Continuous improvement workflow for ESCO

European Skills, Competences, Qualifications and Occupations
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Scope of this document

This document describes the workflow for the continuous improvement of the ESCO classification. This includes updates of concepts and terms. It does not cover changes in the ESCO methodology such as new functionality or changes of ESCO the data model.

The document explains the workflow for changing the content and publishing the updated classification by describing the entire process for one updating cycle. It names the process steps, the expected inputs and outputs, the actors involved and the tools and techniques that can be used. The document does not include the step of developing and implementing a communications plan for an updated version of ESCO.

Why ESCO needs to be updated

Only if ESCO is updated continuously, it will remain fit-for-purpose for the use in various IT applications that deliver high-quality services to end-users. The labour market and the education and training sector are changing permanently. These changes therefore 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; nature of occupations change 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 development or new expectations by end users change the way of service provision and thus the requirements towards the ESCO classification as a building block of the system.

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

Reviewing the continuous improvement process

The Commission will regularly review the continuous improvement process itself, in order to make it as efficient as possible. Before launching the first round of continuous improvement, the Commission intends to simulate the continuous updating cycle of ESCO by piloting the process with various stakeholders. This way the Commission will gather feedback on the various steps of the continuous improvement process and will be able to adapt the process depending on the outcomes of this testing. The Commission also intends to review the process after each iteration of the continuous improvement cycle to identify further potential improvements of its efficiency.
Overview of the ESCO update cycle

Fig. 1 shows an overview of one cycle of the ESCO continuous improvement process. This document describes all steps of the process. For each step, the document explains:

- **Input**: Documents or data that are needed before the process step starts. The input can be part of a previous step of the continuous improvement process or it can result from a process outside the scope of this document;

- **Actors**: A group of people or an organisation that is involved in the process step, e.g. by carrying out part of the work, by taking decisions or by providing an opinion;

- **Tools & techniques**: Systematic methods how to carry out a specific task, as well as software programs and templates helping to do the work. Not all tools and techniques described need to be applied in each updating cycle of ESCO;

- **Output**: Documents or data that are created as a result of the process step.

The roles and responsibilities of the actors of the ESCO update cycle are indicated in Annex I, at the end of this document.

![ESCO continuous improvement process diagram](image-url)

**Fig.1 ESCO continuous updating process**
### 1. Collect feedback

#### Inputs

1. National and international classifications
2. Repository of big data sources
3. Studies
4. Stakeholder register

#### Actors

1. ESCO team
2. ESCO implementers
3. Domain experts
4. ESCO Maintenance Committee

#### Tools & Techniques

1. Big data analyses
2. Interviewing
3. Expert group meetings
4. Online forums
5. Desk research
6. Sectoral blueprints
7. Ticket management software

#### Outputs

1. Register of issues and contributions
2. Updated stakeholder repository
3. List of sources

---

**Fig 2. Process step overview: collect feedback**

#### 1.1 Inputs

**1.1.1 National and international classifications**

National and international classifications covering occupations, knowledge, skills, competences, or related concepts. Such classifications are a useful source of information for the continuous improvement of ESCO. They are usually managed by Member States authorities or by European or international organisations. Updates of the national and international classifications can be signs of underlying changes in the labour market or the education sector and are thus particularly valuable information. If for example a new occupation is added to several national classifications, this can be a strong indication that it emerged as a new occupation in the labour market. National classifications and their mappings with ESCO can also help to determine, which parts of ESCO are modelled with too much detail and for which parts detail is missing. Close cooperation with the custodians of national and international classifications is important in order to learn about new versions early and to obtain reports on the updates, such as release notes or delta files.

**1.1.2 Repository of big data sources**

Big data sources that contain information on occupations, knowledge, skills, competences and related concepts. This includes in particular large data sets of job vacancies, CVs, professional profiles, learning opportunities and education or training curricula. Online tools and services such as EURES, Europass, the EU Skills Panorama, public and private job boards collect such data which can be a useful source for ESCO. Legal constraints need to be verified before any use of big data sources.

**1.1.3 Studies**

Studies on current or future skills demand and skills supply, on new trends in the labour market or in education and training and on related topics. This can include
statistical or economic analyses, surveys and other types of studies. Such studies are published inter alia by the Commission, CEDEFOP, Member State authorities, Social Partners, NGOs, industry associations, business consultancies, think tanks and researchers.

1.1.4 Stakeholder register

A document that contains a list of external and internal project stakeholders. The stakeholder register records important stakeholders during the whole process of the continuous improvement of ESCO. It should include a list of stakeholders’ information including:

- their name, contact information and their affiliation;
- their expectations, interests, impact and requirements;
- the type of communication that the ESCO team had exchanged with them before and after the continuous updating process;
- the possible connection and interlink between them;
- the type of communication means they prefer to be contacted through (email, phone);
- the economic sector or group of occupations for which they have expertise.

1.2 ACTORS

1.2.1 ESCO team

The ESCO team works on behalf of the Commission, currently under the direction of Unit E2 of DG Employment, Social Affairs and Inclusion ("Skills and qualifications"). It is tasked to manage the development and updating of the ESCO classification.

