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Note on ESCO developments

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1. ESCO v.1.1

ESCO needs to be frequently updated to reflect emerging trends in the labour market. An effective continuous improvement cycle is the precondition for providing a reference terminology that can bridge the communication gap between labour market actors and the education and training domain and support mobility of workers and cross-border matching.

The first update cycle of ESCO (ESCO version 1.1) focused in particular on occupations emerged in the labour market since the launch of ESCO v1.0 (in 2017) and on skills and competences areas related to the impact of digital technologies and the greening of the economy, contributing to the goals of Action 6 of the [European Skills Agenda](#).

The content update process resulted in **515 new concepts** and in the revision of **35 ESCO v.1.0 concepts**, out of which 109 concepts belonging to the domain of digital technologies and 148 labelled as green. Moreover, with the publication of ESCO version 1.1 the Commission addressed some of the **quality issues** flagged during the quality reviews of the ESCO occupations and skills pillars. It implemented changes to 203 preferred terms of skills and occupations, to 331 descriptions of skills and occupations and included 154 fully revised concepts (with changes to both terms and descriptions).

ESCO version 1.1 also included a **new structure for transversal skills** and a revised **transversal skills thesaurus**. The transversal skills hierarchy is now composed of **six top-level categories, 24 clusters at the second level** and a list of skills allocated under each cluster, as per the image below.



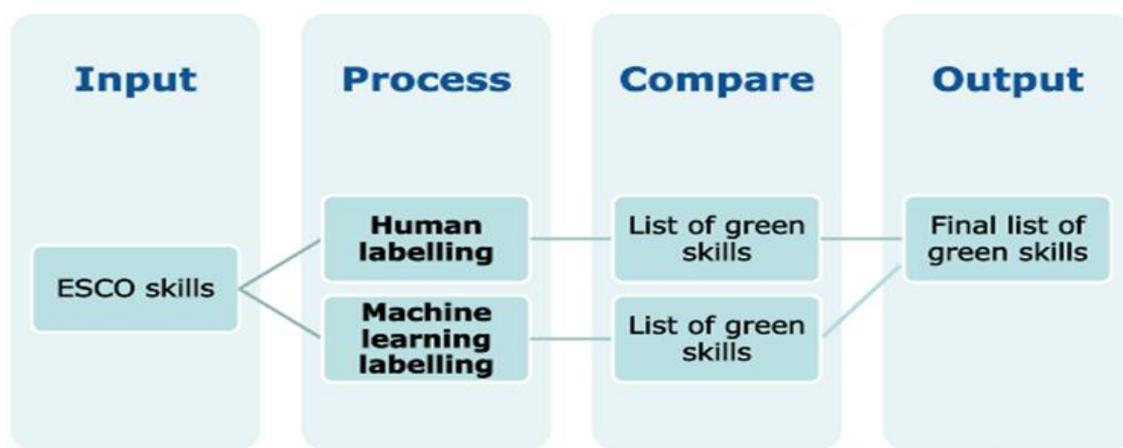
The integration of the new transversal skills model into the overall structure of the ESCO skills pillar required maintenance of the **ESCO skills hierarchy** as included in ESCO

v1.0.9. The **sub-classification of Attitudes and Values** was removed from the ESCO skills pillar, as the skills terms under this sub-class were covered in the newly introduced thesaurus¹.

Possible **duplicates** between the previous and current transversal skills list required a thorough quality check before releasing the dataset. As a result of this analysis, **30 ESCO v1.0 transversal skills** were made obsolete as they overlapped the scope of the new terms. Moreover, several cross-sectoral, sector and occupation-specific skills also included an element of transversality, generating unnecessary duplications. The ESCO Secretariat built on the work carried out during the quality review of the ESCO skills pillar and systematically reviewed the ESCO skills and competences flagged as transversal. **62 additional concepts** were identified as duplicates of the new transversal skills list and therefore made obsolete.

Together with this exercise, ESCO version 1.1 supported the definition of a **taxonomy of skills for researchers** and a comprehensive inclusion of the skills and occupations of researchers in ESCO, contributing to achieving the objectives of Action 5 of the European Skills Agenda and Action 8 of the [new ERA communication](#).

