ESCO information on recent developments

MAI 35-02

European Skills, Competences, Qualifications and Occupations

Contents

1. Purpose of this document

The purpose of this document is to update the members of the Maintenance Committee on developments in ESCO.

2. ESCO implementers, state of play

The Commission is constantly monitoring the implementation of ESCO by different organisations both in Europe and at the international level. ESCO continues being used by a wide range of users, including stakeholders outside the EU. The Commission is currently aware of **85 implementers worldwide** that are using ESCO in their activities or the delivery of services to their end-users. These ESCO implementers include private companies, employment services, public institutions, non-profit organisations, job portals and other organisations.

The majority of ESCO implementers come from Europe and have operations in multiple EU countries and/or languages. Hence, the multilingual aspect of ESCO is highly valued. Figures 1-3 below present overview of the organisations using ESCO per ESCO use case: 1) career learning and development management; 2) job-matching and searching; and 3) statistical research and big data analysis of the labour market.

Figure 1. ESCO implementers: career learning and development management use case

Who is using ESCO for this use case?

The following organisations are using ESCO in their IT systems to deliver career guidance and learning development management solutions:

- SkillsBoard
- Boost.rs
- Certif-ID
- Headai
- Europass
- ODEM
- Open Badge Factory

- Skills Guide by Accenture
- Caisse de Depots
- UPSkills
- Xtoit
- Orange Cat
- Skilllab
- The Adecco Group
- Cities of Learning
- Interoperability Academy
- Kutsekoda – Estonian Qualification Authority
- Eit – Innoenergy
- Peers Solutions

Figure 2. ESCO implementers: job-matching and job-searching use case

Who is using ESCO for this use case?

The following organisations are using ESCO in their IT systems to deliver job-searching and job-matching solutions:

- WCC
- ForeAmmatti
- House of Skills
- Milch&Zucker
- Xlearn
- AKPA
- IGB
- Textkernel
- Joblift
- Dit Werkt
- EURES
- JobsIreland
- Jobmarket Finland
- Monster

- Iceland's Directorate of labour
- Symanto
- Randstad
- Nalantis
- Jobspreader
- Elevate
- Matchmanao
- Zeit-Online
- Almalaurea
- Actonomy
- Techwolf
- JanZZ.technology
- Almazina
- My Xtramile

Figure 3. ESCO implementers: statistics and big data analysis of labour market use case

Who is using ESCO for this use case?

The following organisations are using ESCO in their IT systems to undertake statistical and/or big data analysis of the labour market:

- Deloitte
- CEDEFOP
- University of Cambridge
- European Lung Foundation
- Burning Glass
- Intelligence Group
- Interamerican Development Bank
- CRISP
- NESTA
- Wollybi

- University of Information Technology and Management of Rzeszow, Poland
- West University of Timisoara

As regards the implementation of ESCO outside the EU in particular, the following organisations have shown interest in learning more about ESCO or have already implemented it into their systems:

- The Public Employment service of Albania;
- Upskill, a public-private partnership in Chile;
- The Public Employment service of Israel;
- The Public Employment service of Malaysia;
- The Public Employment service of Peru;
- Mubadala, UAE;
- University of Cambridge, UK;
- Credential Engine, USA;
- Harvard Business School, USA;
- Inter-American Development Bank, USA;
- Deloitte, USA;
- Burning Glass, USA.

The key factors that drive interest by these organisations is ESCO's multilingual aspect and semantic structure. Such international interest or implementation shows that ESCO can be tailored to the national, regional or local labour market needs and that it can also serve as a benchmark tool for new developments in different labour markets.

3. Pilot for linking qualifications to ESCO skills

The pilot project for linking learning outcomes of qualifications with ESCO skills aims at: a) testing a semi-automated approach for linking learning outcomes of qualifications with ESCO skills by using a combination of automation and human intervention; and b) developing an IT tool based on machine learning to support the linking process in all EU languages. The second phase of the pilot project took place between June and December 2020 and built on: a) the results of the first pilot conducted between June and December 2019 with the participation of 5 Member States (Latvia, the Netherlands, Poland, Romania and Slovenia)[1]; and b) the conclusions of the study on the ESCO qualifications pillar[2].

Overall, 13 Member States and organisations participated in the second phase of the pilot:

- Belgium, Czech Republic, France, Italy, Latvia, the Netherlands, Poland, Romania and Slovenia.
- Stakeholder organizations: ETUC and EURASHE.
- The European Training Foundation (ETF).
- The Inter-American Development Bank.

[1] The results of the first phase of the project were presented during the EQF AG meeting of 4-5 February and the ESCO MSWG of 19 February 2020.

