologies and sustainable construction processes. The general focus on energy and environmental awareness skills in construction is evident in many countries.

The trend towards constructing 'green' buildings requires construction workers to have a better grasp of environmentally-friendly materials and technologies that are energy-efficient or greener.

A crucial challenge for the construction sector in the future relates to the increasing implementation of ICT in the general construction process. The current trend towards the intensified use of ICT systems has implications for project management, creating potential efficiencies for managing the construction process, including logistics, monitoring of materials, design and construction.

Gap analysis

In order to identify potential gaps and to ensure the completeness of the classification, the Commission followed the advice of the ESCO Maintenance Committee and, as the final step of the content development process, compared ESCO to eight national occupational classifications. This analysis also aimed to identify discrepancies in the level of detail between ESCO and the national classifications, and complete the ESCO classification where possible.

The Commission carried out this work with the following classifications:

- Répertoire Opérationnel des Métiers et des Emplois (France) ;

- Klassifikation der Berufe 2010 (Germany);

- Beroepen, Opleidingen en Competentieregister (the Netherlands);

- Standard för Svensk Yrkeklassificering (Sweden);

- Clasificación de Ocupaciones del Sistema de Información de los Servicios Públicos de Empleo (Spain) ;

- Clasificarea ocupațiilor din România (Romania);

- Berufsinformationssystem (Austria);

- Klasifikace zaměstnání and Národní soustava povolání (Czech Republic).

As a result of the comparison, the Commission created 249 new occupations. In many cases, a gap was not resolved by adding a new occupation, but rather by adapting the scope of an existing one (e.g. by adding skills or extending the description). This work increased the overall quality of ESCO by ensuring that all occupations in the eight national classifications analysed could be mapped to ESCO and that ESCO occupations were well structured under the ISCO-08 hierarchy.

3. Formulation of terms in ESCO languages

The Commission has made ESCO available in 26 languages, including all EU official languages as well as Icelandic and Norwegian, in order to facilitate increased international transparency and cooperation in the area of skills and qualifications.

ESCO is therefore bridging language barriers by providing terms for each concept in all languages covered by the classification. ESCO categorises and uses different types of terms such as: preferred terms, non-preferred terms and hidden terms[43]. ESCO collects terms used in the labour market to refer to occupations and skills in the different ESCO languages.

ESCO terms were first formulated in English, which is the ESCO reference language. The process of term formulation started with attempts to achieve the best wording for ESCO concepts – separately for the occupations and skills pillars. The aim was to find formulations that would best convey the original idea in the clearest, most concise and self-explanatory manner possible. The process of the formulation of terms involved using vocabulary commonly present in job vacancies, curricula, and national and international occupational classifications from across Europe.

Once the terms were formulated in English, terminologists and market experts ensured that the formulated terms properly reflected the meaning of the concept as captured by the description and the scope note (if available).

The English term validation process consisted of two steps:

- a linguistic (vocabulary and grammar) check by terminologists;

- a labour market reality check by market experts.

A similar process for term formulation and validation took place for all ESCO languages other than English. As opposed to the regular translation practice, translators did not simply translate the terms from English into the target languages of ESCO, but selected the most common expressions from among the existing terms in the given language and the given labour market. This process followed a similarly structured approach as term formulation in English, which consisted of:

- formulation of terms in the target languages followed by terminological checks;

- labour market checks to ensure the concepts reflect the reality at European level.

The whole process required compliance with terminological rules that took into consideration the grammatical and linguistic characteristics of each language. A number of national sources were used to facilitate this task, such as national classifications, websites of public employment services, etc.

Moreover, translators consulted designated national experts in order to ensure that the terms reflected the characteristics of the national employment structure. The Commission consulted Member States through the Member States Working Group on

---

[43] See Part I.1. The structure of ESCO

ESCO[44]. The feedback received was then integrated by the translators and served to improve and adjust the terms, based on the expertise of the Member States.

---

[44] See Part II.1. The governance framework

4. Quality management of ESCO

During the development of ESCO and until its release, the Commission used quality criteria to ensure the consistency and correctness of the structure and content of the ESCO classification. The Commission also focused its efforts to ensure that the requirements of EURES were met (see table below).

Quality assurance criteria	
Data consistency	The extent to which concepts are described using a standard syntax.
Linguistic quality	The extent to which the language used in the terms is correct.
Use of relevant language	The extent to which the terminology used by employers and jobseekers is used.
Main national classifications coverage verified	The fact that all occupations in the national classifications can be mapped to ESCO concepts.
ISCO-08 alignment	The fact that all ESCO occupations are correctly assigned to an ISCO-08 unit group.
Completeness	The extent to which all occupations that are relevant in the European labour market are covered.

The table below provides an in-depth view of the elements that were taken into account to ensure the quality of the classification.

