'Comparing Vocational Education and Training Qualifications: towards a European Comparative Methodology'

Work Assignment 1: Exploring and testing a reference point for VET comparison

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Work Assignment 1: Exploring and testing a reference point for VET comparison

Final Report

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Analysing the suitability and applicability of reference points for comparing VET qualifications

Cedefop project 'Comparing Vocational Education and Training Qualifications: towards a European Comparative Methodology'

Working paper 1

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Background and methodology

Comparison of qualifications can support transnational cooperation in VET and mutual learning across countries as well as the portability of qualifications and the mobility of learners and workers. While Cedefop has supported the exchange of information on VET in Europe since its establishment, detailed comparisons of the purpose, profile and content of VET programmes and the resulting qualifications have only been made in a few cases. The aim of this study is to explore and test appropriate 'reference points and systems' for the cross-country comparison of the content and profile of qualifications. It addresses the following core research questions:

(a) Which are the relative strengths and weaknesses of ESCO (v1), O*NET and WSSS (and other potential reference points) when used as external reference points for the comparison of VET qualifications?

(b) To what extent can these reference points complement each other, and for which purposes?

In a first step, requirements were identified that reference points should meet for different purposes and usage contexts. The four reference points selected were analysed based on these requirements (in addition to the three named above, the fourth one is the VQTS-based Competence Matrix 'Professional Care' developed in the EU project HCEU). The analysis focused on comparing VET qualifications but since these reference points can also play a role in other contexts (such as automated text processing of qualifications data, gathering data on the match/mismatch between qualifications and labour market and Cedefop activities related to the Skills Panorama, Big data analysis from online vacancies or the European Skills and Jobs Survey), these usage contexts were also considered. In a next step, research tools were prepared for mapping learning outcomes of national qualifications (healthcare assistant and ICT service technician) from ten countries (Austria, Bulgaria, Denmark, Finland, France, Ireland, Lithuania, the Netherlands, Spain, and United Kingdom-England) to the four selected reference points. Country researchers, supported by sector experts, conducted the mapping and reflected on strengths and weaknesses of each reference point.

Suitability of the reference points selected for the different usage contexts

Comparing VET qualifications

Although of the four reference points only the VQTS-based Competence Matrix HCEU was developed specifically for the comparison of VET qualifications, all four analysed and tested reference points have their strengths and weaknesses in relation to this usage context:

(a) ESCO, the multilingual classification of European Skills, Competences, Qualifications and Occupations, is clearly the most comprehensive and relevant reference system of the four, aiming at representing an amalgamation of the occupational profiles of European countries. However, as a reference system, it lacks coherence and the profiles are rather simplistic and limited, with a problematic skill inventory that needs supplementation for particular occupations and lacks a hierarchical structure. The use of the concepts of knowledge and skills/competence or the distinction between occupational and transversal knowledge, skills and competences (KSC) is not always clear, knowledge items are presented as nouns (whereas the learning outcomes statements in many national qualifications are formulated as phrases with an action verb) and often without any indication of the context in which they can be applied. There is quite some variation between the learning outcomes in terms of scope and detail (some are considered as too narrow and specific, others as too broad). ESCO also fails to capture the work processes in which required skills and competences are to be used and does not clearly express a level of proficiency.

(b) The Occupational Information Network (O*NET) is a well-developed and differentiated system but focuses on the US labour market. The profiles are rather short and it is easy to gain an overview, and they also include knowledge components. However, the profiles as used in this study lack contextualisation and there is a somewhat unclear division between skills and detailed work activities. Some O*NET statements are very broad and formulated in a more general (less detailed) way, they do not express the level of proficiency of learning outcomes and there is no clear distinction between occupational and cross-sectoral/transversal learning outcomes.

(c) WorldSkills Standards Specifications (WSSS) use a clear and logical structure, they integrate occupational and transversal skills and are activity oriented (however, they could be expanded by specifying detailed work activities). Critical points include that the division into 'know and understand'

and 'be able to' seems to be somewhat artificial and makes the KSC lists rather long and verbose. Some WSSS statements merge KSC that do not necessarily always go hand in hand and transversal aspects are not sufficiently covered. Moreover, WSSS also has an element of hierarchy which is helpful but is too demanding for qualifications of a number of less well-developed VET systems, keeping in mind that WSSS have originally been developed to enhance excellence in VET. To use it for the purpose of comparing VET qualifications, WSSS would need to be adapted also for lower performance levels.

