Status update on the KPI framework

23 April 2018

ESCO (2018) SEC 005 DRAFT
Document Date: 20/03/2018
Last update: 06/04/2018

Purpose of the document

The purpose of this document is to inform the newly appointed members of the ESCO Maintenance Committee (MAI) of the Key Performance Indicators (KPIs) for ESCO. With these KPIs the ESCO team will measure successful business uptake, the quality of the classification and technical compliance with the data model.

Current status of the KPI framework

The ESCO KPI framework consists of three distinct sets of KPIs:

Business KPIs

Business KPIs measure if ESCO is accepted as a de facto standard and reference point by both private and public actors. They monitor e.g. the use of ESCO in EURES (after adoption of Implementing Acts), the use of ESCO by private service providers to deliver online services and the evolution of the qualifications pillar.

The business KPIs have been discussed with the MAI on its 21st meeting[1].

Quality KPIs

Quality KPIs measure how well the ESCO dataset supports the various use cases. They assess e.g. completeness, level of granularity and terminological coverage. They allow us to measure improvements over different versions of the classification.

The quality KPI will measure the quality criteria that have been discussed with the MAI on its 19th meeting.[2]

Technical KPIs

Technical KPIs provide insight into the state of the dataset and its compliance with the data model and the ESCO guidelines. These parameters monitor for example gaps in translations, the existence of preferred terms for all concepts, the number of non-preferred terms per concepts and other related technical metrics.

Business KPIs

The list of business KPIs as discussed with the MAI is included in Annex I of this document.

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[1] Success indicators for the future uptake of ESCO v1.
[2] ESCO quality management, ESCO(2016) SEC 008 FINAL.

European Skills, Competences, Qualifications and Occupations
25th ESCO Maintenance Committee – Status update on the KPI framework

European Commission

Quality KPIs

What will the quality KPIs measure?

Quality KPIs measure the quality of the classification that is needed to support its use cases. The criteria have been discussed on the 19th MAI meeting[3]:

Table 4. Description of ESCO's classification aspects	
Conceptual coverage	The extent to which ESCO's concepts cover the scope of a domain
Conceptual granularity	The level specificity on which ESCO describes the concepts
Knowledge structures	The relations between the ESCO concepts
Supporting taxonomies	Additional structures to support specific applications or use-cases
Right preferred terms	The term defined to represent the concept (language specific)
Terminological richness	All terms defined for the concepts (language specific)

Table 5. Relevancy of ESCO's classification aspects for each type of functionality

	Conceptual coverage	Conceptual granularity	Knowledge structures	Supporting Taxonomies	Right preferred terms	Terminological richness
Concept extraction	Key	Key	Supporting	Supporting		Key
Data entry	Key	Key	Supporting	Supporting	Key	Supporting
Transcoding	Key	Key			Supporting	Supporting
Simple search	Key	Key				Key
Multi-lingual search	Key	Key				Key
Semantic search*	Key	Key	Key	Supporting		Key
Profile comparison	Key	Key	Supporting			
Data collection	Key	Key				Key
Data aggregation	Key					

* Job-matching is an application of semantic search

How will we measure the quality KPIs?

To measure the quality KPIs we intend to apply the following tools and techniques:

1. A tool to automatically compare ESCO with sets of real life documents (e.g. job vacancies, CV terminology, search terms, learning outcomes' descriptions of qualifications). The goal is to understand which terms can be found and understood with ESCO, and which ones appear frequently but are missing in the classification.

2. Comparing ESCO with other classifications, in particular by exploiting the mapping tables between ESCO and national classifications. This allows us to understand how detailed ESCO is compared to other classifications, and to

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[3] ESCO quality management, ESCO(2016) SEC 008 FINAL, p. 4-5.

identify missing concepts as well as incompatibilities in the ISCO-08 mappings of national classifications and ESCO.

3. Comparing relationships in ESCO with real life documents that contain interlinked ESCO concepts, in particular sets of skills/competencies linked to job vacancies, learning outcomes' descriptions of qualifications or to CVs. This allows us to verify if the relationships in ESCO reflect what end users expect, e.g. if the skills linked to an occupation correspond to the skills that employers are most frequently looking for.

4. A mechanism to log user search queries, e.g. on the ESCO portal or the EURES portal. This way, we can compile a list of the most frequently used keywords and analyse their fit with ESCO terminology (using method 1 above). Lists of "stop words" that are known keywords, but should not be included in the three ESCO pillars (e.g. "intern", "full time", etc.) can complement these log files.