Ensuring the quality of ESCO	
Data model	Define the data model and the business rules allowing ESCO users and developers to work efficiently with the vocabulary.
ESCO guidelines	Define guidelines for the development of ESCO and make them available to all experts involved.
Experts' involvement	Involve experts from all over Europe and from all sectors of economic activity to develop and/or evaluate the draft occupations, knowledge, skills and competences.
Quality assurance steps and supporting tools	Define quality assurance steps, checklists, reporting templates, and tools for the Commission and the ESCO Maintenance Committee to monitor the work done and validate the deliverables.
Mapping to ISCO-08	Quality assure the mapping to ISCO-08 with the support of an expert suggested by the ILO.

Completeness	Complete a gap analysis between the ESCO classification, ISCO-08 and eight national classifications to:
	• ensure the completeness of ESCO;
	• identify discrepancies in the level of detail between ESCO, ISCO-08 and the national classifications;
	• enrich the ESCO classification with additional non-preferred terms.
Avoid ambiguities in the occupation structure	Check the scope alignment between the ESCO English terms used in the ESCO occupations and ISCO-08.
Terminological guidelines	Involve linguists to develop general and language-specific guidelines for the formulation of terms in the various languages.
Involve professional translators	Have translators formulate the terms for the various languages
Provide the translators with access to labour market experts	Provide the translators involved in the formulation of terms with access to labour market experts in a given language, to assist them in identifying the terms really used in the labour market.
Feasibility check with the Member States	Consult the Member States on the feasibility of mapping national classifications to ESCO.
Language check with the Member States	Consult the Member States on the accuracy of the ESCO terms in its 26 language variants.

After the publication of ESCO v1, the Commission will assess how it performs in the context of EURES and gather feedback from companies and organisations that will implement the classification in their services. This information will feed into the continuous improvement process of ESCO[45].

---

[45] See Part IV.1. Continuous improving and updating

PART III – USING ESCO

ESCO can only achieve its goal if it is integrated into applications, tools and services. It can be used in several different areas including job matching, education, statistics, etc. The ambition is that ESCO becomes a de facto standard.

1. ESCO and the support of specific use cases

1.1 Connecting people and jobs

Job matching based on skills and competences

Job matching is increasingly carried out online, allowing for a more efficient approach. Not only does job matching provide jobseekers with a wide range of relevant opportunities, but it also helps employees to identify new career paths and understand which transferable skills they have between occupations.

For successful job matching based on knowledge, skills and competences, it is necessary not only to extract the relevant information from online job vacancies and CVs, but also to interpret this information in a correct way. ESCO's structure of three interlinked pillars helps IT systems to achieve this.

ESCO contains a skill and competence set for each occupation and information on relevant qualifications. It enables IT systems to better understand a jobseeker's knowledge, skills and competences based on work experience and education. In this way, ESCO helps create a more precise picture of the skills and competences of an individual. Recruiters can use ESCO to specify the knowledge, skills and competences they expect from a successful candidate. Information on both the candidate and the expectations of the employer can be compared in job matching algorithms. As a result, people can find the job that best matches their skills and employers can find the talent they need.

The Commission tested the added value of ESCO for competence-based job matching in several pilot projects, including a pilot project in the framework of the Interoperability Solutions for Public Administrations (ISA)[46] programme. The aim of this pilot was to demonstrate how ESCO can be used i) to exchange data on job vacancies and CVs between multiple organisations (public and private), ii) for matching between job vacancies and CVs and iii) for skills intelligence. The results of this pilot showed that skills-based matching between the supply side (CVs) and the demand side (job vacancies) can be automated by annotating them with ESCO skills and occupations.

The e-learning and recruitment platform Academy Cube constitutes another concrete example of ESCO pilots. The platform plans to use ESCO to i) improve the matching between jobseekers' skills profiles and vacancies available at companies that are partners of Academy Cube in the ICT sector and ii) identify the candidates' skills gaps

---

[46] https://ec.europa.eu/isa2/home_en

in order to suggest courses that address them. Academy Cube has been developed by leading global companies to strengthen tomorrow's workforce and to open the door to new opportunities in the international labour market for motivated individuals.

ESCO in EURES

The EURES Job Mobility Portal[47] and Network is a key system in enabling mobility. It hosts 1 310 554 job vacancies, 340 768 CVs, and 10 025 registered employers[48]. It helps those who wish to find a job abroad and offers European employers and other stakeholders a variety of services and information covering every aspect of recruiting from other European countries.

In 2016, the Commission adopted a new EURES Regulation aimed at providing better job search and recruitment services across Europe and at boosting intra-EU labour mobility. Among other elements, the new rules are expected to:

- modernise the EURES system, which will become an up-to-date mobility tool that uses the latest IT technologies and is accessible by all;

- lead to an increase in the number of job vacancies and jobseekers' CVs available through EURES;

- introduce automated matching of jobseekers' skills and job openings;

- develop a European classification of occupations and skills and competences to support interoperability[49].

