



2.5 ESCO and Skills Intelligence kit

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Project No. 601217-EPP-1-2018-1-BE-EPPKA2-SSA-B



This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Co-funded by the
Erasmus+ Programme
of the European Union

Document Details

Deliverable Number:	D2.5
Due Date :	October 2021
Leading Organisation:	IDONIAL
Participating Organisations:	EFW, POLIMI, ISQ
Reviewer(s):	ISQ, EC Nantes
Review Date:	October 2021
Languages(s):	English
Dissemination level:	Public

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1. Introduction

The current kit is produced in the framework of WP2, which covers SAM’s Forecast Methodology for the assessment of current and future skills needs in AM.

This kit D2.5 encompasses the guidelines and templates used to feed the multilingual classification of European Skills, Competences, Qualifications and Occupations (ESCO) and EU Skills Intelligence (previously noun as Skills Panorama). The kit details the following information:

- to whom is each tool targeted at;
- inputs and outputs of the tools;
- steps to be implemented and resources
- timeframe to use the tools;
- expected number of stakeholders and targets involved.

SAM is providing up-to-date descriptions of the emergent Additive Manufacturing (AM) /3D Printing Occupations, Skills and Qualifications in alignment with ESCO. To this end, the templates provided by ESCO and the related SAM reports and guidelines are used when a new AM occupation, skill and/or qualification is established or needs to be revised.

Moreover, SAM is contributing to Skills Intelligence by producing AM sectoral skills evidence, to enable informed decisions on education, training and employment issues in AM by different stakeholders.

The implementation of the current ESCO and EU Skills Intelligence kit will serve as input to the AM Observatory (WP4), specifically supporting D.4.8 of “Set of data and external tools”. Whenever applicable, updates in terms of relevant data will be provided to ESCO and/or EU Skills Intelligence by applying the kit described in the following chapters.

A summary is provided in Table 1.

Table 1 Summary of the ESCO and Skills Intelligence Kit

D.2.5 ESCO and Skills Intelligence Kit	
AIM	To support the provision of information regarding AM Occupations, Qualifications and Skills/competences to ESCO and the provision of AM sectoral skills evidence to EU Skills Intelligence
TOOLS USED	Templates from ESCO and the ESCO data model Skills Intelligence Sector Data Insights
TO WHOM	SAM Observatory to feed ESCO and Skills Intelligence
INDICATOR/LEVEL OF IMPACT	Policy makers at European, National and regional levels Industry Education and Training providers Public
INPUT	Data on AM Occupations, Qualifications and Skills/competences collected by SAM Indicators of SAM Observatory. D4.5 Report on the Analysis and Validation of Needs
OUTPUT	Description of AM Occupations, Skills/competences and Qualifications to be included into ESCO AM sectoral skills evidence for Skills Intelligence D4.8 Set of Data – external tools
TIMELINE	Every two years

2. Target Groups

The **ESCO and Skills Intelligence kit** will be used by the AM Observatory (WP4) to provide relevant and up-to-date information to two European Commission’s tools, namely:

- 1) ESCO, which is the European multilingual classification of Skills, Competences, Qualifications and Occupations. ESCO is aimed at supporting the creation of a more integrated and efficient European labour market and bridging the gap between the world of work and education and training [1];
- 2) Skills Intelligence, which is an initiative of the European Commission to improve the transparency on the European labour market by providing online access to data and research findings on skills and labour market prospects at both national and European level [2].

[Data insights | CEDEFOP \(europa.eu\)](https://europa.eu/data-insights/)

Whenever applicable, updates in terms of relevant data will be provided to ESCO and/or EU Skills Intelligence by the AM Observatory using the kit described in the following chapters.

3. Methodology

Figure 1 summarises the methodology applied for the ESCO and Skills Intelligence Kit.