Finally, with the publication of ESCO version 1.1, the classification provides a list of skills and knowledge concepts labelled as **green**. To develop the **taxonomy of green skills** within the ESCO dataset, the Commission opted to combine the outcomes of manual human work and a machine learning driven approach.



First, a set of ESCO skills was manually labelled as green (Human labelling) and by Artificial Intelligence models (Machine learning labelling) in an independent manner. Discrepancies were identified by comparing the two sets, and manually accepted or rejected by two validators. The result is the following volume of green skills, based on their type and reusability level.

¹ In the case of language competences, while languages are also part of the new structure, a separate entry point in the skills pillar offers an easy access to the language skills for ESCO implementers: the sub-classification of languages was therefore maintained, alongside the new transversal skills structure.



One of the key aspects of ESCO version 1.1 is that, for the first time, Artificial Intelligence (AI) applications were employed in various steps of the content development process in order to support the Commission in analysing external input, drafting new content, labelling and translating the content.

Machine learning models have been developed to compute semantic similarity between concepts, with the idea that if two terms are likely to have similar meaning or semantic content, this should result in a higher similarity score compared to another couple of terms. These models have then been employed to compare concepts suggested by different stakeholders with other new concepts as well as existing ESCO concepts.

As an example, the Commission chose to use AI to process new content using **job vacancies collected via the EURES portal** or provided by ESCO implementers in order to detect additional NPTs that should be included in the classification, as they are part of the terminology used in online job vacancies.

This activity consisted of comparing Preferred Terms (PTs), Non-Preferred Terms (NPTs) and descriptions of new occupations with job titles and descriptions used in vacancies. The suggestions were then ranked by an algorithm based on two values: the score of semantic similarity obtained via a machine learning model and the number of times the term was found in the set of vacancies. Around 50 additional NPTs were identified and added to the English version of the classification.

Language models were also applied to test the correctness of the translations of 453 NPTs for occupations and 619 NPTs for skills and knowledge concepts from English into all ESCO languages. Using machine learning models, this process consisted in quantifying the probability of finding a certain sequence of words in one language. This resulted in a list of NPTs for each language which are flagged as problematic and needed further discussion with the concerned Member States before their publication.

ESCO version 1.1 was published in **January 2022**. A [launch event](#) to present the new version took place on 10 February 2022.

2. THE NEXT MINOR VERSION: v1.1.1

As part of the continuous improvement cycle of ESCO, a minor version (1.1.1) of the ESCO database is planned for release in June 2022. While this minor release concerns mostly improvements related to quality assurance of the existing ESCO content, it also introduces a number of new elements to the taxonomy. The following lists summarises the changes made to the database.

Quality assurance	New features
Corrections to translations of occupations and skills terms	Labelling of digital skills
Improvements to the ESCO skills hierarchy	Addition of the Ukrainian language
Improved relationships between occupations and skills	Mapping of ESCO occupations to ONET
Quality review of the allocation of ESCO occupations under ISCO	

The quality assurance part of the ESCO update focuses mainly on making improvements to the occupations and skills pillars, but also includes the implementation of **suggested translations** provided by Member States during the consultation process.

While the **changes made to the ESCO skills hierarchy** builds on feedback received from experts (mostly related to adding new groups to the hierarchy and reducing the variance of skill concepts allocated under groups), the review of the **ESCO occupations mapping to ISCO** and of the **relationships between occupations and skills** are driven by the application of AI techniques. For the latter strand of work, tools such as algorithms based on semantic similarity, data analysis of EURES vacancies, classifiers built on the MS mapping tables were combined with human validation to generate new data.

The new features that ESCO 1.1.1 brings about are twofold.

In addition to the database of green skills introduced in version 1.1, the taxonomy will now be also enriched by the **labelling of digital skills**. Particularly relevant for policy makers, ESCO implementers or researchers in the context of the dynamically changing EU labour market, ESCO 1.1.1 will now contain a label to identify skills concepts that denote digital competences. The labelling methodology primarily built on the **DigComp framework**, and it relied on a combination of human validation and machine labelling.