The Commission developed ESCO so that it can be integrated into the EURES service platform and support the automated matching of jobseekers' skills and job openings. Using ESCO to improve semantic interoperability aims at making the EURES services more relevant to the current demands of the labour market. By highlighting mismatches between CVs and vacancies, ESCO will help identify skill gaps and learning opportunities.

Once national systems adopt ESCO v1 or are mapped to it[50], information that is transmitted to EURES will be based on ESCO v1. This way, EURES provides an exchange platform for CVs and job vacancies across Europe. Thanks to ESCO, these CVs and vacancies will contain more standardised and detailed information covering knowledge, skills and competences and qualifications. Jobseekers all over Europe will be able to better understand job posts as they will be described more precisely, including multilingual information on the knowledge, skills and competences the employer expects. In the same manner, employers will be able to better understand

---

47 https://ec.europa.eu/eures/public/es/homepage

48 Data from 25 September 2017.

49 Article 19 (2) of the EURES Regulation.

50 See Part III.3. Mapping classifications to ESCO

job applications and the work experience, skills and competences that candidates from other European countries can bring to their business.

As ESCO has a broader purpose than the European classification referred to in the EURES Regulation, the implementing act of Article 19(6) will only apply to the procedures and methods relevant for the application of the EURES portal. It may therefore be that the EURES Portal will "freeze" a version of ESCO for a particular interval, taking into account the time necessary to develop and release IT changes resulting from an update.

1.2 Connecting employment and education

Career guidance

Individuals seek career guidance across different levels of education during their working life. ESCO will improve career guidance services in the following ways:

- **Competence assessment:** The skills and competences provided by ESCO facilitate the description of existing capabilities and the identification of missing skills, including transversal skills. Coupled with proficiency levels, applications using ESCO allow individuals to assess their skills and identify those that need improvement.

- **Matching skill profiles to learning opportunities:** Based on their skill profiles, users can identify their skill gaps in relation to their desired job and select learning opportunities that will address them.

Another pilot implementation, the Open European Skill Match Maker (OPESKIMR)[51] uses the ESCO classification to create an algorithm for matching individuals' skills sets to learning opportunities in the STEM area. This will improve their skills and enhance their chances of getting their desired job. The open source nature of ESCO, its compatibility with other systems and its common vocabulary for skills and qualifications enhances OPESKIMR's functionality and allows it to collect real-time data about new skills requirements. It therefore presents users with attractive career options and the tools to successfully pursue them.

Enhancing the dialogue between employment and education

ESCO developments reflect the on-going shift to learning outcomes currently taking place across Europe. The learning outcomes approach states what a jobseeker knows, understands and is able to do on completion of a learning process. It offers an alternative to the traditionally strong emphasis on learning inputs where a qualification is judged according to time spent in education, subjects studied and the location of the learning.

Learning outcomes are commonly defined in terms of knowledge, skills and competences and therefore share the basic terminological principles underpinning

---

[51] https://ec.europa.eu/esco/portal/news/ec030840-4ebd-4a0c-83c3-b390e19ce25b ·

ESCO. This shared terminology will facilitate dialogue between labour market and education and training stakeholders within and across sectors and borders. By annotating the learning outcomes of qualifications with the knowledge, skills and competences of ESCO[52], labour market and education actors will share a common language. In particular:

- employers will be able to better understand the suitability of a candidate for a position on the basis of their qualifications;

- education systems will be able to get feedback on the labour market needs, identify the skills gaps and adapt their qualifications accordingly;

- candidates will be able get advice on which qualifications can increase their employability.

1.3 Understanding skills supply and demand

Supporting skills intelligence and statistics

Labour market statistics are an important instrument for all stakeholders in the domains of employment and education:

- policy makers can use them to better understand labour market dynamics and react to them;

- employers can use them to optimise their recruitment activities;

- jobseekers can use them to make better career decisions;

- education and training institutions can use them to adapt curricula to the needs of the labour market;

- career guidance counsellors and employment advisers can use them to inform students and jobseekers on the best career opportunities.

Classification systems are important for the collection, compilation and dissemination of labour market statistics. They provide standardised concepts (e.g. occupations and skills) that allow the aggregation of data (e.g. people employed in an occupation) and the measuring of trends (e.g. skills in growing demand) across countries and regions. In databases across Europe, there is a vast amount of labour market data available. However, in most cases this data is collected using different classifications systems.

International reference classifications set standards for internationally comparable classifications, which serve as models for the development of corresponding national, multinational and regional statistical classifications and form the basis for internationally comparable data[53]. The ILO developed the ISCO-08 classification

---

[52] See Part I-1.3. The qualifications pillar

[53] http://ec.europa.eu/eurostat/ramon/miscellaneous/index.cfm?TargetUrl=DSP_GENINFO_CLASS_1

primarily to support international reporting, and the comparison and exchange of statistical and administrative data about occupations.