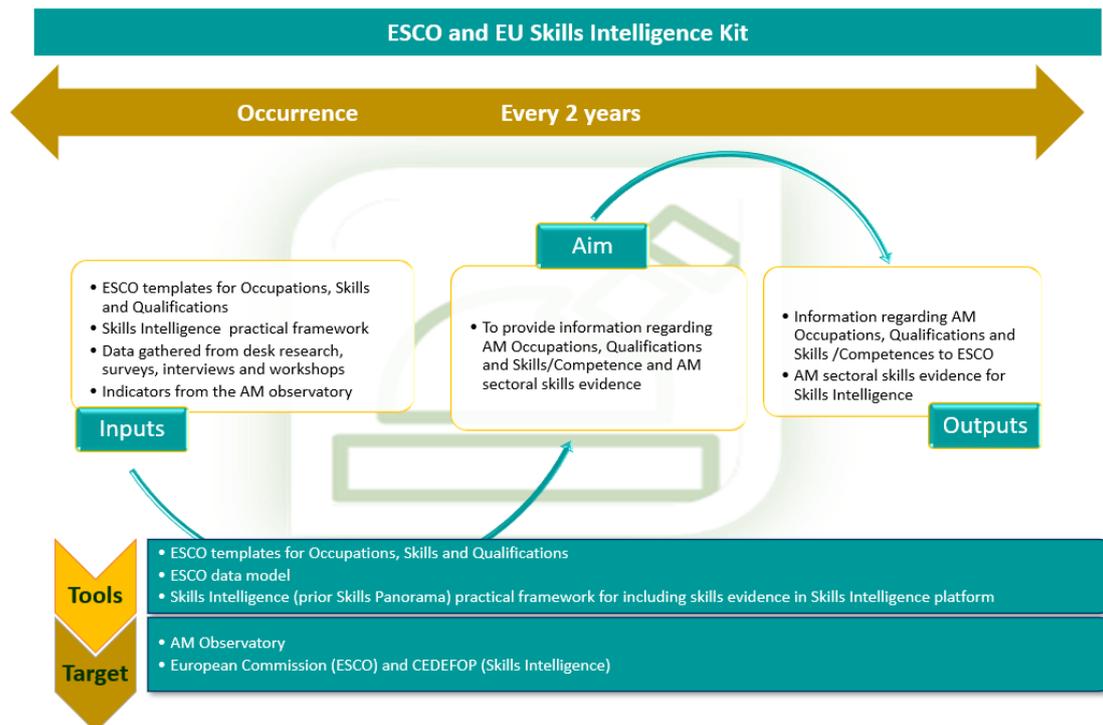


Figure 1 - Methodology applied for ESCO and Skills Intelligence Kit

4. Tools and templates

4.1 ESCO

In general terms, ESCO taxonomy is based on three pillars, representing a searchable database in 27 languages [3]:

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

The ESCO taxonomy is published as Linked Open Data, meaning that the data is freely available.

Globally, three different templates were made available by ESCO team: 1. to provide information on new occupations, 2. to review an occupation, and 3. to review skills. The templates are detailed below and for each SAM will actively contribute. Although the qualification pillar is fed by the identification of formal qualifications recognized by the member states in a voluntary basis, SAM will use the Qualification Pillar terminology [4] to describe the European AM Qualifications that might be developed, even if they might not be yet integrated within the EU countries.

Within SAM project, the ESCO terminology is not exactly replicated, but a matrix comparing SAM terminology with the one from ESCO has been defined to facilitate a common understanding (Table 2 Comparison between ESCO and SAM). For instance, Occupations (ESCO) are equivalent to SAM Professional Profiles (SAM Methodology to Design Qualifications), Essential Skills (ESCO) are equivalent to AM technological Skills for the mandatory Units of Learning Outcomes; Optional Skills (ESCO) are equivalent to AM technological Skills in the optional Units of Learning Outcomes; Transversal Skills (ESCO) refer to Entrepreneurship Skills (SAM Methodology to Design Qualifications).