[2] The study was presented during the joint meeting of the EQF AG and the ESCO MSWG on 6 February 2019

The linking activity began in September 2020 and lasted until December 2020. Workshops in June and November 2020 covered the functioning of the improved platform and the methodological aspects of the project, whereas the final workshop on the results of the pilot took place on 8 February 2021.

The linking exercise covered 367 qualifications in 9 languages, with an average percentage of mapped text of 44% (text that was linked with at least one skill or knowledge concept). This number varies across participants based on the number of qualifications effectively mapped: participants who completed (or almost completed) the linking exercise showed a percentage of mapped text higher than 90%, while participants who mapped only few qualifications had the lowest score.

In total 3724 learning outcomes were mapped to at least one ESCO concept, generating 11998 links. The number of established links per learning outcome varies across linking projects: based on the data obtained, it can be expected that 1 to 3 ESCO skills or knowledge concepts are mapped to each learning outcome entity.

In terms of mapping relations[3], data showed a prevalence of the relation type "close match", suggesting that the selected ESCO concept does not fully cover the scope of a learning outcome. The average percentage of exact matches was 20%, however this number varies across projects (ranging from around 60% to 0%). These statistics should be read, taking into account three aspects:

- "close match" is the default relation type in the linking tool (which implies a link will be automatically defined as close match if no action is taken by the reviewer);
- the linking tool did not provide for the option of linking to broader levels of the skills hierarchy (skill groups); and
- the interpretation of relation types might have been different between participants.

The performance of the mapping algorithm showed promising results. On average, an ESCO concept selected by participants was in 30% of cases the first concept suggested by the algorithm, among the first 3 concepts in 48% of cases, among the top 5 concepts in 56% of cases and among the top 10 concepts in 66% of cases.

Based on these analytics and on the comments provided by the participants during the final workshop, the following conclusions can be drawn:

- Linking learning outcomes to skills is done best in the native language as this allows the algorithm to learn more about the specifics of a language, thus producing better matches.
- The structure of learning outcomes plays a very important role for the correct functioning of the algorithm: on average, 10-15 words are found in a learning outcome, which contributes to returning a high number of concepts, sometimes not (or partially) related to the meaning of the text.
- Splitting sentences in a correct way is very important for the functioning of the tool. In this regard, the variety of approaches used in the description of learning outcomes (numbering, punctuation, flat text) represents a challenge.

[3] The tool allowed four types of mapping relations: exact match, narrower than, broader than, close match.

- It is important to provide a clear definition of the different types of matching relations given the relevance of exact matches for training the AI algorithm.
- The current dataset can already be used for evaluation/comparison of different candidate algorithms. However, more data are needed to refine the model and obtain results that are more accurate.
- Sometimes relevant information is contained in the structure or in the description of a qualification (e.g. unit title). These data would be useful to support the understanding of learning outcomes descriptions by the algorithm.
- Human intervention is an important component of this exercise and a review of the results provided by the machine learning algorithm is needed at this stage of development of the technology. This has an impact on the effort needed to link learning outcomes of qualifications and ESCO skills. Future improvements to the AI model will reduce the time needed to perform this exercise.
- Learning outcomes descriptions are generally broader than ESCO skills and knowledge concepts, leading to links with multiple skills. A vector-approach to linking could be used to indicate those concepts that, if combined, have sufficient similarity to a learning outcome description.
- The ESCO skills taxonomy is very granular and a certain level of abstraction should be introduced in order to link qualifications from higher levels (EQF 5-7). Overall, the linking provided better results for VET qualifications compared to qualifications from higher education.
- The ESCO skills hierarchy supports the search of relevant skills within the ESCO dataset.
- Further improvements to the ESCO linking tool are needed to support its usability. Additional features include: a) filtering the tool's suggestions between skills and knowledge concepts; b) structuring the tool's suggestions by sector; c) a search functionality to filter suggestions based on keywords; and d) modifying the splitting/editing of learning outcomes during the linking activity.

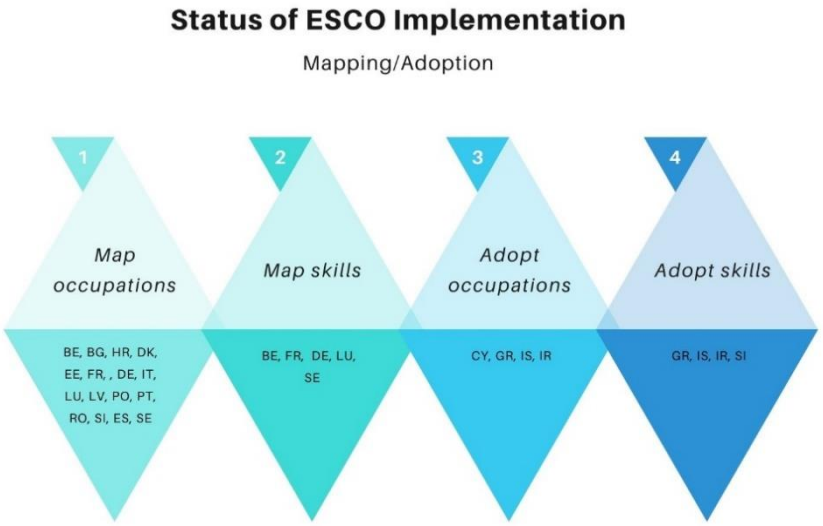
The Commission will discuss the next phases of the project with the EQF Advisory Group and the ESCO Member States Working Group.