Statisticians in most Member States use the ISCO-08 classification. The mapping between ESCO and ISCO-08 is of significant value for them, since it implies that more data and knowledge becomes available for ISCO-08-based reporting. Since the terminology used in ESCO is more detailed than ISCO-08 and closer to the language used on the labour market, it can help statisticians identify the correct association of occupation terms in their national language to the appropriate ISCO-08 category[54].

ESCO also allows statisticians to collect, compile and disseminate data at a more detailed level if needed. Since ESCO classifies the occupations under the appropriate ISCO-08 group, this added precision still supports the ISCO-08 comparability.

ESCO and big data

The digitisation of the economy, the increased accessibility of the World Wide Web, and technological innovations in ICT have produced:

- the increased online availability of user-generated data (e.g. CVs and job vacancies);

- more powerful computer processors and more efficient ways of data mining;

- the possibility of processing large amounts of data digitally in real-time using machine learning through cloud services.

The analysis of large amounts of data, also referred to as big data, allows real-time reporting, more accurate and precise data on labour market trends.

ESCO's terminology base is well-suited to create repositories in the domains of labour and education that are accessible for big data research. Since ESCO includes a rich vocabulary of terms (including synonyms, alternative terms, acronyms, etc.) in 26 languages (356 428 occupation terms and 541 745 skills and competences terms), analysts can use Natural Language Processing more effectively. This allows them to identify relevant concepts in available repositories or on the Internet and classify them regardless of their language. For instance, they can collect information on occupations and skills (through the terms defined in ESCO) in job vacancies and CV repositories. This would provide new insights on the dynamics of the labour market.

Additionally, once ESCO is mapped to many other classifications it can become a reference point when using data encoded with different classifications.

The Cedefop study *Real-time labour market information on skill requirements* provides a clear example of this use case. Cedefop developed a prototype multilingual system to collect and analyse data on the demand for skills using job postings. The tool has already been tested in five countries and is now being refined and expanded to more

---

[54] Additionally, Member States can use the ESCO to ISCO mappings to simplify the direct mapping of national occupation classifications to ESCO.

countries. This experience demonstrated that ESCO was very useful for both the extraction and classification of the skills requested in the job vacancies.

Big data research can also be useful to improve the ESCO classification. The Commission can monitor the terms used in CV and job vacancies repositories as a useful source of information to understand which terms are missing in ESCO and identify a need to update the classification.

2. Implementing ESCO within systems

ESCO architecture

The architecture of ESCO is composed of different functional blocks, as shown in the figure below.
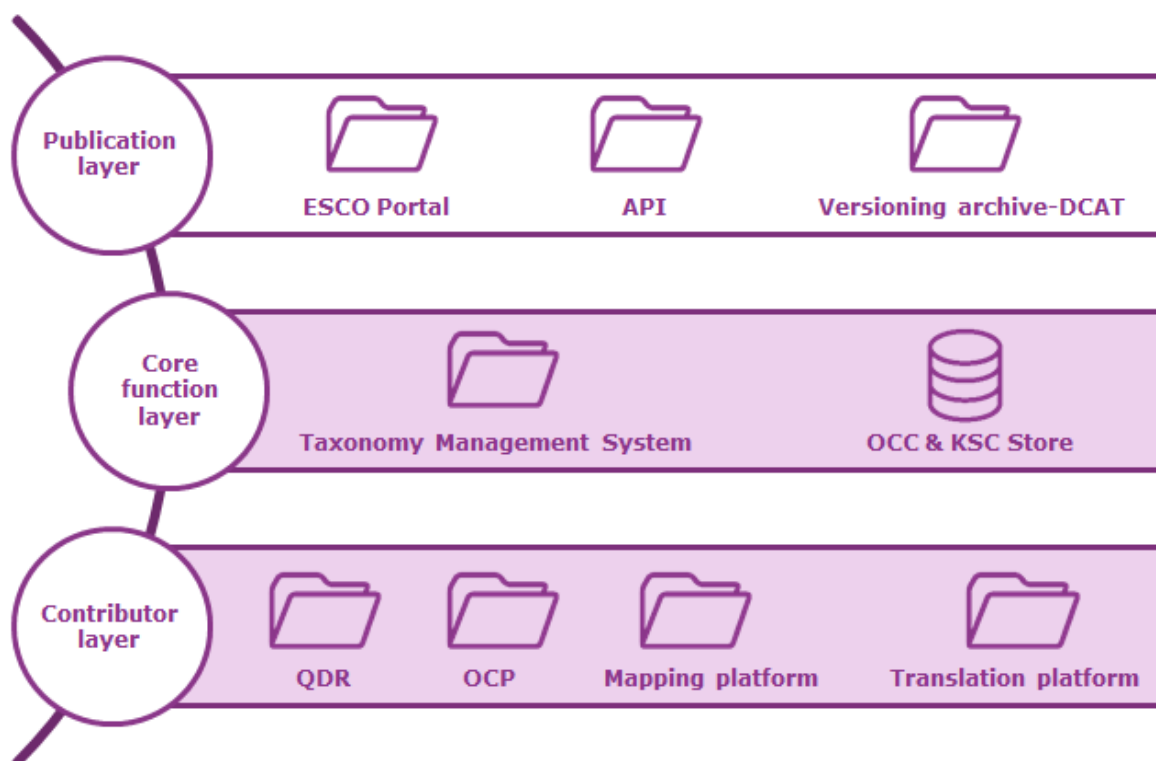
Figure 11. ESCO functional architecture