1.2.2 ESCO implementers

ESCO implementers use the ESCO classification in order to provide software solutions, products or services to customers or end users. This includes inter alia public and private employment services, job boards, HR software vendors, social media platforms, recruiters, career guidance services, training providers and awarding bodies. Since they use ESCO in their applications and systems, implementers have valuable insights in the performance of ESCO in specific use cases. This is valuable feedback for the continuous improvement of ESCO.

1.2.3 Domain experts

Domain experts have a deeper insight into the knowledge, skills and competences needed in specific economic sectors or specific occupations or into cross-sectoral knowledge, skills and competences. Domain experts include inter alia specialised recruiters, education and training professionals, social partners, industry associations, professional associations, sector skills councils and networks. They can provide
valuable information on how an economic sector evolves. They know what new occupations or skills requirements emerge in the market. With their expertise they can also help to validate content in the classification or to point out quality issues.

1.2.4 ESCO Maintenance Committee

The ESCO Maintenance Committee is a Commission expert group. It provides advice on the technical and conceptual development of ESCO. It formulates opinions on the approach for technical implementation, on quality control principles and on the revision of ESCO data. Additionally, the ESCO Maintenance Committee advises the Commission on the implementation of ESCO in concrete business cases. The ESCO Maintenance Committee will continue playing an important role on the continuous improvement of the ESCO classification. The future ESCO Maintenance Committee will include custodians of national and international classifications, ESCO implementers and cross-sectoral domain experts.

1.3 TOOLS & TECHNIQUES

1.3.1 Big data analyses

Analysing big data allows the ESCO team to detect, evaluate, and interpret data deriving from the education and labour market. It can be repeated on a regular basis and at low incremental costs. The relevant data can be analysed and compared with the data of the ESCO classification to identify any mismatches and missing terminology that could derive from new occupations and skills requirements.

1.3.2 Interviewing

The ESCO team can conduct interviews to collect input from ESCO implementers or domain experts. Interviews can be done in person or remotely and allow to collect information with targeted questions.

1.3.3 Expert group meetings

The Commission can organise physical meetings or webinars with its expert groups. It can present topics to the experts for information or consultation. When setting up expert groups, the Commission clarifies the mandate and the working methods of each group. The Commission publishes the terms of mandate of the group, the agendas, meeting documents and minutes online.

1.3.4 Online forums

Online forums are an efficient way to support the communication of the ESCO team with stakeholders and to obtain feedback on the content of ESCO. They can be implemented using standard software components or existing social media networks for professionals. The ESCO team can manage separate online forums per target group, in particular one to communicate with ESCO implementers and one to communicate with domain experts.
1.3.5 Desk research

Desk research is a cost-efficient way of collecting knowledge that is readily available. The ESCO team can make use of existing sources on economic sectors, occupations and knowledge, skills and competences. This includes reports published by the Commission and its agencies, by social partners, by professional and industry associations and by academia.

1.3.6 Sectoral blueprints

Sectoral blueprints\(^1\) are initiatives to design sector-specific skills solutions based on an industry-led three-step approach. They will:

- Collect evidence of skills gaps and their potential impact on growth, innovation and competitiveness;
- Translate sectoral strategy into forecasts and actions on jobs and skills; and
- Roll out EU sectoral partnerships at national and regional level and expand to more sectors.

ESCO will cooperate closely with the sectoral blueprints in order to collect feedback and information deriving from their work.

1.3.7 Ticket management software

A ticket management software such as JIRA allows to record issues, plan tasks, and distribute them across a team. The ESCO team uses ticket management software to record any known issues for potential updates of ESCO, as well as any issues that require further investigation. In the ticketing software, these issues can be assigned to team members for further analysis as well as to the scope of a specific ESCO release or work package.

1.4 OUTPUTS

1.4.1 Register of issues and contributions

A register recording details of all contributions received and of all issues identified. Together with the contributions and issues, it records the actions taken to address them and the results achieved. The list is continuously updated during the work on an ESCO update cycle. The register allows users to compile reports that support the ESCO team throughout the process.

1.4.2 Updated stakeholder repository

See chapter 1.1.4. The ESCO team updates the stakeholder to record new stakeholders engaged in the ESCO project, to record contacts with stakeholders and to update information on the stakeholder details.

1.4.3 List of sources

A list of reference material that can be used to update content in the ESCO classification. It allows the reader to find information that was provided by stakeholders, other classification systems and any other useful source. It includes information where to find the source, the year when it was published and any legal constraints in using it. The sources can be recorded as part of the taxonomy management software (4.3.7).
2. Analyse and structure feedback

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>ACTORS</th>
<th>TOOLS &amp; TECHNIQUES</th>
<th>OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Register of issues and contributions</td>
<td>1. ESCO team</td>
<td>1. Clustering</td>
<td>1. List of update bundles</td>
</tr>
<tr>
<td>2. Fit-for-purpose KPIs</td>
<td></td>
<td>2. Requirement and value analysis</td>
<td>2. Updated register of issues and contributions</td>
</tr>
<tr>
<td>3. Reference classifications</td>
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<td></td>
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</tr>
</tbody>
</table>

Fig.3 Process step overview: analyse and structure feedback

2.1 INPUTS

2.1.1 Register of issues and contributions

See chapter 1.4.1.