4. ESCO implementation in EURES

At the end of 2020, the situation with Members States mapping to ESCO or directly adopting it was as follows[4]:

- **seventeen** Member States were in the process of mapping occupations;
- **five** Member States were in the process of mapping skills;
- **four** Member States were in the process of adopting occupations;
- **four** Member States were in the process of adopting skills.

[4] The data that we present stem from requests by Member States to use the mapping platform and by information received via EURES. Therefore this list is not exhaustive and there could be Member States who map/adopt without having communicated doing so to the Commission, thus such Member States are not included in this list.



[5]

Figure 4. Status of ESCO mapping/adoption

Member States use various approaches to carry out mapping. These are:

- artificial intelligence models;
- "human" approach, i.e. experts in the Member States carry out the mapping exercise manually;
- hybrid approach combining the above approaches.

5. ESCO version 1.1

On 28 January 2021, the Commission launched the consultation of the ESCO MSWG on the pre-release of ESCO v1.1. It included a content update with new occupations, skills and knowledge concepts as well as significant revisions to existing concepts resulting from the content update. Overall, the pre-release included 66 new occupations, 441 new skills and knowledge concepts, 75 significantly revised occupations and 9 significantly revised skills.

The consultation ended on 19 March 2021 and 7 countries submitted contributions: Finland, France, Germany, Italy, Lithuania, the Netherlands and Slovenia.

A detailed summary of the input received is reported below. Annex 2 provides the final list of new concepts resulting from the content update process.

Finland

The concept "domestic cooling system" should be considered as a knowledge.

[5] Romania, although commenced the mapping exercise in February in 2021, is included in the list because the submission of its request to use the ESCO mapping platform dates from December 2020.

Reaction: this feedback will be implemented.

France

1. The concept "manage volunteering programme" does not express a unitary competence but rather the sum of different skills contextualised to the domain of volunteering.
2. The concept "volunteering and third sector legal frameworks" is too broad and should not be included.
3. The concept "types of tidal stream generators" does not express a knowledge and should not be included.
4. The concept "be a role model" is not sufficiently contextualised and should be revised.
5. The concept "open badges" as currently formulated cannot be considered as a knowledge.
6. The concept "volunteer management" does not express a knowledge and is already covered by other concepts in ESCO.
7. The concept "validation of learning acquired through volunteering" should be transformed from knowledge to skill.
8. The dataset shows inconsistencies in the level of granularity between sectors. Some fields (e.g. project and learn management) are covered by very granular concepts compared to other fields.
9. The concept "telehealth" should be revised, as telehealth refers to a field of activity and not to a unitary knowledge.

Reaction:

Feedback under points 1 -6 will be implemented.

Feedback under point 7 will not be implemented, as the concept refers to the knowledge of procedures used in the domain of validation of volunteering competences.

Feedback under point 8 will be taken into account in the context of the reflection on the next versions of ESCO.

Feedback under point 9 is currently being examined.

Germany

Germany did not raise any objection on the content or scope of the proposed terms. Germany welcomed the focus on green and digital skills and competences, and believes that this will have a positive effect on future mappings between national classifications of occupations and skills and ESCO v1.1.

Italy

Italy provided comments related to the continuous improvement of ESCO:

1. Skills reusability levels should be clearly defined and existing inconsistencies should be addressed. Moreover, the reasoning for assigning reusability levels to knowledge concepts is not always clear.

2. The level of information provided is not the same for all concepts. In some cases, information on broader and narrower relations and on relations between skills and occupations or between skills and knowledge are indicated. This is however not done in a consistent way throughout the classification.
3. It is not clear whether occupations are linked to skills by way of example or if these are the only professions that a specific skill is able to cover. In some cases, skills and knowledge concepts are not linked to any occupation while in other cases they are linked to irrelevant occupations.