Three basic layers are distinguished:

The core functions layer

The ESCO core functions layer is the "heart" of the system, as it includes the fundamental component of the taxonomy development and maintenance:

- **The Taxonomy Management System**, which is responsible for the editorial work needed to maintain the taxonomy and the ESCO Store, which stores the SKOS/RDF[55] ESCO dataset.

---

[55] Symple Knowledge Organisation System: a standard way to represent knowledge organisation systems using the Resource Description Framework (RDF). Encoding this information in RDF allows it to be passed between computer applications in an interoperable way (W3C).

The contributor layer

- **The Translation Management platform**, which provides all the functionalities needed to translate ESCO into the other 25 languages (and store the translated datasets);

- **The Mapping Management platform**, the environment through which mappings between National Occupation Classifications and ESCO can be created;

- **The Qualifications Dataset Register (QDR)**, which is the platform that stores metadata about qualifications, based on a common schema, the Qualifications Metadata Schema[56];

- **The Online Consultation Platform (OCP)**, which allows contributors to browse through the classification and to provide feedback directly on the specific concepts (occupations, knowledge, skills or competences) that are displayed in the platform.

The publication layer

This layer is the ESCO gateway that makes the classification available to the end users. It includes:

- **The ESCO Service Platform**, which is the access point to the classification and all the supporting documents and tools for the end users.

- **The Application Programming Interface (API)**, which is a software component facilitating the interaction with other software components. ESCO offers access to the classification through APIs, accessible through the ESCO Service Platform. The ESCO APIs represent a set of services and functionalities published in the Web that allow other applications to access the ESCO classification. ESCO offers two different types of APIs: the ESCO Web Services API, already available, and the ESCO Local API (to be released in winter 2017/2018).

- **Data Catalogue Vocabulary (DCAT)**, which allows ESCO users and systems to explore, find, identify and select ESCO datasets of different versions. This register maintains a catalogue of all published datasets (including their metadata) and their different versions.

ESCO data files

The ESCO classification is composed of several building blocks, each one of them containing specific content such as occupations, knowledge, skills and competences, qualifications, regulatory aspects, transversal skills, the ISCO hierarchy, etc. They contain concepts in the reference language (English) and, when combined and interrelated, they create the whole classification.

Modules are divided into three types:

---

[56] See Part I-1.3. The qualifications pillar

- **Core modules:** Core modules are the files that hold ESCO concepts along with their URIs: occupations and skills. They are the reference datasets, the "heart" of the ESCO classification. The data is compliant with the ESCO model.

- **Linking modules:** Linking modules enrich core datasets by providing links between two or more different modules, at least one of which is a core native dataset. For instance, relationships between occupations and skills or taxonomies within the ESCO model constitute linking modules.

- **Supporting modules:** Supporting modules define concepts that can be used to enrich core datasets. Examples are controlled vocabularies such as ISCO-08.

For each concept, ESCO provides the corresponding terms in the 24 official EU languages and in Icelandic and Norwegian. This is referred to as the ESCO language packs.

The full list of languages covered by ESCO is:

- Bulgarian (bg)
- Spanish (es)
- Czech (cs)
- Danish (da)
- German (de)
- Estonian (et)
- Greek (el)
- English (en)
- French (fr)
- Irish (ga)
- Croatian (hr)
- Italian (it)
- Latvian (lv)

- Lithuanian (lt)
- Hungarian (hu)
- Maltese (mt)
- Dutch (nl)
- Polish (pl)
- Portuguese (pt)
- Romanian (ro)
- Slovak (sk)
- Slovenian (sl)
- Finnish (fi)
- Swedish (sv)
- Icelandic (is)
- Norwegian (no)

A user might only want to use a singular ESCO language pack, depending on the language s/he speaks or the purpose for which s/he is using ESCO (i.e. s/he can choose to use the occupations, knowledge, skills and competences in one language only).

The following table defines ESCO modules that are published in v1.