2.1.2 Fit-for-purpose KPIs

A set of KPIs to measure the performance of ESCO in different use cases. With the ESCO classification the Commission seeks to accommodate a variety of use cases and potential user groups. The ESCO team will take this into consideration while evaluating ESCO. In some cases ESCO might have a perfect fit for a specific use case while having a less optimal fit for another area. The use of KPIs helps analysts to measure the coverage and relevancy of the classification from the perspectives of different use cases.

2.1.3 Reference classifications

Reference classifications provide a high level structure of economic sectors, occupation groups, skill groups and other domains related to ESCO. They help the ESCO team to structure the list of issues and contributions, since they allow them to organise the list by concept type, by economic sector, by occupation group or other criteria. Reference classifications include inter alia the NACE and ISCO classification, as well as ESCO in its version n².

2.2 ACTORS

2.2.1 ESCO team

See chapter 1.2.1.

² This document describes the continuous updating cycle from an ESCO version n to an ESCO version n+1.
2.3 TOOLS & TECHNIQUES

2.3.1 Clustering

The ESCO team will organise issues and contributions into groups with common characteristics. To this end, it makes use of reference classifications. The aim is to group the individual issues for the updating of the classification into update bundles that:

- are well manageable in size and number,
- contain concepts or terms that have interdependencies between each other and should be looked at from a holistic perspective during the updating process, and
- are relevant for a specific sub-group of ESCO implementers and/or domain experts so that the involvement of stakeholders during the revision process can be more targeted.

2.3.2 Requirement and value analysis

Requirements analysis involves frequent communication with ESCO implementers to determine their expectations towards the content of the classification, to clarify their requirements and documenting them for a fit-for-purpose classification. The ESCO team can compare the results of a requirement analysis with the scope of potential updates. The ESCO team can also perform a value analysis in order to determine which potential updates would have the highest added value in relation to the effort and costs for these updates.

2.4 OUTPUTS

2.4.1 List of update bundles

A list describing candidate groups of issues (bundles) that can be treated in one ESCO update cycle. For each bundle it includes a description of the scope, the list of issues and contributions included and an assessment of the effort and value of executing the updates included in the bundle.

2.4.2 Updated register of issues and contributions

An updated version of the register described in chapter 1.4.1.
3. **Plan release scope**

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>ACTORS</th>
<th>TOOLS &amp; TECHNIQUES</th>
<th>OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Description of update bundles and assessment of their added value</td>
<td>1. Commission</td>
<td>1. Project scope management</td>
<td>1. Scope document for ESCO version ( n+1 )</td>
</tr>
<tr>
<td>2. Political priorities</td>
<td>2. Member State experts</td>
<td>2. Expert group meetings</td>
<td>2. Quality management plan for ESCO version ( n+1 )</td>
</tr>
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<td></td>
<td>3. ESCO Maintenance Committee</td>
<td>3. Project risk planning</td>
<td>3. Risk management plan for ESCO version ( n+1 )</td>
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<tr>
<td></td>
<td></td>
<td>4. Project quality management</td>
<td></td>
</tr>
</tbody>
</table>

**Fig.4 Process step overview: plan release scope**

### 3.1 INPUTS

#### 3.1.1 Description of update bundles and assessment of their added value

See chapter 2.4.1.

#### 3.1.2 Political priorities

A description of the broader political context that is defined by political initiatives, agendas or priorities set by the Commission and/or Member States. The updates of ESCO can impact on political, economic, social and environmental aspects and thus support these political priorities.

### 3.2 ACTORS

#### 3.2.1 Commission

The Commission services in charge of ESCO are the main actor for deciding on ESCO updates and setting strategic goals for the ESCO project.

#### 3.2.2 Member State experts

The Commission involves Member State experts in the decision making process. Currently, they are involved through the Member States Working Group on ESCO. The group is composed of representatives from Member States on employment and education and training affairs and representatives from European Social Partners. Each Member State appoints up to two national experts as members of the group. Each European organisation representing social partners appoints one member to the group. The members present at the meeting are mandated to contribute on behalf of the country.
3.2.3 ESCO Maintenance Committee

See chapter 1.2.4.

3.3 TOOLS & TECHNIQUES

3.3.1 Project scope management

Planning the scope for the next ESCO release includes the following steps: identifying the update bundles that will be included in the next release, assessing the cost, time and effort needed to implement the work, and documenting the decisions on the project scope.

3.3.2 Expert group meetings

See chapter 1.3.3.

3.3.3 Project risk planning

The planning of the scope for each update cycle of ESCO should include a separate project risk planning process. It helps the project managers to identify potential risks and develop solutions that reduce the likelihood of risk occurrence. Through a project risk planning, managers could also mitigate the negative impact of the risks. The key steps of a project risk planning are the following:

- Identify risks
- Analyse risks
- Evaluate risks
- Plan risk response
- Monitor and control risks

3.3.4 Project quality management

Defining the scope for the next update cycle should be accompanied by a project quality management process. The goal is to determine the quality requirements and how quality will be managed during the improvement process. Project quality management needs to ensure that the updated part of the classification corresponds with the level of granularity and the quality level of the rest of the classification.