Table 2 Comparison between ESCO and SAM

ESCO	SAM
Occupation Profile	Professional Profile
Essential Skills	AM technological Skills (and if applicable Digital and Green Skills) included in Mandatory Units of Learning Outcomes
Essential Knowledge	AM technological knowledge
Transversal Skills	Entrepreneurship Skills
Optional Skills	AM technological Skills (and if applicable Digital and Green Skills) included in Optional Units of Learning Outcomes

4.1.1. Templates for the Occupation Pillar

In ESCO **occupation pillar**, each occupation concept defines the content and scope of the occupation, and it provides useful metadata. Each ESCO occupation is assigned to a unit group of the International Standard Classification of Occupations ISCO-08 [5].

The following list outlines the information needed to fill in the ESCO template for a **new Occupation (Appendix 1)**, to add a new occupation in ESCO taxonomy:

- **Alternative labels/synonyms:** Provide a tentative list of synonyms for the name of the new occupation (non-preferred terms provide other ways of labelling a concept and can be of

the neutral, male or female grammatical gender. These terms usually provide synonyms for the described concept, but can also be spelling variants, declensions, abbreviations, etc. For instance, alternative labels for “electronic equipment assembler” can be “electronic equipment fabricator”, “electronics assembler”¹, etc.);

- **Scope note:** Specify the boundaries of this occupation and what distinguishes it from existing occupations;
- **Information on regulation:** Specify if the occupation is a regulated one (i.e., access and exercise is subject to the possession of a specific professional qualification);
- **Essential skills and competences:** Provide a list of essential skills/competences that are needed to perform this occupation. "Essential" are those skills and competences that are usually required when working in the occupation, independently of the work context or the employer;
- **Optional skills and competences:** Provide a list of optional skills and competences that can be required in specific working environments;
- **Essential knowledge:** Provide a list of essential knowledges that are needed to perform this occupation. "Essential" is the knowledge that is usually required when working in the occupation, independently of the work context or the employer;
- **Optional knowledge:** Provide a list of optional knowledge that can be required in specific working environments.

The following list outlines the information needed to fill in the ESCO template for reviewing an **existing Occupation (Appendix 2)**, which is to be used to update an existing occupation in ESCO:

- **Occupation URI:** Include the Uniform Resource Identifier (URI)² of the occupation in ESCO. An URI is a string of characters that unambiguously identifies a particular resource. The URI of the occupation can be found at the bottom of each occupation description on the ESCO website (<https://ec.europa.eu/esco/portal/occupation>);
- **Occupation title:** Specify the Occupation title (Preferred Term); It should always be of the neutral gender and there is only one preferred term per language.
- **Comments on the preferred term:** Add a relevant comment on the Occupation title (Preferred Term);
- **New description of an existing occupation:** Provide the description of new tasks and/or the new description of the tasks associated to this occupation in max 2000 characters;
- **Alternative labels to be removed/modified:** Specify the synonyms for the name/title of the occupation that need to be removed or modified (in ESCO Non-preferred terms provide other ways of labelling a concept and can be of the neutral, male or female grammatical gender. These terms usually provide synonyms for the described concept, but can also be spelling variants, declensions, abbreviations, etc.);
- **Essential skills and knowledge concepts to add/remove:** Specify the essential skills, competences and knowledge that need to be added or removed. "Essential" are those

¹ <https://ec.europa.eu/esco/portal/occupation?resetLanguage=true&newLanguage=en>

² A Uniform Resource Identifier (URI) is a string of characters that unambiguously identifies a particular resource. A URI is a crucial component of the Semantic Web. Each URI:
is unique over the web (universal);
allows data from different sources to link to it;
is persistent).

knowledge, skills and competences that are usually required when working in the occupation, independently of the work context or the employer;

- **Optional skills and knowledge concepts to add/remove:** Specify the optional skills, competences and knowledge that need to be added or removed. "Optional" refers to knowledge, skills and competences that may be required or occur when working in an occupation depending on the employer, on the working context or on the country.

4.1.2. Template for the Skills pillar

In ESCO **skills pillar**, each one of the skill and knowledge concepts defines the content and scope of the knowledge, skill and competence, and it provides useful metadata. The following list outlines the information needed to fill in the ESCO template for a **New Skills description (Appendix 3)** and reviewing an **existing skill description (Appendix 4)**.