Italy also provided detailed feedback on individual concepts. The comments received are reported below:

4. The concept "aquaponics" should be classified under the knowledge field "crops production".
5. The concepts "customise project methodologies'", "PM²", "maintain a project repository", "risk types", "project configuration management", "online ads campaign techniques", "perform contract reporting and evaluation", "document sharing procedures", "create social alliances", "organise information services" and "international development", should be redefined as cross-sectoral skills and knowledge.
6. The concepts "offshore constructions and facilities", "micro mobility devices", "design indicators for food waste reduction", "design food waste reduction strategies" and "implement route planning in smart mobility services" should be redefined as sector-specific skills and knowledge.
7. The concept "media and information literacy" should be linked to occupations in the field of journalism.
8. The allocation of the concepts "integrate gender dimension in research" and "measure physical phenomena in healthcare" in the skills hierarchy should be reviewed.
9. The concept "circular economy" should not be linked to the occupations of social entrepreneur, marine painter and industrial designer.
10. The concepts "local representative" and "host/hostess" belong to a sector that is regulated by law.
11. The concept "augmented reality", "machine learning", "principles of distributed ledger technology", "develop open-source software", "develop computer vision system", "manage volunteering programmes", "identify information needs of young people", "provide youth information services" and "manage youth information services" could be linked to other occupations.
12. The concept "GDPR" should be labelled as a knowledge and not as a skill.
13. The concept "design space for religious needs" should not be linked to the occupations of venue director and accommodation manager. It should not be classified under Skill group S4.1.3.
14. The concept "geothermal technician" should be classified under ISCO group 7412.
15. The concept drone pilot should not be classified under the ISCO group 3153.
16. The concept "project support officer" should be classified under ISCO group 3343.
17. The concept "temperature screener" covers a role that in Italy is performed by other professions such as nurses or pharmacists.
18. The occupation of "Covid tester" does not exist in Italy and there is no plan of recognising such role at national level.

19. The description of the concept "design microclimates in buildings" should be modified by deleting the first sentence.
20. The concept "use systemic design" is not clear and should be deleted.
21. The concept "e-agriculture" should not refer to fishery.
22. The concepts "design indicators for food waste reduction" and "conduct research on food waste prevention" could be duplicates of the concept "develop food waste reduction strategies".

Reaction:

Feedback under points 1-3 will be taken into account in the context of the reflection on the next versions of ESCO.

Feedback under points 4-12 will be implemented.

Feedback under point 13 will be partially implemented. The link with the occupation of accommodation manager will be maintained to reflect the importance to ensure equal opportunities and equal access to touristic services.

Feedback under points 14-18 is being examined. The Commission will consult the ILO on the proposed mapping of the new occupations to ISCO.

Feedback under point 19 will not be implemented, as knowledge of climatic and local conditions of sites is necessary to design microclimates.

Feedback under point 20 will not be implemented, and the concept will be revised following the feedback from other Member States.

Feedback under point 21 will not be implemented, as fishery is one of the fields included in the definition of e-agriculture.

Feedback under point 22 will not be implemented, as these three concepts cover different skills related to food waste policies.

Lithuania

Lithuania believes that the occupation "rubber technologist" should be classified under ISCO unit group 2145 "Chemicals engineers", as other ESCO occupations of technologists (such as clothing technologist, textile technologist or food technologist) belong to ISCO group 2.

Reaction: this feedback is under examination. The Commission will consult the ILO on the proposed mapping of the new occupations to ISCO.

The Netherlands

The Netherlands provided written comments resulting from the exercise of mapping the Dutch national classification of occupations to ESCO.

These comments therefore do not address the new content but focus on existing ESCO occupations. The comments touch upon the level of granularity of occupations, the hierarchical allocation and mapping to ISCO, the existence of duplicate occupations and their description.

This feedback will be implemented in version 1.1 where possible.

Slovenia

Slovenia provided detailed feedback on the individual concepts. The comments received are reported below:

1. The concept "mobile agriculture" is a duplicate of the concept "e-agriculture" and should be deleted.
2. The description of the concept ''aeroponics'' should be revised.
3. The concept "molecular gastronomy" should be classified under the knowledge area of food science.
4. The concept "risk types" should be changed into "risk identification".
5. The concept "hoshin kanri" should be changed into "hoshin kanri strategic planning".
6. The concept "use systemic design" is too general and should be further specified.
7. The concept "promote open innovation in research" could also be formulated as "promote integrated collaboration in research".
8. The label "use open access publishing methods" should not be used as alternative label for the concept "publish research in open access''.
9. The concept ''generate research funding'' could be changed into ''apply for research funding''.
10. The concept "install smart thermostat" is too specific and should be revised.
11. The concept "perform venous cannulation" could be linked to other nursing occupations.
12. The concept "simulation-based clinical education" belongs to the education domain.
13. The description of the concept "medical physics expert" could be shortened.
14. The NPT "research AdMs" should be deleted from the concept "develop advanced materials".
15. The concept "train medical students" is a duplicate of existing concepts related to the provision of training and should be deleted.
16. The concept "local representative" is similar to the occupation of "tour operator" and should not be included. Alternatively, its PT should be changed into "local information/administration representative".
17. The description of the concept "smart home installer" is too detailed.
18. The description of the concept "smart home engineer" is too detailed.
19. The concept "philanthropy" raises questions whether the activity of donating funds can be considered as a knowledge. It should be revised.
20. The concepts "provide youth information counselling" and "provide youth information services" are duplicates and therefore they should be merged.
21. The concept "personal reflection techniques based on feedback" should be classified under the knowledge area of social and behavioural sciences. It should be linked as optional skill for the human resource manager, the recruitment consultant, the human resource officer and the psychologist.
22. The concept "open badges" as currently formulated cannot be considered as a knowledge.
23. The concept "type-approval" should be changed into "vehicle type approval".
24. The concept "maintain relations with mining stakeholders" is too specific and should be deleted.
25. The description of the skill "integrate gender dimension in research'' is too broad and should be revised.