3.4 OUTPUTS

3.4.1 Scope document for ESCO version $n+1$

A document describing the scope for the new ESCO version, i.e. the version after the update. It describes the work packages of the continuous improvement cycle by listing all the update bundles and issues that will be addressed in the new version. It provides a cost estimate, a timeline and identifies constraints and assumptions.
3.4.2 Quality management plan for ESCO version $n+1$

A document listing the criteria and processes that will be applied for managing the quality of the new ESCO version. Since not all types of updates require the same checks for quality assurance, the plan will list the tools and techniques that will be applied in managing the quality of the specific update of ESCO.

3.4.3 Risk management plan for ESCO version $n+1$

A document listing and assessing the risks of the update cycle and suggested risk mitigations. It helps the project manager to organise and take concrete actions for the practical implementation of the risk mitigation strategy for ESCO version $n+1$. 
4. Develop update reference version

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>ACTORS</th>
<th>TOOLS &amp; TECHNIQUES</th>
<th>OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scope document for ESCO version (n+1)</td>
<td>1. ESCO team</td>
<td>1. Desk research</td>
<td></td>
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<tr>
<td>2. ESCO version (n)</td>
<td>2. Relevant stakeholders</td>
<td>2. Functional analysis</td>
<td></td>
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<tr>
<td>3. National and international classifications</td>
<td></td>
<td>3. Interviewing/surveying</td>
<td></td>
</tr>
<tr>
<td>4. Other relevant sources</td>
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<td>4. Online consultation</td>
<td></td>
</tr>
<tr>
<td>5. Register of issues and contributions</td>
<td></td>
<td>5. Skills contextualisation</td>
<td></td>
</tr>
<tr>
<td>7. ESCO guidelines</td>
<td></td>
<td>7. Taxonomy management software (eTMS)</td>
<td></td>
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</tbody>
</table>

Fig 5. Process step overview: develop updated reference version

4.1 INPUTS

4.1.1 Scope document for ESCO version \(n+1\)

See chapter 3.4.1.

4.1.2 ESCO version \(n\)

The latest published ESCO version (version \(n\)). This version will be the starting point for the development of the new version (version \(n+1\)). All issues in scope of the release will be addressed by modifying concepts, terms, relationships and metadata of ESCO version \(n\).

4.1.3 National and international classifications

See chapter 1.1.1. National and international classifications are valuable sources for ESCO development process. Their knowledge and term base are an important input for the updating of ESCO.

4.1.4 Other relevant sources

See chapter 1.4.3. Other sources relevant for the continuous improvement process include job vacancies, studies and research papers, statistical data and learning outcome descriptions. Learning outcomes are statements of what a learner knows, understands and is able to do on completion of a learning process, defined in terms of knowledge, skills and competences. Education and training institutions are increasingly describing their qualifications in terms of learning outcomes following the approach adopted by the European Qualifications Framework (EQF). Using relevant sources and learning outcomes descriptions ensures that the updates of the ESCO classification
cover the terminology used by various stakeholders, including the language of the labour market and of the world of education and training.

4.1.5 Register of issues and contributions

See chapter 2.4.2.

4.1.6 Stakeholder register

See chapter 1.1.4.

4.1.7 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.

4.2 ACTORS

4.2.1 ESCO team

See chapter 1.2.1.

4.2.2 Relevant stakeholders

During the development of the updated classification it is not necessary to involve all stakeholders (ESCO implementers: chapter 1.2.2; Domain experts: chapter 1.2.3). Instead, the ESCO team will identify a subset of the stakeholders relevant within the scope of the update to ESCO version n+1. This includes multipliers, who are willing to engage their constituencies and to inform them about ESCO and the planned update.

4.3 TOOLS & TECHNIQUES

4.3.1 Desk research

See chapter 1.3.5.

4.3.2 Functional analysis

Functional analysis\(^3\) determines the scope of an occupation by analysing the functions, i.e. the activities expected to be performed as part of the occupation. This process allows describing the occupation, identifying the boundaries of its scope, and capturing the knowledge, skills and competences that are needed to successfully perform the functions. This information is recorded in the occupational profiles of ESCO.

4.3.3 Interviewing/surveying

Interviews and surveys are an effective way to obtain, assess and evaluate information. They generate answers to queries that help to improve the different aspects of the ESCO classification. While surveys can reach a large number of people in a short amount of time and typically produce data that is easy to analyse, interviews can be used as a tool to obtain an in-depth insight into stakeholders’ perceptions on various issues and aspects of a project. Both methods allow knowledge engineers to ask targeted questions to expert stakeholders that help them to obtain the knowledge needed for the update.

4.3.4 Online consultation

The online consultation is a cost- and time-efficient process of collecting comments by stakeholders and domain experts through an online platform. The ESCO online consultation platform allows them to browse through a draft new version of the classification and to provide feedback directly at the specific concepts (occupations, knowledge, skills or competences) that are displayed in the platform. Due to this feature, the feedback is already organised according to the structure of the classification, which saves time and effort of the knowledge engineers.

4.3.5 Skills 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 bringing transversal knowledge, skills and competences which are rather abstract to a more detailed level so that they can be directly used in occupational profiles. Skills contextualisation can use several layers of making a generic, abstract skill more specific, by putting it into an increasingly narrow context.