To describe a new skill, the following information are requested:

- **Concept name:** Insert the title of the skill/knowledge.
- **Description:** Provide an explanation of the concept in the form of a description which length is between 50 and 300 characters. It is suggested to refer to the Bloom Taxonomy [6] to:
 - explain in more depth what the skill is about in line with the action verb and level of detail used in the name.
 - to explain in more depth the content of the knowledge concept.
- **Alternative labels/synonyms:** Provide a tentative list of synonyms. (non-preferred terms provide other ways of labelling a concept and can be of the neutral, male or female grammatical gender. These terms usually provide synonyms for the described concept, but can also be spelling variants, declensions, abbreviations, etc.
- **Skill Type:** Indicate if Skill (S) or Knowledge (K). Choose if the concept is a skill/competence (i.e., the ability to apply knowledge and use know-how to complete tasks and solve problems) or knowledge (i.e., the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study);
- **Skills reusability level:** Indicate the reusability level. A skill can be considered transversal, cross sectoral, sector specific or occupation specific.
- **Essential skill of:** Provide a list of associated occupations for which this skill is essential. "Essential" are those knowledge, skills and competences that are usually required when working in the occupation, independently of the work context or the employer.
- **Optional skill of:** Provide a list of associated occupations for which this skill is optional. "Optional" refers to knowledge, skills and competences that may be required or occur when working in an occupation depending on the employer, on the working context or on the country.

To review an existing skill, the following information are requested:

- **Existing skill/knowledge URI:** Include the Uniform Resource Identifier (URI) of the skill/knowledge in ESCO; An URI is a string of characters that unambiguously identifies a particular resource. The URI of the skill/knowledge can be found at the bottom of each description on the ESCO website (<https://ec.europa.eu/esco/portal/skill>);
- **Skill type:** Choose if the concept is a skill/competence (i.e., the ability to apply knowledge and use know-how to complete tasks and solve problems) or knowledge (i.e., the outcome

of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study);

- **New relevant skill/knowledge name:** Specify the new skill/knowledge name (Preferred Term);
- **New relevant skill/knowledge description:** Provide an explanation of the concept in the form of a description which length is between 50 and 300 characters. It is suggested to refer to the Bloom Taxonomy [6] in order to
 - explain in more depth what the skill is about in line with the action verb and level of detail used in the name.
 - to explain in more depth the content of the knowledge concept.
- **Skill reusability level:** A skill can be considered transversal, cross sectoral, sector specific or occupation specific;
- **Existing skill/knowledge name to be unlinked:** Specify the existing skill/knowledge that need to be unlinked;
- **Associated occupations to be added/removed:** Specify the relationships between the skill/knowledge and occupations that need to be added or removed, considering:
 - the occupations for which the knowledge, skill or competence is essential;
 - the occupations for which the knowledge, skill or competence is optional;
 - the occupations for which the knowledge, skill or competence is not required anymore.

4.1.3. Template for the Qualification pillar

In ESCO **qualification pillar**, each qualification concept defines the content and scope of the qualification, and it provides several useful metadata [4]. It is important to mention that the qualification pillar is not meant to be filled in by SAM, but rather by Member States on a voluntary basis. In its national roll-out plan, SAM aims to present SAM European qualifications to National Qualification Bodies for formal recognition. In case of acceptance, they should fill the template to update SAM qualifications in their own national framework and ESCO.

The following list outlines the information needed to fill in the ESCO template for **Qualifications (Appendix 5)**:

- **Title of the Qualification:** The exact and official title of the qualification.
- **Field:** Indicate the thematic area of the qualification, according to the ISCED FoET 2013 classification (Field of Education and Training Code). The International Standard Classification of Education (ISCED) is the reference international classification for organizing education programs and related qualifications by levels and fields [7];
- **Country/Region (code):** Based on the European nomenclature of territorial units for statistics (NUTS);
- **EQF Level:** Indicate the EQF level of the qualification as specified by the European Qualification Framework (EQF);
- **Applicable NQF level:** Indicate the level of the qualification as specified by the applicable National Qualification Framework (NQF);
- **Description of the qualification:**
 - Knowledge, Skills, Responsibility/Autonomy
 - Open text field describing what the learner is expected to know, understand and able to do

Expresses each learning outcome of the qualification in terms of a skill, competence or knowledge from ESCO (recommended) and/ or other known frameworks or standard classifications.