26. The Preferred Term of the concept "manage open licensing" is not sufficiently clear.
27. The concept "travel agent" should be changed into ''travel consultant''.
28. The concept "conduct retanning operations" is not sufficiently clear.
29. The concept "plan tanning operations" and "plan tanning finishing operations" are mutual duplicates.
30. The concept "measure temperature" is too detailed.
31. The concept "health technology assessment" is not sufficiently clear.
32. In the description of the concept "rubber technology", the word "types" should be replaced with the term "properties".
33. The concept "use questioning techniques for assessment" is too detailed and therefore not necessary.
34. The description of the concept "manage documentation of prior learning assessments" does not add value to the classification and should not be included.
35. The concept "apply quality standards to the interaction with candidates" is too specific and should not be included.
36. The concept "communicate about scientific findings" should be changed into "communicate about scientific findings to the public".
37. The term "microelectronics smart manufacturing engineer" could be changed into "microelectronics technology expert".

Reaction:

Feedback under points 1-24 will be implemented.

Feedback under points 25-26 is under examination.

Feedback under point 27 will not be implemented, as ''travel consultant'' and ''travel agent'' are two different occupations in the current ESCO version.

Feedback under points 28-29 will not be implemented, as these concepts refer to different phases of the tanning process.

Feedback under point 30 will not be implemented, as this concept is an important aspect in the context of Covid-19 adaptation measures.

Feedback under point 31 will not be implemented, as health technology assessment is an important element of the EU health policy.

Feedback under point 32 will not be implemented, as this concept refers also to the methodology to process rubber into rubber material with different characteristics, suitable for the targeted application.

Feedback under points 33–35 will not be implemented, as these concepts are coherent with the approach for skills contextualization used in ESCO.

Feedback under point 36 will be partially implemented. The proposed wording will be added to the list of alternative labels in order to ensure compliance with the provisions of the ESCO terminological guidelines governing the number of words used in preferred terms.

Feedback under point 37 will not be implemented, as the terminology used has been proposed by a sectoral Blueprint and the suggested alternative is already between the alternative labels.

6. Further improvement of the Skills hierarchy

In May 2020, the Commission published the draft skills hierarchy with the release of ESCO v1.0.5. Several implementers and other stakeholders have been able to use the hierarchy in practice and have provided feedback. Additionally, suggestions for improvement were formulated by the experts who had worked on the hierarchy. All this information will allow the Commission to improve the skills hierarchy. The following paragraphs summarize the feedback and areas of improvement that need further examination; a detailed overview can be found in Annex 1. The Commission will plan the processing of this feedback in order to improve the hierarchy.

a. Points of attention regarding usability

In September 2019, the Commission discussed the draft skills hierarchy with Europass, the EQF and Cedefop. In this context, changes were proposed, some of which have already been implemented, while others are worth listing:

1. The DigComp framework has been linked with ESCO. However, the skills hierarchy partly overlaps with the structure of DigComp. It is therefore worth considering to keep the DigComp framework as a distinct subhierarchy of the transversal skills of ESCO. This can be taken into account in the ongoing work on the renewed transversal skills hierarchy.

2. Some groups contain a high number of skill concepts which makes it impractical from a user experience point of view. It is therefore recommended to define the scope of the different skill groups in such a way that a manageable amount of skills is linked to each group.

3. Specific terminological guidelines for scope notes and examples would be useful.

4. The transversal skills must be easily accessible, therefore a separate hierarchy for transversal skills would serve better. However, with the ongoing work of the transversal skills expert group, this consideration will be addressed in the update of the transversal skills hierarchy.

b. Improvements recommended by experts

The experts who worked on the skills hierarchy have provided a list of suggestions for improvements that needed further investigation. The suggestions are summarised in the list below and a detailed list can be found in Annex 1.