The reverse process, skill decontextualisation is a method for generalising an occupation-specific knowledge, skill or competence so that it can be applied across sectors. It leads to the creation of more abstract and reusable knowledge, skill or competence concept.

4.3.6 Data mining

Data and terminology mining is a method that applies analytical tools on databases (in particular big data) can be used in order to enhance the ESCO classification. Based on the underlying data it identifies candidate concepts, terms and relationships and suggests them for inclusion into the ESCO classification. It can e.g. detect recurring patterns of knowledge, skills and competences, frequently used terminologies and the semantic closeness of different concepts in the classification. Data mining is a cost-efficient way of generating suggestions for changes in the classification.

4.3.7 Taxonomy management software (eTMS)

The purpose of the taxonomy management software (eTMS) is to maintain and manage the lifecycle of ESCO and to update and align it with the changes of the labour market. The platform will provide a number of services and functionalities to ESCO in
order to facilitate the management and release of updated versions of the classification. ETMS will offer a coherent interface to ESCO with services that support the seamless integration of data from other tools for managing the classification, such as the Translation Platform, the Mapping Platform and the ESCO portal system. Key functionality to support the updating of ESCO is:

- The capability to create and deprecate concepts;
- The ability to integrate changes in properties and relations;
- The possibility to import and export data; and
- The capacity to consult the ESCO classification in all ESCO languages.

### 4.4 OUTPUTS

#### 4.4.1 Draft ESCO version n+1 in the reference language

A new draft version of the ESCO classification (version n+1) in the reference language (English). The new draft contains the original content of ESCO version n with updated concepts, terms, relationships and metadata. The draft classification is stored in the taxonomy management software (eTMS) which also tracks all changes.

#### 4.4.2 Updated register of issues/contributions

An updated version of the register described in chapter 4.1.5.
5. Quality assure updated reference version

**INPUTS**
1. Draft ESCO version \(n+1\) in the reference language
2. ESCO guidelines
3. Quality assurance plan for ESCO version \(n+1\)

**ACTORS**
1. ESCO quality assurance team
2. ESCO Maintenance Committee
3. Member State experts

**TOOLS & TECHNIQUES**
1. Checklists
2. Validation tools & reports
3. Fit-for-purpose KPIs
4. Gap analyses and comparisons with other classifications
5. Member State consultation

**OUTPUTS**
1. Final ESCO version \(n+1\) in the reference language
2. Quality assurance report for ESCO version \(n+1\)

Fig.6 Process step overview: quality assure updated reference version

5.1 INPUTS

5.1.1 Draft ESCO version \(n+1\) in the reference language

See chapter 4.4.1.

5.1.2 ESCO guidelines

See chapter 4.1.7.

5.1.3 Quality assurance plan for ESCO version \(n+1\)

See chapter 3.4.2.

5.2 ACTORS

5.2.1 ESCO quality assurance team

The quality assurance of the ESCO classification will be performed by a team consisting of other people than the ones who developed the updated version of the ESCO classification (i.e. the team referred to in chapter 4.2.1). This ensures that nobody is quality assuring their own work. The team will need to combine experience in knowledge engineering with expertise in the language, processes and applications used in the labour market and the education and training sector.

5.2.2 ESCO Maintenance Committee

See chapter 1.2.4.

5.2.3 Member State experts

See chapter 3.2.2.
5.3 TOOLS & TECHNIQUES

5.3.1 Checklists

Lists compiling important rules of the ESCO guidelines into statements that can be answered with yes (checked) or no. The statements can be collected at the level of the classification and its structure, of occupational profiles or of individual concepts, terms or relationships. They provide an easy to use tool that helps to assess compliance with a pre-defined set of rules.

5.3.2 Validation tools & reports

Software products that verify compliance of an ESCO dataset with a set of rules. In several cases, compliance with the ESCO data model or the ESCO guidelines can be verified in an automated way. To this end, software tools (validators) analyse the draft data set and provide reports listing cases of incompliance. These reports allow the members of the quality assurance team to directly address the issues.

5.3.3 Fit-for-purpose KPIs

See chapter 2.1.2. Several fit-for-purpose KPIs can be measured in an automated way. For these KPIs, software tools can be executed on the draft new ESCO version, in order to determine if the new version leads to improvement in specific use cases.

5.3.4 Gap analyses and comparisons with other classifications

The main purpose of the gap analysis is to identify real gaps in the ESCO classification, thus ensuring its completeness. In addition to this, a gap analysis helps the quality assurance team to identify discrepancies in the level of granularity between ESCO and the national classifications and additional non-preferred terms. Moreover, through comparison with other classification systems, the quality assurance team can validate occupations for which no expert feedback could be gathered during the development process.

5.3.5 Member State consultation

As part of the quality assurance process, the Commission has the possibility to consult Member States on the draft version of the classification and to receive their informal feedback. Focus of such consultations is the use of ESCO to adopt it on national level or to map national classifications to it, as foreseen in the new EURES Regulation. It can also include other use cases of ESCO in which Member States are interested.