(d) The VQTS (Vocational Qualification Transfer System) model was developed and further applied in a series of EU funded projects. VQTS-based Competence Matrices are only available for selected occupational fields and they are usually not updated. However, the rationality for structuring the VQTS/HCEU Competence Matrix is generally logical and understandable, the descriptions are generally short and clear and are based on the holistic descriptors of competences related to work processes. Specific occupational items are included but also more transversal ones. The VQTS/HCEU Competence Matrix is very good at differentiating competence areas and higher and lower level abilities. However, this makes the mapping process more time-consuming and requires deeper expertise related to these work processes. Moreover, some statements are described in a rather broad manner (and in these cases it would be sometimes necessary to read the detailed information also provided in the HCEU Competence Matrix but not used for the mapping in this project) whereas others are too much focused on the details. Also, the lack of knowledge descriptors in the profile used for the mapping exercise is a weakness. However, in the HCEU Competence Matrix, knowledge aspects are actually specified and could be used for mapping.

Comparisons of the profile and content of VET qualifications can serve different purposes and, depending on the purpose, the methodology applied, the reference points and the sources used as well as the results obtained (including the way they are presented and what is considered as 'meaningful' result) must meet different requirements. For example, while the VQTS-model would need extensive resources in view of upscaling, VQTS-based Competence Matrices are well placed to show differences and similarities of qualifications in the EQF context or to support recognition of formal, non-formal and informal learning outcomes obtained in another country. In general, however, a comparison, although probably always with limitations, can in most cases at least serve as a starting point for further steps and can be used to support countries in reflecting

on their own choices as well as in identifying parts of qualifications that are common across countries.

Automated text processing of qualifications data

ESCO is the only one of the four analysed reference points or systems that qualifies as a potential reference system for automated text processing; it is, however, far from perfect. Major deficits are the currently inadequate structure of most parts of the skills pillar (hampering automated reasoning), the lack of generic skills terms (hampering the automated mapping of concepts occurring at different levels of specificity), the fact that ESCO occupational profiles have not been compiled according to a uniform construction scheme consistently applied across all sectors (resulting in an imbalanced assignment of transversal and occupational KSC across occupations and sectors) and a weighting of KSC which can be contested, because it is the result of a non-transparent editorial decision, and not of empirical evidence.

Exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements

In this usage context, the reference point will not only be used for mapping intended learning outcomes (learning outcomes included in qualification descriptions) but also for mapping achieved learning outcomes (that have been put into practice by graduates and 'experienced' by employers) and required learning outcomes (that are actually needed at the workplace). The goal is to apply it in a survey that involves graduates as well as employers in order to gather and analyse data on the relevance of VET qualifications, i.e. the match/mismatch between qualifications and the labour market. Thus, the reference point to be used in this context must meet some specific requirements: It should not be too detailed; in particular, the reference point needs to contain concepts for assessing achieved learning outcomes at a lower level of granularity compared to the usage contexts discussed above). In addition, the concepts included need to be understandable for both, graduates as well as employers, and the workload for completing the survey has to be reasonable, i.e. it should probably not take more than 30 minutes to complete it.

A reference point that is structured around work tasks which reflect real working life seems to be most suitable for this purpose, as it is the case in the WSSS and the VQTS-based Competence Matrices. Regarding the level of detail, the O*NET profile (at least for the nursing assistant) could be the preferred one because it is the reference point with the lowest number of learning outcomes items. The VQTS/HCEU Competence Matrix, however, has the advantage that allows indicating different performance levels. Thus, it could serve as a means to

explore commonalities and differences in terms of performance levels between the intended, achieved and required learning outcomes.