1. A comprehensive quality assurance of the allocation of skills concepts should be done. Notes on potential further adjustments to the structure of the hierarchy and scope of groups should be made as a by-product of this process. To the extent possible, the quality assured allocations should be implemented in operational versions of the hierarchy without waiting for an updated hierarchy.
2. Following quality assurance, a further revision of the hierarchy should be undertaken over a period that would allow sufficient time for reflection on the major issues. The results of testing the hierarchy currently being undertaken by several agencies should be fed into this process, as well as the specific issues discovered during the creation of the hierarchy. Once the revision of transversal skills has been completed, further input for improving the skills hierarchy might also be available.

3. Review and rationalisation of the skill/competence concepts themselves is advised.

c. Feedback from stakeholders

In April 2020, the MAI brought forward seven stakeholders that tested the skills hierarchy for their respective use case and provided the Commission with feedback.

In line with the suggestions of the experts, several stakeholders drew attention to remaining misallocations of skill concepts to the hierarchy and suggested some changes to the structure and grouping of the hierarchy. In addition, the stakeholders had some specific suggestions such as for example the need for clear explanation on how the hierarchy is conceived, the usefulness of mapping the hierarchy (and ESCO in general) to other classifications such as O*Net, and the value of also having an aggregated view on the skills hierarchy.

d. Suggested improvements following skills allocation

While allocating the skill concepts to the hierarchy, a detailed analysis was performed on the draft skills hierarchy. This resulted in several suggestions for improvement. The primary areas addressed were overlapping groups, issues with formulation, and placement of certain groups within the hierarchy. A detailed list can be found in Annex 1.

7. Work on the transversal skills of ESCO

In October 2020, the expert group on transversal skills delivered an approach to refine and structure the terminology of transversal skills in ESCO. The proposal, which was presented in detail during the 34th ESCO MAI, is based on a multilevel structure developed around five broad categories of transversal skills, closely interconnected and moving from the internal reasoning and individual self-awareness to the social and external. Each category is divided into a number of transversal skill clusters covering a range of single concepts.

These identified categories are:

- Language skills and competences
- Thinking (cognitive) skills and competences
- Self-management skills and competences
- Social and communication skills and competences
- Life skills and competences.

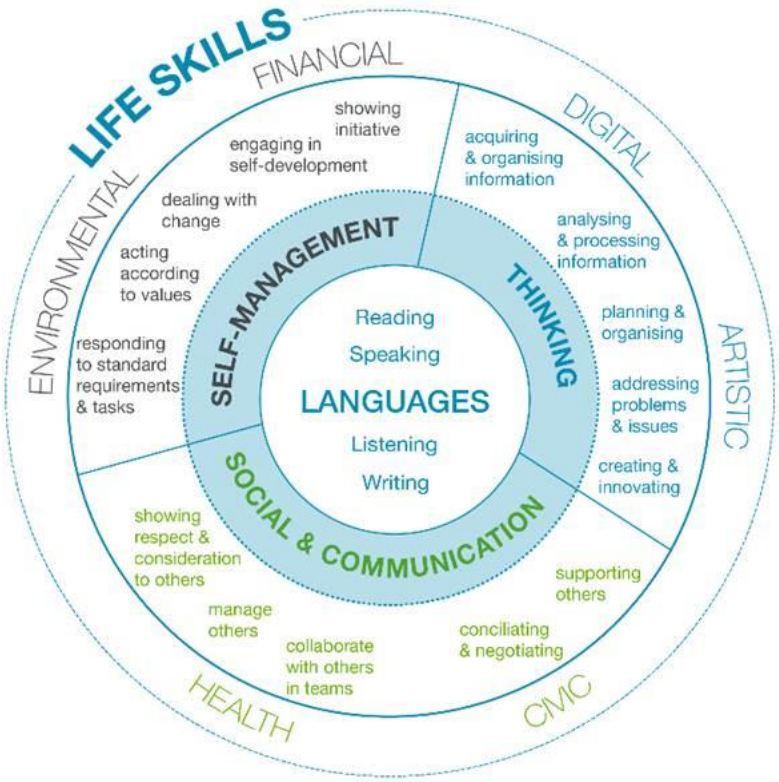


Figure 5. The newly developed broad categories of ESCO transversal skills

At the end of 2020, the Commission consulted the ESCO Member States Working Group and the EQF AG on the proposed draft structure. The consultation touched upon the different national use cases of a revised taxonomy of transversal skills, the proposed categories, clusters and terms and the integration of the new structure with the existing skills hierarchy. Member States were invited to reply to the following questions:

1. What are the national needs for transversal skills in ESCO?
2. Do you agree with the five categories? Do you find the clusters informative and helpful?
3. Could you please give us your comments on the proposed new terms?
4. Are there skills that according to your national experience or practice should be added to this list? Are there skills in the list that are superfluous? If yes, which are these?
5. Would the new transversal skills clustering be better placed integrally in the ESCO skills hierarchy or separate to it?