Moreover, ESCO v1.1.1 will also include the translations of occupations, occupation groups, skills and knowledge concepts and groups into **Ukrainian**, offering a practical tool to support the integration of Ukrainian citizens in the European labour market.

3. PLANNING FOR THE NEXT ESCO MAJOR VERSION

ESCO has the ambition to grow into a **connected knowledge graph** of data and metadata, to work in concert with other instruments for enhancing interoperability in the labour market and in education and training. The conscious choice to build ESCO on linked open data principles illustrates that this ambition was there already from the beginning.

ESCO in fact consists of a collection of interlinked labour market related data, being a network of entities (occupations, skills, and knowledge concepts) that are described,

translated, and related between themselves via various types of relationship. Future updates of ESCO aim at enriching the current knowledge graph using heterogeneous data sources, increasing the value and uniqueness of the classification for data integration, unification, analysis and sharing. Put into practice, this enables the comparison of different data sources and their integration into the classification.

For the next major version of ESCO, one first significant step is the aim to better bridge the language used in the labour market to the classification thanks to the collaboration with the **European cooperation network of employment services (EURES)**. Not only the EURES network collects millions of job offers posted by employers from all over Europe, but EURES members are actively using ESCO to exchange vacancies across borders.

Building of the synergies between the two databases (ESCO and EURES), the possibility to allow users of ESCO to consult the classification for specific occupations, and then navigate through the vacancies stored in the **EURES portal**, could be explored. This is intended to ease the job search process for job seekers and employers, while ensuring a correct and shared understanding of the same job role among the Member States.

A second step towards the enrichment of ESCO is the publication of the **mapping tables**, which connect national classifications of occupations and skills to ESCO. Implementers from one Member State will be able to look for one ESCO occupation and compare how it is represented in the official classification of their own country. Furthermore, implementers will be able to start from a specific occupation of one Member State, look for the related ESCO occupation, and identify similar occupations from other national classifications – hence using ESCO as a bridge between countries. The Mapping Tables will be published in the ESCO Portal, and more possibilities to ease their accessibility are currently being explored.

A third step planned for the next ESCO major version is to ease the use of ESCO metadata for implementers. Since 2021, the Commission is providing a series of **matrices** connecting ESCO skills and occupations at different levels of granularity along the respective hierarchies. These matrices have been highly appreciated by implementers, but further help can be provided by showing insights from the matrices in an easy and visually compelling manner.

A fourth step consists of adding **new metadata** in the classification.

One potential area of improvement lies in the distinction between skills/competences and concrete **tasks and activities** performed in a working environment. Options for addressing this challenge include reformulating concepts that are detailed at task level or introducing the notion of task alongside skills and knowledges. This requires however formulating a definition of “task” that will be used to identify and tag all concepts which do not express a skill but rather a work activity or procedure.

A second element of reflection is the notion of **skills levelling**. Different stakeholders have expressed their interest in adding ‘levels’ to ESCO; however the term ‘levels’ can have different interpretations,² but not all the options can be implemented through the existing system of essential and optional skills. The Commission is further analysing

² Levelling can refer to the proficiency of the skills itself (the same skills can have different grades of complexity) or to the level of mastery required in a particular occupation.

these challenges to come up with an approach to increase consistency across the classification and thus improve its interoperability.

Finally, another important element is to improve the system used to display the relevance of skills in a particular occupation. Naming this information **skill representativeness**, the Commission is exploring the possibility to include for each occupation a chart showing the distribution of different skill groups (at the first level of the hierarchy) based on its essential and optional skills. A similar approach may be adopted for knowledge concepts.

Moreover, as it happened already for ESCO v1.1, future major versions of ESCO will include the update of the classification with new occupations, skills, and knowledge, and the quality review of the existing concepts.

4. THIRD PHASE OF THE PILOT PROJECT FOR LINKING LEARNING OUTCOMES OF QUALIFICATIONS TO ESCO SKILLS: STATE OF PLAY

For ESCO to reach its full potential as a bridge between education and training and the labour market, the ESCO skills terminology could be used to systematically identify and analyse which skills are related to a particular qualification.