5.4 OUTPUTS

5.4.1 Final ESCO version \( n+1 \) in the reference language

The updated classification for ESCO version \( n+1 \) in the reference language, as resulting from the quality management process. In this version, the quality assurance team corrected any issues that they identified during the quality assurance process. The version is compliant with the ESCO guidelines and ready for translation.
5.4.2 Quality assurance report for ESCO version \( n+1 \)

A report in which the quality assurance team lists the steps they took to verify the quality, the issues that they identified, the actions they took in order to correct these issues and the results they obtained.
6. Develop updated language versions

**INPUTS**
1. Final ESCO version \( n+1 \) in the reference language
2. ESCO terminological guidelines

**ACTORS**
1. Translators and terminologists
2. National contact points
3. ESCO team

**TOOLS & TECHNIQUES**
1. Terms formulation process
2. Translation software (translation memory, TrMP, Studio)

**OUTPUTS**
1. Draft ESCO version \( n+1 \) in each ESCO language

Fig.7 Process step overview: develop updated language versions

### 6.1 Inputs

#### 6.1.1 Final ESCO version \( n+1 \) in the reference language
See chapter 5.4.1.

#### 6.1.2 ESCO terminological guidelines
A set of documents providing methodology, rules, do's and don'ts and examples to support the terms formulation process. It consists of general guidelines that are applicable to all language versions of ESCO and to complementary language-specific guidelines that set additional rules for the specific languages.

### 6.2 Actors

#### 6.2.1 Translators and terminologists
Translators translate written material from one language to another, usually into their mother tongue, while terminologists master languages and can interpret them in terms of their grammatical, semantic, and phonetic characteristics. In ESCO translators and terminologists work together to translate the concepts in 24 languages and check how these concepts are commonly used in the labour market. With the Directorate-General for Translations (DGT)\(^4\), the Commission has the largest translation service in the world at its disposal.

#### 6.2.2 National contact points
In order to ensure the highest quality of translations, translators and linguists can consult use of domain experts. This role is fulfilled by the national contact points which Member States can appoint upon invitation by the Commission.

#### 6.2.3 ESCO team
See chapter 1.2.1.

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\(^4\) [http://ec.europa.eu/info/departments/translation](http://ec.europa.eu/info/departments/translation)
6.3 TOOLS & TECHNIQUES

6.3.1 Terms formulation process

The terms formulation process starts from the description of concepts and their metadata in the reference language. In order to create a new language version, terminologists and translators formulate the terms for the target languages following the principles laid down in the terminological guidelines. They create terms for each concept and capture these as a preferred term, non-preferred term(s) or hidden terms. For choosing the right terms, the terminologist will take into consideration the description as well as other available metadata on the concept. They also use sources, such as dictionaries, other classification systems and job vacancies and they can consult the national contact points. They also verify that all formulated terms are relevant for the labour market.

6.3.2 Translation software (translation memory, TrMP, Studio)

The terms formulation process is supported by software tools. The ESCO translation platform allows users to manage the translation workflow and to record terms in all ESCO languages directly in the classification. A translation memory keeps track of the results from past translation projects and assists translators and terminologists in finding the right term.

6.4 OUTPUTS

6.4.1 Draft ESCO version $n+1$ in each ESCO language

The final ESCO version $n+1$ in the reference language and a draft language version$^5$ in each ESCO language consisting of a set of terms (preferred, non-preferred and hidden terms) and their metadata.

$^5$ Also for the reference language, the full set of terms (including synonyms, spelling variants, abbreviations, etc.) is being created during the terms formulation process.
### 7. Quality assure updated language versions

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>ACTORS</th>
<th>TOOLS &amp; TECHNIQUES</th>
<th>OUTPUTS</th>
</tr>
</thead>
</table>
| 1. Draft ESCO version \( n+1 \) in each ESCO language  
2. ESCO terminological guidelines | 1. Translators and terminologists  
2. Member State experts | 1. Checklists  
2. Validation tools and reports  
3. Fit-for-purpose KPIs  
4. Member State consultation | 1. Final ESCO version \( n+1 \) in each ESCO language |

#### 7.1 INPUTS

**7.1.1 Draft ESCO version \( n+1 \) in each ESCO language**

See chapter 6.4.1.

**7.1.2 ESCO terminological guidelines**

See chapter 6.1.2.

#### 7.2 ACTORS

**7.2.1 Translators and terminologists**

See chapter 6.2.1. Validation of translations or terminology follows a four-eyes principle. This means, that at least two people are involved in each addition or change of a term in one of the ESCO languages.

**7.2.2 Member State experts**

See chapter 5.2.3.

#### 7.3 TOOLS & TECHNIQUES

**7.3.1 Checklists**

See chapter 5.3.1. Checklists can be used not only for concept validation and the development process of the version in the reference language, but also for verifying the terms formulation process and the resulting list of terms.

**7.3.2 Validation tools and reports**

See chapter 5.3.2. Validation tools can also perform automated checks on term level, such as the correct number (exactly 1) and uniqueness of preferred terms, the completeness of metadata recorded with terms, and compliance with some specific rules of the terminological guidelines (e.g. use of non-allowed characters, spelling mistakes, grammatical forms). Reports can help translators and terminologists to remedy open issues.
7.3.3 Fit-for-purpose KPIs

See chapter 5.3.3. Some fit-for-purpose KPIs can be used to measure the performance of specific language versions of ESCO. They can e.g. be used to measure terminological richness and preciseness through comparison with labour market big data (e.g. job vacancies). This allows terminologists and translators to identify specific languages or parts of the classification for which the terminological base can be improved.