This set of tools and techniques will result in reports for the continuous improvement of ESCO, as well as metrics to measure the overall quality of ESCO. They will allow us to measure performance in the six quality criteria indicated above:

Conceptual coverage

For all ESCO use cases it is essential that ESCO is complete, i.e. it includes all relevant concepts. People (and software) need to be able to find the occupation, knowledge, skills and competence that are relevant in a specific context.

Assumptions:
*   Each job should fit into at least one occupation[4].
*   Each knowledge, skill or competence that employers or jobseekers need to express should be within the scope of at least one ESCO concept.

Methodology/implementation:
*   Comparison with big data (e.g. job vacancies, logged search terms). This will allow us to identify candidate concepts and terms, such as newly emerging occupations and skills.
*   Comparison with national classifications through the mapping tables. Concepts in the national classification that could not be mapped to an ESCO concept might indicate gaps in ESCO.

Conceptual granularity

An adequate granularity ensures that ESCO includes a sufficient number of concepts to describe the content of a job, the professional profile of a candidate or the learning outcomes of a qualification, but is at the same time still manageable. It is not straightforward to define the best-possible level of granularity. The ESCO Maintenance Committee advised in its 4th meeting to use a pre-defined set of reference classifications to determine the best level of detail.[5]

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[4] ESCO defines an occupation as a grouping of jobs involving similar tasks and which require a similar skills set.
[5] https://ec.europa.eu/esco/resources//escopedia/20180323_113837/53d857ec-5798-4c0b-b0af-e2983ec4e44bFinal_minutes_of_4th_MAI_meeting.pdf.

Assumptions:

- An ESCO concept is described at the best possible level of granularity, if there is a balance between the number of reference classifications containing broader and those containing narrower concepts than the ESCO concept.
- We only include reference classifications for which Member States will create mapping tables.

Methodology/implementation:

- For a measurable KPI, we will conduct an automated analysis of mapping tables[6] which establish correspondence between concepts in national classifications and ESCO. Counting the number of concepts that are the same, more general than, or more specific than the ESCO concepts, allows us to understand if granularity is adequate. E.g. a concept for which all mapping tables show that narrower concepts exist in the national classifications, it should be refined into more detailed concepts also in ESCO.
- Comparisons with big data can also be used for this purpose: concepts that appear very often and those that appear very rarely should be marked for a review of their level of granularity.

Knowledge structures

Relations in ESCO should support people (and software) to identify the most relevant concepts for them. In ESCO v1 the focus is on the relations between occupations and skills. The occupational profiles in ESCO should include recording the most relevant skills for this specific occupation.

Assumptions:

- Each ESCO occupation should include the skills that are most frequently selected by employers, job-seekers and other institutional bodies.

Methodology/implementation:

- By comparing ESCO with different sets of interlinked data coming from the labour market (e.g. skills that users choose when creating CVs, job vacancies or learning outcomes), we can assess if the right skills were used in the occupational profile in ESCO and if they match the users' actual choices such as employers, job-seekers and other institutional bodies.
- A major challenge in implementing this KPI is to identify high quality datasets, in which users selected all relevant skills for an occupation, including those that are implicit.

Supporting taxonomies

ESCO uses existing external taxonomies to structure its content, in particular ISCO-08 to structure occupations and ISCED-F and EQF for metadata in qualifications. As qualifications data in ESCO is provided by third parties, in particular by Member States, the quality KPI focus on the mapping of ESCO occupations to ISCO-08 (which is managed in the scope of the ESCO project). Before the release of ESCO, experts that were suggested by the ILO reviewed the mapping to ISCO-08 twice.

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[6] Mapping tables are machine readable correspondence tables that express how concepts in one classification relate to one or more concepts in another classification. Mapping tables are used e.g. for automatic transcoding of information for the purpose of automated matching in EURES.

Assumptions:
- An ESCO occupation and an occupation in a national classification that is mapped to an ESCO occupation (as same or narrower concept) should be part of the same ISCO-08 group.

Methodology/implementation:
- By analysing mapping tables with national occupational classifications, we can automatically identify conflicts in the ISCO-08 mappings. These conflicts can be due to inaccuracies in ESCO or in the national classification and will need to be reviewed one-by-one.

Right preferred terms

Each ESCO concept is represented by a preferred term in each of the 27 languages. Preferred terms should be terms that are frequently used, but they also need to fulfil a range of criteria that are spelled out in the ESCO terminological guidelines, e.g. they need to correspond to the scope of the concept, they need to be unambiguous and gender-neutral.