This can help make qualifications more transparent across Europe. It can also help the translation, comparison and/or review of qualifications. Furthermore, his identification and analysis of the content and profile of a qualification can be used to indicate matches and/or mismatches with skills needs of occupations and sectors. Linking learning outcomes of qualifications to ESCO skills means that employers can more easily grasp the labour market value of a qualification, in particular in a cross-border context. Individuals may see their chances on the labour market improved through better matching based on richer qualifications information.

In November 2021, the Commission published a [call for expression of interest](#) to participate in the third phase of the pilot project for linking learning outcomes of qualifications to ESCO skills. The call registered strong interest from the ESCO stakeholders' community, with 30 organisations participating to the third phase of the pilot. A breakdown of the project participants and observers, by organisation type, is provided below:

- 10 EU Member States: CZ, FR, DE, EI, IT, NL, PL, RO, SI, SE
- the European Training Foundation (ETF)
- 6 training providers: Rīga Stradiņš University, Hellenic American Union, Academy of Fine Arts Vienna, University of Deusto, Lusophone University, Politecnico of Porto.
- 7 private companies (SkillLab, Intelligence Group, Nxus, Monster/Randstad, Web2Learn, Hurrah, Employchain)

- 4 sectoral organisations (ETUC, SME United, Lifelong Learning Platform, World Steel)
- 1 third country organisation (the Commonwealth Scientific and Industrial Research Organisation (CSIRO))
- 1 EU funded project (ECCOE - European Credit Clearinghouse for Opening up Education)

A first online meeting to introduce the scope of the project took place in January 2022. Based on the feedback provided by the participants to the second phase of the pilot, the Commission developed a revised version of the IT tool supporting the automate linking of qualifications with ESCO skills and knowledge concepts.

This new version of the IT tool offers:

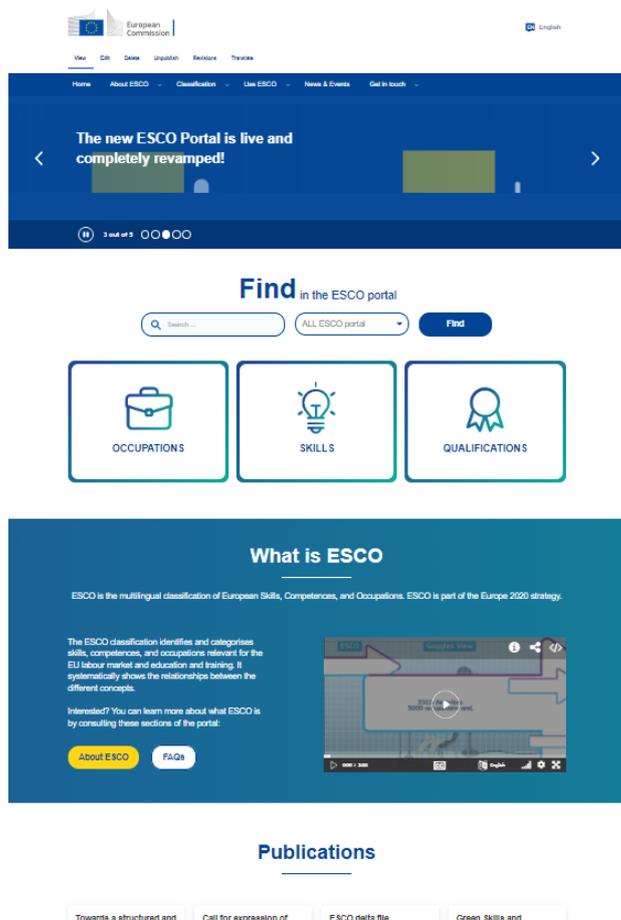
- Suggestions of relevant ESCO skills based on machine learning (ML). Based on the results from the 2nd phase of the pilot, a thorough statistical analysis of these mappings was performed, resulting in a benchmark dataset for algorithm development purposes. These data are crucial to iteratively improve the ESCO skill suggestions as it enables us to compute and compare the performance of different algorithms. For phase 3 of the pilot two additional algorithms were integrated besides a word embedding-based algorithm that was already included in the platform. In total over 30 different models were built based on sentence embedding algorithms. Part of these models are multilingual and can perform semantic comparisons directly in the native language. Other models only accept English input text, requiring a translation step. For each of these algorithm types the model with best performance on the benchmark dataset was selected.
- The possibility to browse and map to skills and knowledge groups in the ESCO skills hierarchy and to search for occupations in the ESCO occupation pillar.
- The possibility to filter ML suggestions based on the skill type (skills vs knowledge) or specific keywords.
- A multilingual text-splitting algorithm supporting atomization of learning outcomes was implemented. In the previous phase of the pilot a simple rule-based system was used, which could result in inaccurate splits and leading to significant manual corrections. The new sentence splitter that was implemented for phase 3 is a machine learning model that learned to split multilingual qualifications based on a set of already split qualifications. This enables an iterative approach such that we can further improve the model with the data that will be collected in the upcoming phase of the pilot.
- The integration of ESCO v1.1 in the algorithms and in the API search functionality.