- **Awarding body or competent authority:** Specify the name of awarding body of the qualification, location and hyperlink to the website. An awarding body is an institution, organization or company that is recognized for issuing the qualification and formally recognizing the learning outcomes of an individual, following an assessment and validation procedure.
- **Credit points/notional workload needed to achieve the Learning Outcomes:** Indicate the credit points assigned to the qualification, following the European Credit Transfer and Accumulation System (ECTS).
- **Internal quality assurance processes:** Specify the applied internal quality assurance processes
- **External quality assurance /regulatory body:** Organizations quality assuring, regulating or accrediting the qualification.
- **Further information on the qualification:** Documents are used to specify any further information about the qualification.
- **Source of information:** Any publicly accessible web document that provides more information about the qualification. The document can be a web page that can be navigated to or a downloadable file.
- **Link to relevant qualification supplements:** Report the links to documents, which can be a web page that can be navigated to or a downloadable file.
- **URL of the qualification:** the homepage or landing page of the qualification.
- **Information language:** Specify the language using ISO 639 alpha-2 language code.
- **Entry requirements:** Specify entry requirements of the qualification, such as work experience, pre-assessment and qualification, to enter the program that leads to the qualification, or to access the examination or certification process. Specify if the entry requirement is mandatory or recommended.
- **Expiry date (if relevant):** Indicate the validity period of the qualification.
- **Ways to acquire qualification:** Indicate whether the qualification can be acquired by validation of a formal, non-formal, informal learning processes.
- **Relationship to occupations:** Relate the qualification to occupations from ESCO (recommended) and/ or other known frameworks or standard classifications.

4.2 Skills Intelligence

Skills Panorama was an initiative of the European Commission to improve transparency on the European labour market by providing online access to data and research findings on skills and labour market prospects at both national and European level [2]. In October 2021 it was announced that Skills Panorama becomes integrated into CEDEFOP website under the “Skills intelligence” name (see Figure 2). Skill Intelligence now provides all the information on occupations, sectors, countries, and skills created during the Skills Panorama life [8].