Type	Name	Description
Core	Occupation concepts	The occupation concepts and their metadata.
Core	Skills concepts	The knowledge, skills and competences concepts and their metadata.
Core	Qualification concepts	The qualification concepts and their metadata.
Linking	Relationships between occupations and skills	The skills, competences and knowledge concepts that are essential or optional for an occupation.
Linking	Occupations primary hierarchy	The relationships between ESCO occupations and ISCO, organising the occupations in the ISCO hierarchy.
Supporting	Occupation terms	The terms of occupations in a specific language, including information on gender.
Supporting	Skill terms	The terms of skills in a specific language.
Supporting	Supporting taxonomies such as: • ISCO-08 (and ISCO-08 translations); • Common European framework of reference languages (CEFR); • EQF; • ISCED-F 2013 and ISCED-F 2013 translations; • NUTS.	All supporting taxonomies integrated in ESCO and republished as Linked Open Data.

3. Connecting national, regional and sectoral standards: Mapping classifications to ESCO

ESCO will help employers, jobseekers and labour market brokers such as public and private employment services to reach out to a larger number of CVs or job vacancies. This will be achieved by improving semantic interoperability[57], which increases the ability to exchange relevant documents or data throughout Europe.

According to art. 19 of the new EURES Regulation, Member States will either create links between the concepts in their national, regional or sectoral occupational/skill classifications and the European classification ("mapping") or adopt the European classification at national level. In addition, private employment services, profit-making organisations, non-profit organisations, trade unions and employers' organisations can map their own classifications to ESCO.

ESCO as a hub for the creation of mapping relationships

After mapping several classifications to ESCO, these classifications are also indirectly mapped to each other. Therefore, ESCO will serve as a reference classification or "hub". The following chart illustrates how ESCO will reduce the number of mappings required when exchanging data between classification systems:

Mapping classifications without ESCO   *Mapping classifications with ESCO*
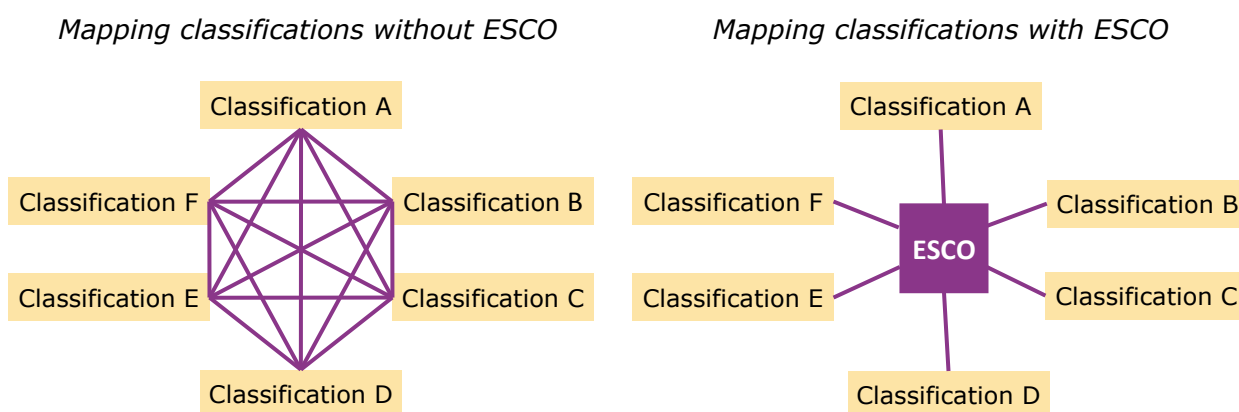

Figure 12. Mapping classifications without and with ESCO

This will help to overcome the main obstacles in the cross-border exchange of data: the use of different IT and classification systems and different languages. As a hub, ESCO can be used to transcode information encoded in different classifications and IT systems. This enables employment services from all European countries to exchange job vacancies and/or CVs. The advantage of this solution is that employment services do not need to change their way of working and can maintain their own classification and IT systems. Nonetheless, they will be able to exchange data using ESCO.

---

[57] See Part I-3. Publishing ESCO as Linked Open Data

Since ESCO is available in 26 languages, it will be possible to overcome the language barrier as well.

> *Example: Once the national classification systems are mapped to ESCO, the Irish public employment service could search for an "electrical engineer" job vacancy in the Eures database. It will be possible to find the "Elektroingenieur" job vacancy, if the vacancy is identified with the name of the occupation in German language or with the code according to the German classification system.*

Developing a methodology for the creation of mapping relationships

The Commission coordinated the following mapping pilots both with the public and private sectors:

- a pilot in the field of occupations between ESCO and national occupational classifications;

- a pilot in the field of skills between ESCO and LinkedIn.

Throughout these pilots, the Commission:

- learned more about the process and the resources required for the creation and maintenance of the correspondence tables of occupations and skills;

- understood better the requirements of the tools and/or services facilitating the mapping process;

- identified the level of interoperability that can be achieved between ESCO and national skill classifications.