The revised tool was presented during a second online webinar on 2 June 2022. The project will be concluded in September 2022. A final workshop to discuss the project results will take place in the fourth quarter of 2022.

5. THE NEW ESCO PORTAL

In 2022, the Commission launched the revamped version of the [ESCO portal](#). The new website is based on the **Drupal web content management system** making the ESCO portal more user-friendly and aligned with the Europass and EURES sites.

The new ESCO portal features a completely **renovated homepage**, that allows the user to quickly get acquainted with the classification and the multiple ways they can interact with it. When visiting the homepage, users can browse the latest news related to ESCO, query the classification or the whole portal, directly access the download or the API pages, see the latest publications, and subscribe to the ESCO newsletter.



Users can benefit from the “**About ESCO**” section, which contains extensive information regarding the classification and its universe, concentrating all the ESCO knowledge in one organised section makes it easier for users to find what they are looking for and guarantees a better learning experience. Some of the novelties introduced are: the **FAQ section**, which answers to the most common questions regarding ESCO; the **Data Science Blog**, which features the latest advancements achieved on the topic; the **Stakeholders section**, which maps the ESCO universe, describes the various use cases, and lists the implementing organisations; the publications page, which now also highlights external papers and research which is based or includes ESCO.

The **classification pages** have been improved and re-styled to create a smoother user and innovative user experience. With the next portal release, both skills and occupations will feature an **advanced filter** with multiple functions, granting a customisable and interactive exploration of the ESCO classification.

Occupations Select an ESCO version
ESCO dataset - v1.0.7

Search occupations Find Hide filters

Filters Clear filters

Concept Type: Occupation Status: Published Labels: Label 1, Label 2, Label... ESCO code: All ESCO codes

NACE code: All NACE codes See all filters Apply

Search results Hierarchy view

- 2 - Professionals
- 21 - Science and engineering professionals
- 22 - Health professionals
- 2230.3 - ticket issuing clerk
- 24 - Business and administration professionals
- 25 - Information and communications technology professionals
- 252 - Database and network professionals
- 26 - Legal, social and cultural professionals
- 3 - Technicians and associate professionals

ticket issuing clerk
Discuss in the forum
Download

5 - Service and sales workers > 52 - Sales workers > 523 - Cashiers and tickets clerks > 5230 - Cashiers and ticket clerks > 5230.3 - ticket issuing clerk

Description

Code
5230.3

NACE code
5230.3

Description
Ticket issuing clerks provide service to customers, sell tickets and fill the reservation offer to customers' needs. They sell tickets for all events such as sporting, cultural and leisure activities. They provide customers with information on offers and make the necessary arrangements.

Scope note
Includes: travel tickets clerk.