Assumptions:
- Since preferred terms have been selected by experts based on a variety of criteria, their preciseness cannot be measured in a fully automated way.

Methodology/implementation:
- By logging terms that users used when searching for a concept and comparing them with the concept they finally selected, we can derive a list of the most frequently used terminology for each concept. This can help to review the choice of the preferred terms. This analysis needs to be done separately for each language.

Terminological richness

The ESCO terminology should allow end users to find the concepts they are looking for, and it should enable natural language processing. It is therefore essential that ESCO includes all terms, synonyms, abbreviations, etc. that are frequently used to refer to a concept.

Assumption:
- ESCO should include all frequently used terms that are used when referring to a concept.
- ESCO should not include terms that are not used.

Methodology/implementation:
- Terminological richness can be measured by automatically comparing and classifying data records of actual data (e.g. job vacancies, professional profiles, learning outcome descriptions, logged search keywords) with the available ESCO terminology. This way, we can identify how much of the actually used terminology is already recorded in ESCO.
- All analyses could be done by sector of activity, by language and by ESCO version. This will allow us to identify areas with high potential for improvement and to monitor the improvement over the ESCO versions.
- The analysis will also help us to identify terms that are not relevant. Such a check could also be done with the help of search engines by counting how many search results a term generates. Terms with very few hits are not widely used in the market and should be marked for review.

Technical KPIs

Technical KPIs are already implemented and form part of the classification management systems.

Summary of KPI usage

The figure below summarises how the main tools and techniques can help to measure the relevant criteria:

Tool or technique	Market acceptance	Conceptual coverage	Conceptual granularity	Knowledge structures	Supporting taxonomies	Right preferred term	Termino-logical richness	Compliance
1. Business KPIs	+++							
2. Quality KPIs								
2.1 Compare ESCO with big data		++	+	+			+++	
2.2 Analysing mapping tables		++	+++	+	++		+	
2.3 Compare ESCO with documents containing interlinked concepts				+++				
2.4 Logging search keywords		+	+	+		+	+++	
3. Technical KPIs				+	+	+	+	+++

Next steps

The committee is invited to provide feedback on this document during the meeting or in writing until 1 May 2018 via email to empl-esco-secretariat@ec.europa.eu.

The Commission will then prioritise the envisaged tools and techniques and plan their implementation through small scale software applications. This also includes the challenge to identify the most adequate test datasets. For this purpose, the ESCO team will inter alia explore to use test data from EURES and from CEDEFOP's project "Real time labour market analysis"[7].

In addition, the Commission will prepare a draft KPI dashboard, start to measure first business KPIs and present them to the MAI for its 26th meeting in June 2018.

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[7]

https://ec.europa.eu/esco/portal/escopedia/Cedefop_pilot_on_real_time_labour_market_information

Annex I

Business KPIs to measure the success of ESCO

Use of ESCO in EURES (after adoption of the Implementing Act)
- % of Member States that mapped to the occupations pillar of ESCO
- % of Member States that mapped to the skills/competences pillar of ESCO
- % of job vacancies sent to EURES that are annotated with ESCO occupations[8]
- % of job vacancies sent to EURES that are annotated with ESCO skills/competences
- % of Member States adopting ESCO on national level

Use of ESCO in other EU initiatives
- No. of EU tools that use ESCO

Uptake of ESCO by the public and private market
- No. of downloads of the ESCO API and of the classification itself
- No. of private service providers that use ESCO to deliver online services
- No. of public actors using ESCO
- No. of websites that use ESCO to semantically annotate pages, such as job offers or qualification information

Evolution of the ESCO qualifications pillar
- No. of national qualification databases connected to ESCO
- No. of qualifications in the ESCO qualifications pillar[9]
- % of qualifications with learning outcome descriptions that are annotated with ESCO knowledge, skills and competences[10]

Evolution of an eco-system of classifications
- No. of semantic assets (i.e. classifications, taxonomies, controlled vocabularies, ontologies and the like) in the labour market and education domain that are mapped to ESCO or use the same concepts as ESCO

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[8] These figures could be measured per ESCO version (how many are annotated with ESCO v1, ESCO v1.1, etc.) in order to measure the time to market of new ESCO versions.

[9] We can measure the number of qualifications coming from the Member States' national qualification databases (indirect inclusion) separately from information sent by other data providers (direct inclusion)

[10] The Commission is preparing a study on a methodology to link skills with learning outcomes of qualifications and depending on the results, these KPIs might need to be adjusted