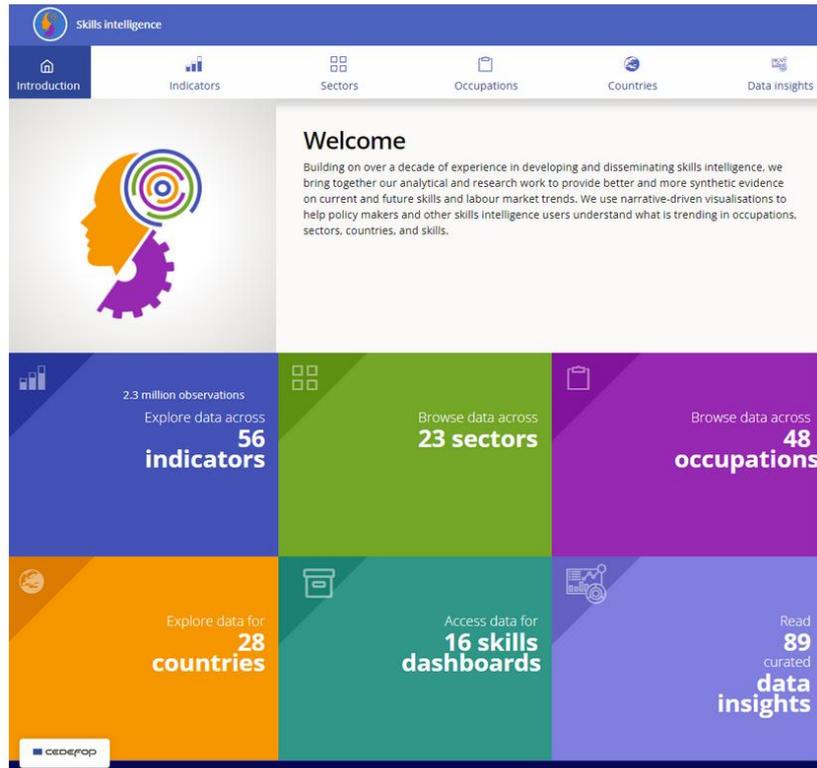


Figure 2 Skills Intelligence

The “Data Insights” section of the website displays relevant information about the transformation of EU sectors and its implication for skills and employment. For instance, the main topics reported in relation to the automotive sector are ([Automotive industry at a crossroads | CEDEFOP \(europa.eu\)](#)):

- The rise of European automotive industry
- Automotive jobs and skills
- Automotive: The next decade
- Skills for the future

Each topic is also linked to data insights details.

4.2.1 Guidelines for SAM Set of Data and external tools

Regarding SAM contribution to Skills Intelligence, following the new structure of the “Data Insights” section reported in the previous paragraph, it is suggested that the main chapters outlined below are included in the SAM D4.8 “Set of Data – external tools”:

- The raise of AM Industry
- AM jobs and skills: current demand and supply
- AM trends
- AM future skills
- Sources and Methodology
- References

For each section both textual information, graphics and examples should be provided. Whenever possible, country and/or sector analysis should be included. The above-mentioned sections can be further expanded by incorporating other relevant results and insights obtained in upcoming SAM analyses.

Regarding the graphs/charts to be included in the report (D4.8), it is asked to keep:

- raw data in a standard format (Excel/SPSS/STATA), including the scripts (e.g. STATA log and do-files) to ensure transparency and replicability of the results;
- record of original tables/figures and the relevant raw data to allow for further handling (e.g. for an analytical highlight);
the metadata (summary of basic information about data, e.g. author, date created, date modified, file size, definitions used, etc.).

Finally, SAM report (D4.8) and future updates, and their respective web-link must be provided in Word document format, including the hyperlink that will be delivered to the European Commission/EU Institution; the publication date and contact information (name, phone number, address and an e-mail address of the contact person); a clear mention of the copyrights.

5. References

- [1] European Commission, “ESCO Handbook,” 2019. [Online]. Available: <https://ec.europa.eu/esco/portal/documents>. [Accessed 20 04 2020].
- [2] Skill Panorama, “Skill Panorama,” 2020. [Online]. Available: <https://skillspanorama.cedefop.europa.eu>. [Accessed 20 04 2020].
- [3] European Commission, “The ESCO data model,” 2020. [Online]. Available: <https://ec.europa.eu/esco/portal/documents>. [Accessed 20 04 2020].
- [4] ESCO, “INCLUDING QUALIFICATIONS IN THE LEARNING OPPORTUNITIES AND QUALIFICATIONS IN EUROPE PORTAL AND IN THE ESCO PORTAL - QUALIFICATIONS METADATA SCHEMA SPECIFICATIONS version 1.1.0,” European Commission – DG EMPL, Bruxelles, 2017.
- [5] International Labour Organization, “International Standard Classification of Occupations,” 2007. [Online]. Available: <https://www.ilo.org/public/english/bureau/stat/isco/>. [Accessed 2020].
- [6] L. Anderson, D. Krathwohl and B. S. Bloom, A taxonomy for learning, teaching, and assessing: a revision of Bloom's taxonomy of educational objectives, New York: Longman, 2001.
- [7] UNESCO Institute for Statistics, “INTERNATIONAL STANDARD CLASSIFICATION OF EDUCATION. Fields of education and training 2013 (ISCED F 2013) - Detailed field descriptions,” UNESCO Institute for Statistics, Montreal, Canada, 2015.
- [8] CEDEFOP, “Skills Intelligence,” [Online]. Available: <https://www.cedefop.europa.eu/en/tools/skills-intelligence>.
- [9] SAM, “Deiverable 3.1 - Definition of Professional Profiles Design & Review Process and AM Sectoral Framework to Sustain and Feed the AM Qualification System,” 2019.
- [10] SAM, “Deliverable 4.2 - Observatory in Additive Manufacturing (Online platform),” 2020.