Skills Panorama

ESCO appears to be the best suited reference system for structuring online labour market information, as it fulfils most of the requirements labelled as 'necessary' for this usage context, such as comprehensiveness, both with regard to concepts and languages covered, an appropriate organisation format, additional structural organisation and strong public commitment to long-term development. Yet, ESCO shows shortcomings with regard to two 'necessary' requirements, namely vocabulary control and traceability of amendments (the latter is, however, intended for its further development). Of the 'desired' requirements, ESCO has deficiencies in structuring its content, and it lacks a consistent and transparent construction scheme for OSP, as well as linkage to national European taxonomies. What counts more, however, is the connection with ISCO 08, even if linkage to other standard taxonomies such as ISCED would also be desirable.

O*NET's strong points lie primarily in its well-founded taxonomy work, visible in the requirements of vocabulary control, of structuring and using a consistent construction scheme for OSP. This is also fostered by O*NET's long history, resulting in experience with regular updates and the development of transparent documentation. A strong argument why it should not be chosen as a central reference system, however, is its limitation to the U.S. labour market, and consequently to (American) English as the only language.

Both WSSS and the VQTS model suffer from comparable weaknesses: Their primary intention is not to serve as a comprehensive reference system. Instead, WSSS were developed to foster capacity building and to enhance excellence in VET. Both are limited in terms of occupations and KSCs, and also in terms of qualification levels. These features make them less suitable for structuring information systems such as the Cedefop Skills Panorama.

Big data analysis from online vacancies / European Skills & Jobs Survey

The same as for 'Automated text processing of qualifications data' also applies to this usage context: ESCO, despite having certain shortcomings (mainly lack of structure in the KSCs pillar and an unsuitable alignment with the language of the labour market, again mostly for KSCs), it is the only candidate that seems to show at least medium suitability for this usage context.

Conclusions

The study comes to the following conclusions based on the analysis of ESCO, O*NET, WSSS and VQTS:

Conclusion 1 on relative strengths and weaknesses of potential reference points for international comparison of VET qualifications: All four analysed reference points show potential to be generally applicable as reference points for comparing VET qualifications and have strengths and weaknesses to be used in this context. While ESCO is currently best positioned for this purpose in terms of sectoral and linguistic coverage, ESCO would require the development of a conceptual model underlying the approach to ensure consistency in the description of KSC and the design of OSP. In general, any reference system needs a firm conceptual basis to interpret the outcomes of a comparison of qualifications. The other reference points also provide opportunities in different contexts in which comparison of VET qualifications is involved and particularly the use of VQTS-based Competence Matrices or WSSS can be further explored in cross-country cooperation activities within Europe (such as in Erasmus+ projects, Sector Sills Alliances, Centres of Vocational Excellence).

Conclusion 2 on the focus on learning outcomes: The sole focus on learning outcomes constitutes a certain restriction for the international comparison of qualifications. Nevertheless, a reference point (based on learning outcomes) can serve as translation hub between VET qualifications as well as between the supply and the demand side, in different usage contexts.

Conclusion 3 on whether reference points can sufficiently capture intended learning outcomes of national qualifications: All reference points generally strike a balance between being detailed enough to capture the content of what is included in national qualifications and being concise enough to be applicable. Some reference points (WSSS and O*NET) are more consistent in how learning outcomes are described (at what level) and clustered. ESCO has the disadvantage of not having a strictly applied approach to clustering and integrating (transversal) learning outcomes, leading to duplications, to variations across sectors and in the level of detail applied and to a lack of consistency.

Conclusion 4 on whether reference points capture the overall scope of national qualifications: All reference points can be used to capture the scope of the national qualifications to a certain extent. But all reference points face challenges in terms of comprehensiveness and relevance in relation to different country contexts. The comparison of qualifications with each other based on the reference points is therefore only of limited informative value, as there are

learning outcomes in some national qualifications that are not reflected in the reference points.

Conclusion 5 on whether reference points support weighting of the different learning outcomes covered by the qualifications: The weighting of learning outcomes of national qualification descriptions mapped to the learning outcomes included in reference points appears challenging and the reference points do not provide sufficient ground to apply weighting approaches in national contexts.

Conclusion 6 on distinguishing occupation-specific and cross-sectoral/transversal knowledge, skills and competences: Only ESCO makes an explicit distinction between transversal and occupation-specific KSC. This distinction however is conceptually not well developed leading to conceptual and operational challenges in international comparison of qualifications. The distinction between transversal and occupation-specific KSC often has a political dimension whereby specific emphasis is placed in VET on specific (sets of) key competences, 21st century skills and alike.