Building on these findings, the Commission is currently developing a toolbox to help Member States to carry out mappings. The toolbox is composed of the following parts:

1. **A mapping management platform** (including documentation on how to use it): The platform allows users to map concepts from other classifications to ESCO. It is supported by advanced search options, automatic mapping suggestions and a user-friendly interface.

2. **A mapping manual:** a step-by-step guide for mapping occupational and skill classifications to ESCO.

3. **A dedicated helpdesk:** a team of experts who reply to queries received from the mappers;

4. **A series of training sessions:** a team of taxonomists and IT specialists who will provide training to the mappers.

The Commission will coordinate in 2017/18 one further pilot in the field of knowledge, skills and competences between ESCO and national skill classifications.

Mapping ESCO to other classifications

Within the course of the creation of the mappings, employment services can follow the process described below to create mapping relationships between ESCO and their own classification systems:

1. Transform the data in their classifications into a Simple Knowledge Organisation System (SKOS)[58]. This is the standard, which is well-suited to create correspondences between classifications.

2. Import the data into a software tool that can make suggestions for mapping occupations and/or skills (the mapping management platform).

3. Taxonomy experts create mapping relationships between concepts (occupations or knowledge, skills and competences) in their own classifications and the concepts in ESCO, while consulting the suggestions made by the tool.

Mapping relationships can be published on the ESCO Service Platform as Linked Open Data to enable re-use by interested stakeholders. In addition, mapping relations should be updated, for instance, upon release of a new version of ESCO. More information on the creation of mapping relationships will be available in the mapping manual, which will be published at a later stage.

---

[58] https://www.w3.org/2004/02/skos/

4. Extend ESCO

In order to achieve a deeper level of detail, the occupations and skills pillars of ESCO can be extended. This can be achieved by adding more detailed concepts to ESCO and is useful for building sector-specific applications of a higher accuracy, e.g. job matching, workforce planning or career guidance tools for a specific economic sector. In addition, those Member States that opt to use ESCO at national level can create their own national classifications by extending ESCO.

Occupations in ESCO are linked to ISCO unit groups. When compared to ISCO occupations, ESCO occupations are either at the same level of detail or more detailed. When compared to occupations in other classifications, they may be less detailed.

Every occupation in ESCO includes a set of knowledge, skills and competences which are essential and optional for that specific occupation. Other classifications may list additional skills for the same or similar occupations. For instance, the European Broadcasting Union (EBU), the world's leading alliance of public service media, carried out a pilot project in 2016. The ESCO classification was used to reference the jobs, by matching their job descriptions with the ESCO occupations and skills in the media sector. The findings showed that several ESCO occupational profiles could be enriched with additional skills stemming from the job profiles of EBU and vice versa. For example, EBU could extend the ESCO occupation "radio producer" with additional skills for a more detailed EBU job profile "radio news producer".

Figure 13. Enriching ESCO occupational profiles with those from EBU

5. Legal conditions applying to the ESCO service

Use of ESCO

When using ESCO, end users need to acknowledge its use by publishing the statement below, in accordance with the Commission Decision of 12 December 2011 on the reuse of Commission documents[59].

- For services, tools and applications totally or partially integrating ESCO: **"This service uses the ESCO classification of the European Commission."**

- For other documents such as studies, analysis or reports making use of ESCO: **"This publication uses the ESCO classification of the European Commission".**

Any modified or adapted version of ESCO must be clearly indicated as such.

Use of ISCO in ESCO

Information and data in ESCO is based on an original work published by the ILO under the title International Standard Classification of Occupations, ISCO-08. Structure, Group Definitions and Correspondence Tables (© International Labour Organization 2012). It can be adapted and reproduced with permission.

Use of ISCED in ESCO

The translations provided by ISCED are not official UNESCO Institute for Statistics translations (UIS). They are published with its permission, but their quality and coherence with the original language text are the responsibility of the authors of the translation. The original classification is published by the UIS in English under the title: International Standard Classification of Education: Fields of Education and Training 2013 (ISCED-F2013) (© UNESCO-UIS 2014).

---

[59] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:330:0039:0042:EN:PDF

PART IV – KEEPING ESCO UP-TO-DATE

1. Continuous improvement and updating

ESCO will only remain fit-for-purpose and able to deliver a high-quality service to end-users if it is continuously updated. The labour market and the education and training sector are constantly evolving and these changes need to be reflected in new versions of the ESCO classification. The changes include:

- **Changes in the labour market:** new occupations emerge; occupations become obsolete; the nature of occupations changes and with it the knowledge, skills and competences requested by employers;

- **Changes in curricula:** new knowledge, skills and competences appear in education and training curricula, while others disappear;

- **Changes in terminology:** terms to refer to specific occupations, knowledge, skills and competences change; rules of the entire language change (e.g. spelling reforms, female forms of occupation names become more common);

- **Changes in the requirements of IT applications:** technological developments or new expectations by end users change the way of service provision and therefore the requirements of the ESCO classification as a building block for the system.