The Commission received replies to the consultation from 8 countries: Belgium, Croatia, Estonia, France, Italy, Norway, Poland and Slovenia. The expert group on transversal skills is currently implementing the feedback received from Member States in order to define the final version of the new transversal skills structure. The draft version of the final report will be discussed in a workshop on 22 April 2021.

The Commission will continue working during the course of 2021 in order to complete the final list of transversal skill concepts based on the update structure. This includes narrowing down the final list of terms to 100-200 concepts and defining the different metadata for these concepts (describe their content and scope, provide a list of alternative labels, synonyms and spelling variants and organise the terms into a thesaurus structure indicating broader/narrower relations between terms). The final list of transversal skills will provide the basis for a broad discussion with the community of ESCO implementers on the revision of the approach for skills contextualisation.

Annex 1 Suggestions for further adjustments of the skills hierarchy

Proposals by the experts

S1.06 Promoting, selling and purchasing

There is potentially a need for an additional level 3 group in S1.06 Promoting, selling and purchasing for "trading". This group would include skill concepts that involve both buying and selling such as trade securities, trade jewellery and make bids in forward auctions. These and similar concepts can currently only be allocated at Level 2.

S1.11 Designing systems and products

There is scope for further disaggregation of this group. For example, S1.11.5 Designing industrial materials, systems or products could potentially be further subdivided and a separate Level 3 category for designing optical systems and sensors should be considered.

S2.01.1 Conducting investigations

This group is large and quite diverse. Further breakdown is needed following analysis of the concepts allocated to it.

S2.01.2 Diagnosing health conditions and S2.08.6 Monitoring health conditions

These groups cover both human and animal health conditions, whereas S3.02 Providing health care or medical treatments and S6.09.7 Providing therapy or veterinary treatment for animals separate the provision of health care for humans and for animals. Moreover, the definition of S6.09.7 explicitly includes diagnosis. Various possible solutions could be envisaged to resolve these inconsistencies.

S2.08.1 Monitoring, inspecting and testing equipment, systems and products

This group contains more than 300 skills, so it could be good to divide it in different groups. For example, one could be about monitoring and testing equipment, another one about systems and a last one about products. Further analysis is needed to determine the exact groups to be included and to define their boundaries.

S3.03.1 Complying with health and safety procedures

This group overlaps to a certain extent with A1.03.1 Attend to personal hygiene. A solution should be addressed in close consultation with the transversal skills group.

S3.04.3 Assisting people with paperwork

Very few skill concepts have been assigned to this group, but this may indicate a gap in ESCO skills. The need to retain the group should be evaluated following completion of quality assurance of the allocations.

S4.01.4 Developing research plans

This group may not be viable. Most concepts currently allocated to it could easily be allocated elsewhere. The need to retain the group should be evaluated following completion of quality assurance of the allocations.

S4.04.3 Performing general clerical and administrative tasks

All concepts allocated to this group should be thoroughly reviewed and analysed with a view to allocation somewhere else, or to the creation of more specific groups.

Create a single group at level 2 for managing and leading people

This would involve merging S4.05 Leading and motivating (which contains a single level 3 group) with S4.08 Supervising people. This would not require change to the existing level 3 groups, although S4.05.3 Assigning work to others has only 5 concepts allocated to it. If this is still the case following quality assurance, consideration could be given to merging it with Supervising a team or group. However, a relatively large number of occupations are linked to the five concepts currently assigned to the group. S4.03.2 Managing human resources, and potentially S4.04.1 Administering human resources could also be included in the merged Level 2 group as follows:

S4.05 Managing and leading people

S4.05.1 Leading and motivating

S4.05.2 Supervising a team or group

S4.05.3 Assigning work to others

S4.05.4 Monitoring and evaluating the performance of individuals

S4.05.5 Managing human resources

S4.05.6 Administering human resources

S5 Working with computers

This group needs significantly more work. There is scope for further subdivision of Programming computer systems and Managing and analysing digital data. The latter group also has boundary issues with Browsing, searching and filtering digital data. Good suggestions have been made about solutions to these problems but due to the large number of relatively diverse concepts currently allocated to some of the groups there has been no time to resolve the complex issues.

S6.04.2 Planting crops, trees, or other plants

Consideration should be given to merging this group with S6.04.1 Cultivating land and crops

S6.08 Positioning materials, tools or equipment

The two level 3 groups included here could potentially be merged and moved to S6.02 Moving and lifting.

S8.05.0 Operating machinery for the manufacture of products

A large number of concepts have been allocated to this category at level 2. There is a need to review these to identify possibilities for allocation at level 3 and to identify clusters to form new categories.