Appendixes

Appendix 1 - ESCO template for a new Occupation (Excel file: new_OCC_template)

Alternative labels/synonyms	Scope	Information on regulated profession	Essential skills	Essential knowledge	Optional skills	Optional knowledge
Provide a tentative list of synonyms	Clarify the boundaries of this occupation and what distinguish it from existing occupations	Is this occupation regulated at national level?	Provide a list of essential skills/competences that are needed to perform this occupation	Provide a list of essential knowledge/know-how needed to perform this occupation	Provide a list of optional skills and competences that can be required in specific working environments	Provide a list of optional knowledges

Appendix 2 - ESCO template for reviewing an existing Occupation (Excel file: review_of_occupational_profiles)

Occupation URI	Occupation title	Comments on the preferred term	New description of an existing occupation	Alternative labels to be removed/modified	Essential skills and knowledge concepts to add/remove	Optional skills and knowledge concepts to add/remove
Include the Uniform Resource Identifier (URI) of the occupation in ESCO	Specify the Occupation title (Preferred Term)	Add a relevant comment on the Occupation title	Provide the description of new tasks and/or new description of the tasks associated to this occupation in max 2000 characters	Specify the synonyms for the name/title of the occupation that need to be removed or modified	Specify the essential skills, competences and knowledge that need to be added or removed	Specify the optional skills, competences and knowledge that need to be added or removed

Appendix 3 - ESCO template for new Skill description (Excel file New_skill_profiles)

Concept name	Description	Alternative labels/synonyms	Skill type	Skills reusability level	Essential skill of	Optional skill of	Hierarchy
Insert the title of the skill/knowledge	Describe the tasks associated to this skill in max 2000 characters	Provide a tentative list of synonyms	Indicate if Skill (S) or Knowledge (K)	Indicate the reusability level. A skill can be considered transversal, cross sectoral, sector specific or occupation specific	Provide a list of associated occupations for which this skill is essential	Provide a list of associated occupations for which this skill is optional	Indicate the hierarchy code (ESCO to fill in)

Appendix 4 - ESCO template for reviewing an existing Skill description (Excel file: Review_skill_profiles)

Existing skill/knowledge URI	New relevant skill/knowledge name	Essential skill	New relevant skill/knowledge description	Existing skill/knowledge name to be unlinked	Associated occupations to be added/removed
Include the Uniform Resource Identifier (URI) of the skill/knowledge in ESCO	Specify the new skill/knowledge name	Choose if the concept is a skill (essential or optional) or knowledge	Provide an explanation of the concept in the form of a description which length is between 50 and 300 characters	Specify the existing skill/knowledge that need to be unlinked	Specify the relationships between the skill/knowledge and occupations that need to be added or removed

Appendix 5 - ESCO template for Qualifications (Excel file: ESCO Metaschema data) (To be filled in my Members States that formally recognised the AM European Qualification in their Educational System)

DATA		Required /Optional	
Title of the Qualification		Required	
Field		Required	
Country/Region (code)		Required	
EQF Level		Required	
NQF level		Required	
Description of the qualification	Either	Knowledge	Required
		Skills	Required
		Responsibility/Autonomy	Required
	Or	Open text field describing what learner is expected to know, understand and able to do	Required
Awarding body or competent authority		Required	
Credit points/notional workload needed to achieve the Learning Outcomes		<i>Optional</i>	
Internal quality assurance processes		<i>Optional</i>	
External quality assurance/regulatory body		<i>Optional</i>	
Further information on the qualification		<i>Optional</i>	
Source of information		<i>Optional</i>	
Link to relevant qualification supplement		<i>Optional</i>	
URL of the qualification		<i>Optional</i>	
Information langue		<i>Optional</i>	
Entry requirements		<i>Optional</i>	
Expiry date (if relevant)		<i>Optional</i>	
Ways to acquire qualification		<i>Optional</i>	
Relationship to occupations		<i>Optional</i>	