Alternative Labels
concert ticket selling agent | ticket selling agent | sport ticket selling agent
museum ticket selling agent | museumshop selling agent

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

Skills & Competences

Essential Skills and Competences

attach PCX pipe | check water pressure | clear out drains
follow health and safety procedures in constructions | respect construction supplies
install PVC piping | install metal gas piping | install metal gas piping
install plumbing systems | interpret 2D plans | interpret 3D plans
place sanitary equipment | prepare copper pipes for use as gas lines
transport construction supplies | use measurement instruments
use safety equipment in construction | use welding equipment | work ergonomically

Essential Knowledge

In the past, the ESCO secretariat received several queries asking for advices on the best way to download ESCO packages and how to get specific datasets; this is why the Commission decided to **redesign the functioning of the download section**. To download the classification, users need to specify the preferred version, language, content, and format and the whole package will be delivered to the users' device. The Commission also developed a Quick Start guide to guide ESCO novices towards the various implementation options of the classification.

Download ESCO

ESCO can be used by developers as a building block for different types of applications that provide services such as auto complete, suggestion systems, job search algorithms and job matching algorithms.

The ESCO classification is composed of modules that contain elements such as occupations, knowledge, skills and competences, qualifications, and the International Standard Classification of Occupations (ISCO) hierarchy. When combined and interrelated, these modules make up the whole classification.

Here you can select your modules and can prepare your custom package of datasets of the ESCO classification to download.

Your costum dataset

The interface allows users to customize their dataset by selecting filters for Content type, Version, Language, and File type. The selected filters are: Content type: Classification, Version: V1.07, Language: English, and File type: csv, ods. Below the filters, two preview cards show the resulting packages: one for 'csv (16.2 MB)' and one for 'csv | pdf (30.2 MB)'. An 'Export your package' button is located at the bottom right.

6. 2022 WORK PROGRAMME

As foreseen in its Terms of Reference, the ESCO Member States Working Group will meet whenever required but at least once a year. In addition to the traditional meetings, in order to increase the efficiency of the work of this Group the Commission will organise focus meetings to discuss specific topics of interest.

A tentative calendar for the second half of 2022 is provided below.

1/06/22 MSWG kick off meeting

14/09/22 Focus meeting

05/10/22 Focus meeting

09/11/22 Focus meeting

07/12/22 MSWG plenary meeting

Focus meetings will target three main areas:

1. Focus meetings on classification maintenance

These meetings will focus on assuring the quality of the existing concepts in the taxonomy and enhancing ESCO's fitness for purpose in the different use cases, including:

- developing methodologies to improve and update the relations between occupations and skills and knowledge concepts;
- exchanging upon and scoping labelling activities of skills and occupations;
- developing an approach to skills contextualization in order to support the development of a more transparent and consistent expression of cross-sectoral, sectoral and occupation-specific skills;
- discussing the data collected in the context of the Monitoring and Evaluation strategy for ESCO;
- developing strategies to improve the representativeness of multilingual content, by leveraging on the possibilities offered by Artificial Intelligence;
- defining improvements to the organization of the occupations and skills pillar, including options to develop alternative hierarchical structures;
- improving information related to the reusability level and existing relations between skills concepts;
- defining an approach to detect duplicate concepts (labels and descriptions) in the classification.

2. Focus meetings on structural evolution into a knowledge graph

These meetings will focus on the definition of new structural elements of the taxonomy in order to build a richer knowledge graph, including:

- defining an approach to display the relevance, frequency or significance of skills and knowledge in occupational profiles;
- defining an approach to describe proficiency levels for skills, using when possible existing standards to define the levels;
- enhancing the use of ESCO by adding additional employment data, such as salary ranges associated to given occupations and employment rates related to gender or age;
- defining an approach to differentiate skills and competences from tasks and work activities;
- detecting emerging occupations and skills by leveraging on the data available in online job advertisements;
- reflecting upon the connection between ESCO and EURES, including streamlining the links between the two portal and integrating the data from the mapping tables into the ESCO dataset.

3. Focus meetings on peer learning

These meetings will focus on the identification and sharing of good practices in the use of ESCO and related taxonomies.

The participants will help to:

- Organize country visits and peer learning events
- Identify gaps in ESCO communication and outreach activities
- Raise awareness of ESCO and its use

Members are invited to express their interest and views on the proposed topics. A final decision on the topics of the first three meetings will be made based on the outcomes of the discussion in the Plenary session.