S8.05.7 Operating metal, plastic or rubber forming equipment

This group is quite heterogeneous. Concepts related to operating welding machinery are included here but should probably form a separate category.

S8.06.0 Using precision instrumentation and equipment

There is a need to clarify the boundary between this group and S5.07.0 Using digital tools to control machinery. Several concepts concerned with operating control equipment have been assigned to the latter group, and in some cases, it is not evident that they involve using digital tools. Creation of a separate group for operating non-digital control equipment should be considered. Alternatively, all concepts that involve operating control equipment could be allocated to Using digital tools to control equipment. This may not be appropriate, however.

Detailed suggestions for improving current skills groups.

Level 1	CODE L3	LABEL	COMMENT
S1	S1041	Presenting general information	The group overlaps with S1040 *Presenting information.*
	S1091	Developing solutions	This group is very similar with S1090 *Solving problems.*
	S1110	Designing systems and products	We believe that the example "film making" does not belong there.
	S1111	Designing computer or information systems or applications	We believe this group fits better under S5 *Interacting with computers.*
	S1112	Designing electrical or electronic systems or equipment	Clarification is needed on the difference between systems and equipment. Do we need both?
	S1113	Developing recipes or menus	We believe this group should not belong to S1.
	S1123	Creating artistic designs or performances	This group could be split into two groups: "Creating artistic designs" and "Creating artistic performances".
	S1133	Functional writing	We believe that the example "drafting laws" does not belong there.
	S1150	Using more than one language	Replace this group with S1151 *Using foreign languages* (S1151 changes from L3 to L2) and *Using foreign languages* (currently L3) should be deleted. This is because S1150 and S1151 are the same.
S2	S2040	Processing information	This group should be changed from L2 to L3. As a consequence, the codes of S2040, S2041 *Gathering information from physical or electronic sources* , S2042 *Entering and transforming information* should be changed to S2031, S2032, S2033.
	S2051	Measuring dimensions and related properties	This group is redundant and should be removed because S2052 *Weighing* and S2053 *Taking physical measurements of patients or clients* are enough.
	S2088	Testing and analysing substances/Collecting and preparing specimens or materials for testing	This group overlaps with S6036 *Collecting and preparing specimens or materials for testing*
S3	S3011	Counselling others about personal, family or social issues/Providing support to resolve problems	This group could be merged with S3012 *Providing support to resolve problems*
	S3026	Fitting assistive devices	Spelling mistake in the revised definition (orthotic)
	S3034	Verifying identities and documentation	This group could be renamed to *"Investigating identities"* , which would make it suitable to fit under S2011 *Conducting investigations*
	S3043	Assisting others with paperwork	This group is too granular and has 10 skills. Maybe we can allocate its skills to other skill groups and delete it.
	S3050	Providing food and beverage services.	This group overlaps with S3051 *Preparing and food and drinks* . As a solution, S3051 could be removed. Also, spelling mistake in the label of S3051 ("and"should be left out).
	S3057	Fabricating food and related products *(group deleted at 18.04)h*	Tobacco should not be included in this group. We need to find a place for skills referring to various processes of handling tobacco.
	S3063	Caring for children	We propose to delete this group and move the skills under S3062 *Assisting others with personal needs* . The scope of S3062 can cover the skills included currently in S3063.

Feedback from stakeholders

<u>Skill groups</u> 1. Fine-tune skill group labels 2. Misallocations of skills to skill groups 3. Non-homogeneous groups: number of skills per group very different --> either merge or divide groups to achieve balance 4. Some skill groups are broad or abstract Skills 1. Several duplicates
<u>Skill groups</u> 1. Misallocations of skills to skill groups 2. Skill group overlaps, e.g. S8 Installing, maintaining and repairing
<u>Use case: improve clustering of qualifications</u> Match skills to text of learning outcomes 1. Lack of knowledge on how the hierarchy was developed 2. Graph of the hierarchy would be useful for a quick overview 3. Non-homogeneous groups: number of skills per group very different --> either merge or divide groups to achieve balance. Ideally 30-60 skills per group 4. Bad translation in PL

Skills 1. Misallocations of skills to occupations 2. Transversal skills: not common understanding 3. Several occupations have a big number of skills. This is partly because of duplicates. By eliminating the duplicates in the next version we will achieve a smaller number of skills allocated in occupations.
1. ESCO - O*NET mapping would be useful
Comparison of Dutch qualification structure and ESCO 1. It would be useful to have interdependences between K+S+C 2. Add work context to skills 3. Need for common definitions: K+S+C+attitudes&values 4. Skills transferability to be ensured throughout the skill hierarchy
Big data application of the skill hierarchy: display of the % of the skill groups included in JVs