7.3.4 Member State consultation

See chapter 5.3.5. Similar to the consultation on the content of ESCO, the Commission has the possibility to consult Member States on the respective draft language versions of ESCO. This way, Member State experts can provide feedback on the translated content of ESCO and ensure that the terminology is well aligned with the one of the national classification, and with that used in the national labour market and education and training system.

7.4 OUTPUTS

7.4.1 Final ESCO version \( n+1 \) in each ESCO language

The updated classification for ESCO version \( n+1 \) in each ESCO language, as resulting from the translation quality management process. In this version, translators and terminologists corrected any issues that they identified during the translation quality assurance process. The version is compliant with the terminological guidelines and ready for the publication process.
8. Release updated version

**INPUTS**

1. Final ESCO version \( n+1 \) in the reference language
2. Final ESCO version \( n+1 \) in each ESCO language

**ACTORS**

1. Commission
2. ESCO team

**TOOLS & TECHNIQUES**

1. Decision to release
2. Taxonomy dissemination environment
3. Release management

**OUTPUTS**

1. ESCO version \( n+1 \) dataset
2. ESCO version \( n+1 \) release notes
3. ESCO version \( n/n+1 \) delta report
4. Updated ESCO service platform and APIs

---

**Fig.9 Process step overview: release updated version**

### 8.1 INPUTS

**8.1.1 Final ESCO version \( n+1 \) in the reference language**

See chapter 5.4.1.

**8.1.2 Final ESCO version \( n+1 \) in each ESCO language**

See chapter 7.4.1.

### 8.2 ACTORS

**8.2.1 Commission**

See chapter 3.2.1.

**8.2.2 ESCO team**

See chapter 1.2.1.

### 8.3 TOOLS & TECHNIQUES

**8.3.1 Decision to release**

Following the collection of feedback, the quality assurance process and the translation process, the Commission services will take the decision for the new release of ESCO. In case of major updates the Commission might decide to use the new version of ESCO to adopt changes to the European classification for EURES through Implementing Acts. Once a new release of ESCO is available, the Commission will publish it in the ESCO service platform, together with release notes and documents explaining the differences between the new and the old versions of ESCO.
8.3.2 Taxonomy dissemination environment

A set of software systems allows the Commission to publish the new version of the ESCO classification in various formats and as Linked Open Data. The most important elements of the taxonomy dissemination environment are:

- ESCO service platform: a website that allows users to browse, search and download the ESCO classification;
- Linked Open Data architecture: a set of redirections that allows users to access ESCO concepts by using the Uniform Resource Identifiers (URI);
- Application programming interface (APIs): software components that allow other software tools to send queries to the ESCO classifications and to receive responses.

8.3.3 Release management

The release management process describes the steps that are needed in order to deploy the new ESCO versions. The process includes data export from the various management systems (taxonomy management software, see chapter 4.3.7; translation management software, see chapter 6.3.2), data transformation into various modules and file formats, data imports into the taxonomy dissemination software (see chapter 8.3.2), software testing and deployment.

8.4 OUTPUTS

8.4.1 ESCO version \( n + 1 \) dataset

The full dataset in RDF format, combining the "Final ESCO version \( n + 1 \) in the reference language" (chapter 5.4.1) and the "Final ESCO version \( n + 1 \) in each ESCO language" (chapter 7.4.1), ready for publication.

8.4.2 ESCO version \( n + 1 \) release notes

Documents with information on the new ESCO version \( n + 1 \) and describing the changes made in this version. Release notes will be published in the ESCO service portal together with the ESCO version \( n + 1 \) dataset.

8.4.3 ESCO version \( n/n+1 \) delta report

A machine readable file listing all differences between ESCO version \( n \) and ESCO version \( n + 1 \). It covers the changes of the "current version" of the publication with respect to the "previous version" of that publication. This approach is documented in the ESCO versioning strategy.

8.4.4 Updated ESCO service platform and APIs

The ESCO service platform will be updated once the new release of ESCO version \( n + 1 \) will be available. It will display the new version of ESCO, but might also include updated information on use cases, pilots and tutorials of ESCO, ESCO documents such as publications and leaflets and technical documentation. The ESCO APIs will also use the new ESCO dataset.
9. Implement updated version

**INPUTS**
1. ESCO version \( n+1 \) dataset
2. ESCO version \( n+1 \) release notes
3. ESCO version \( n/n+1 \) delta report
4. Updated ESCO service platform including updated API
5. Mapping manual

**ACTORS**
1. Commission
2. EURES Committee
3. Member States (PES or other responsible actors)
4. ESCO team
5. EURES technical team
6. ESCO implementers

**TOOLS & TECHNIQUES**
1. Adoption of Implementing Act
2. Taxonomy alignment
3. Mapping environment
4. Implementation in services by public or private providers
5. Implementation in European tools

**OUTPUTS**
1. Implementing Act
2. Updated mapping tables from national classifications to ESCO version \( n+1 \)
3. Updated software tools and services

9.1 INPUTS

9.1.1 ESCO version \( n+1 \) dataset

See chapter 8.4.1.