Updates to ESCO are also occasions to correct any identified mistakes in the classification such as the misspellings of the terms, wrong metadata or relationships.

For this purpose, the Commission has set up a process to continuously improve and keep the classification up-to-date according to the new requirements of the education and labour market. Through this process, the Commission will learn how the classification behaves in different business cases – in job matching, in big data analysis, in CV creation – and what needs to be improved, and be able to remediate any identified issues in the classification.

The continuous improvement process of ESCO[60] is structured in four phases, each one of them including various steps (see the following figure).

---

[60] See full document on continuous improvement:
https://ec.europa.eu/esco/portal/document/en/f834e202-0ebf-461a-9249-a00e91d86e94

Figure 14. Continuous updating process

In order to understand how the classification needs to be improved, the Commission will analyse the feedback from various sources (national and international classifications, studies, stakeholders, etc.). Different actors will take part in each step of the continuous improvement process (ESCO domain experts, implementers, Maintenance Committee, etc.) by using various tools and techniques such as online forums, interviews or big data analyses. The scope of each release will be decided depending on the type of changes that need to be implemented (major or minor).

For the development of a new version, the Commission, with the support of knowledge engineers, will ensure continuous discussions with experts from different classification systems and stakeholders from the education and labour market. After this step, the Commission will organise the translation into all ESCO languages. Throughout the knowledge engineering and translation process the Commission will put a quality assurance process in place.

The classification will then be ready for the new release after consultation with Member States experts, classification experts and stakeholders from the employment and education and training sectors. The Commission will decide when the new release of ESCO is ready to be published.

2.   ESCO versions

The changes that result from the continuous updating process are reflected in different ESCO versions. Version numbers starting with 0 (zero) refer to early ESCO versions that are used for piloting and testing only:

- ESCO v0: Released 23 October 2013;

- ESCO v0.1: Used for piloting as of early 2015;

- ESCO v0.2: Used for piloting as of late 2015;

- ESCO v0.8: Used for piloting as of mid-2017.

The first fully-fledged ESCO version is ESCO v1, which was published in July 2017. As of this version, a versioning mechanism will keep track of changes in ESCO throughout its lifecycle. As the content of the ESCO classification will evolve with future releases, versioning is very relevant. It will apply to the publication (every new release of ESCO will be identified with a new release number), the taxonomy itself (keeping track of the history of each concept), and the data model (keeping track of changes to the properties, business rules, etc.). A more comprehensive document on versioning will be published at a later stage.

ANNEXES

ANNEX I

Sectoral Reference Groups:

- Agriculture, forestry, fishery;

- Hospitality and tourism;

- Manufacturing of textile, apparel, leather, footwear and related products;

- Wholesale and retail trade, renting and leasing;

- Human health and social services activities;

- Veterinary activities;

- ICT service activities;

- Transportation and storage;

- Arts, entertainment and recreation;

- Mining and heavy industry;

- Manufacturing of food, beverages and tobacco.

Online consultation of experts:

- Manufacturing of electrical equipment;

- Manufacturing of transport equipment;

- Business administration;

- Construction;

- Energy and water supply, sewerage and waste management;

- Education;

- Personal services, administrative support services and security and investigation activities;

- Scientific and technical activities;

- Manufacturing of consumer goods except food, beverages, tobacco, textile, apparel, leather;

- Wood processing, paper and printing;

- Chemical industry;

- Fabricated metal products except machinery and equipment;

- Media;

- Machinery and equipment except electrical equipment;

- Finance, insurance and real estate;

- Public administration and defence and membership organisations.

Getting in touch with the EU

In person
All over the European Union there are hundreds of Europe Direct Information Centres.
You can find the address of the centre nearest you at: http://europa.eu/contact

On the phone or by e-mail
Europe Direct is a service that answers your questions about the European Union.
You can contact this service

– by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

– at the following standard number: +32 22999696 or

– by electronic mail via: http://europa.eu/contact

Finding information about the EU

Online
Information about the European Union in all the official languages of the EU is
available on the Europa website at: http://europa.eu

EU Publications
You can download or order free and priced EU publications from EU Bookshop at:
http://bookshop.europa.eu.
Multiple copies of free publications may be obtained by contacting Europe Direct or
your local information centre (see http://europa.eu/contact)

EU law and related documents
For access to legal information from the EU, including all EU law since 1951 in all the
official language versions,go to EUR-Lex at: http://eur-lex.europa.eu

Open data from the EU
The EU Open Data Portal (http://data.europa.eu/euodp/en/data) provides access to
datasets from the EU.
Data can be downloaded and reused for free, both for commercial and non-commercial
purposes.

Contact information

You can send us your comments, remarks or suggestions via the ESCO Service Platform:

https://ec.europa.eu/esco/portal/contact

Or the following email address:

EMPL-ESCO-SECRETARIAT@ec.europa.eu

Follow us:

@EU_Social

#ESCO_EU