9.1.2 ESCO version \( n+1 \) release notes

See chapter 8.4.2.

9.1.3 ESCO version \( n/n+1 \) delta report

See chapter 8.4.3.

9.1.4 Updated ESCO service platform including updated API

See chapter 8.4.4.

9.1.5 Mapping manual

A mapping manual will be documentation for experts that explains how to map a classification to ESCO. It will include information on technical aspects of the mapping and general guidance on how to organise thesaurus alignment (mapping) projects. The main target group of the mapping manual are Member State experts that are tasked to map national occupational and/or skills classifications to and from a European classification in the framework of the EURES Regulation.

9.2 ACTORS

9.2.1 Commission

See chapter 3.2.1.
9.2.2 EURES Committee

The EURES Committee is composed by representatives of the Member States assisting the Commission with the adoption of implementing acts under the new EURES Regulation.

9.2.3 Member States (PES or other responsible actors)

Under the new EURES Regulation, after adoption of the implementing act, Member States will be the key actors to adopt a European classification or to map to it. Art. 19 of the EURES Regulation leaves Member States the choice between either mapping their national, regional or sectoral classifications to and from the European classification or adopting the European classification on national level.

9.2.4 ESCO team

See chapter 1.2.1.

9.2.5 EURES technical team

The EURES technical team designs and coordinates IT features and systems such as interoperability projects and standards for the EURES Portal (e.g. integration of ESCO into specific functionalities of the EURES portal) and supports the development of it.

9.2.6 ESCO implementers

See chapter 1.2.2.

9.3 TOOLS & TECHNIQUES

9.3.1 Adoption of Implementing Act

In order to make ESCO applicable as a European classification in the context of EURES, the Commission intends to adopt it as a list of skills/competences and occupations under the new EURES Regulation.

9.3.2 Taxonomy alignment

Taxonomy alignment refers to the process of mapping two classifications. As part of the process, which can be assisted by software tools, an expert identifies corresponding concepts in the two classifications and records a relationship (mapping) between them.

9.3.3 Mapping environment

The mapping environment is a software product which the Commission will make available to Member States so that they can use it to create mappings. The software tool will allow users to

- create new mapping projects by loading two classifications;
- review mappings between concepts of the two classifications as suggested by the software tool;
- create their own mappings between concepts;
9.3.4 Implementation in services by public or private providers

ESCO implementers (see chapter 1.2.2) will include private and public service providers. They use ESCO to offer services to end users. In order to improve their service provision, they will usually be interested in upgrading their systems to the new ESCO version \( n+1 \). The ESCO team could support ESCO implementers in their efforts by providing technical support, such as documentation, case studies or training videos.

9.3.5 Implementation in European tools

The Commission is offering various services to end users through European tools. This includes *inter alia* the EURES Job Mobility Portal and the new Europass service. The Commission will regularly update these tools according to the newest ESCO version.

9.4 OUTPUTS

9.4.1 Implementing Act

The legal act as foreseen in article 19 of the EURES Regulation.

9.4.2 Updated mapping tables from national classifications to ESCO version \( n+1 \)

Machine readable correspondence tables between two classifications. For each concept in one classification, a mapping table contains information on the corresponding elements in the other classification. The mapping is thus composed by a list of statements expressing:

- which concepts in the two classifications are identical;
- which concepts in one classifications are broader or narrower in scope than in the other classification;
- which concepts in the two classifications are similar to each other.

9.4.3 Updated software tools and services

The software tools and services managed by the Commission or by ESCO implementers that have been updated to using ESCO version \( n+1 \).
Annex 1: RACI matrix

<table>
<thead>
<tr>
<th>Activity</th>
<th>Commission</th>
<th>ESCO team</th>
<th>ESCO quality assurance team</th>
<th>Terminologists and translators</th>
<th>ESCO implementers</th>
<th>Domain experts</th>
<th>Member States</th>
<th>ESCO Maintenance Committee</th>
<th>EURES Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Collect feedback</td>
<td>A</td>
<td>R</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>I</td>
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<tr>
<td>2. Analyse and structure feedback</td>
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<td>R</td>
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<tr>
<td>3. Plan release scope</td>
<td>A, R</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td>C</td>
<td>C</td>
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<tr>
<td>4. Develop updated reference version</td>
<td>A</td>
<td>R</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>I</td>
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<tr>
<td>5. Quality assure updated reference version</td>
<td>A</td>
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<tr>
<td>6. Develop updated language versions</td>
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<td>8. Release updated version</td>
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<td>9. Implement updated version</td>
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</tbody>
</table>

- EURES Implementing Act
- Mapping*
- Adoption on national level*
- Implementation in services
- Implementation in EU tools

*) *mapping or adoption on national level as foreseen in art. 19 (3) and (4) of the EURES Regulation*

The RACI matrix indicates roles and responsibilities as follows:

- **R = Responsible** for the work that is needed to achieve the process step;
- **A = Accountable**, i.e. the one who delegates the tasks to the responsible and who approves the final completion of the process step;
- **C = Consulted** during the process step to give advice/opinion;
- **I = Informed** on the progress of the process step.