Conclusion 7 on the suitability of reference points for other usage contexts: ESCO appears to be the most relevant reference system compared to the other three for the other usage contexts: automated collection/analysis of national qualifications data (WA2); data collection/survey on (mis)match between qualifications and LM requirements (WA3); structuring online information systems on LM/VET related topics (e.g. Cedefop Skills Panorama); (automated) collection/analysis of national vacancy data (e.g. Cedefop RTLMI project, Skills & Jobs surveys). This relevance mainly relies on the far greater coverage of ESCO in terms of sectors and languages and the reference to labour markets in EU countries. The relevance of ESCO for other usage contexts is however seriously hampered by the lack of a conceptual model underlying the approach that can be used to cluster, classify and organise KSC and for designing OSP. While the workload for making ESCO relevant for all sectors and languages is limited, the workload for the conceptual further development of the ESCO skills pillar (and the implications for revising the OSP) is considerably high.

Conclusion 8 on required adjustments of ESCO and what can be learned from other reference points: ESCO needs to undergo a number of fundamental amendments to serve as reference point in all usage contexts. These adjustments relate to providing the conceptual foundation for ESCO (quality of learning outcome descriptions; clustering of learning outcomes; integrating transversal and occupation specific learning outcomes; and levels of proficiency). Besides other sources, inspiration could be taken from WSSS (clustering learning outcomes), O*NET (conceptual model) and the VQTS model

(both regarding embedding transversal and occupational learning outcomes, and regarding levels of proficiency).

Chapter 1. Introduction

1.1. Setting the scene

Comparing the purpose, profile and content of vocational education and training (VET) qualifications in Europe can serve both national VET actors responsible for qualifications and individual learners, workers and employers for different purposes.

At the individual level, for example, a holder of a vocational training qualification could apply for a job or a training programme in another country. A vacancy notice or the access requirements for an education programme may specify a specific VET qualification from that country as a condition or requirement. The aim of this person may be to find out whether his or her own qualification is fully or partially in compliance with the stated qualification and what learning outcomes may be missing. Or, if someone has already gained work experience in one country and wants to validate the competences obtained for the acquisition of a qualification in another country (where possible), he or she will want to determine which of the required learning outcomes he or she has already acquired and which are still to be achieved.

At the provider level, the purpose of qualification comparison could be to identify learning outcomes that can be addressed in mobility phases or in joint programmes. In addition, the comparison of VET qualifications can support mutual learning across countries. While VET qualifications will always have to respond to national, regional and local needs, their relevance and quality increasingly depend on their ability to respond to international developments and requirements, imposed by global markets and rapidly developing and changing technologies. National VET qualifications are not developed in a national vacuum but respond to skills and competence needs shared across national and institutional borders. How this balancing of local, national and international needs and requirements is carried out in practice, however, varies across countries. Countries also organise the interaction between their education and training and labour markets in different ways, meaning that qualifications are reviewed and renewed in different ways. The comparison of VET qualifications, which helps to identify differences and similarities, allows national (inside or outside Europe) policy-makers and stakeholders to systematically reflect and evaluate their own

priorities and solutions and to draw inspiration from other countries' decisions and solutions to design, revise or develop their own qualifications.

Thus, comparison of qualifications can support learning from each other, transnational cooperation in VET, portability of qualifications and mobility of learners and workers. But how can this comparison be made? Which methods and procedures can be used to enhance understanding of qualifications across countries and to make qualifications comparable to allow authorities and individuals to make more informed choices?

Attempts to compare (in particular initial) VET qualifications to promote transparency and mobility are not new: in the last twenty years there have been sustained attempts within the EU to do so. Important initiatives in this regard include the development and implementation of the European Qualifications Framework for lifelong learning (EQF), the European Credit System in VET (ECVET) and ESCO (European Skills/Competences, Qualifications and Occupations). However, the comparison of VET qualifications has proved difficult so far. Some of the reasons are listed below:

(a) It is difficult to understand VET qualifications in isolation from the governance, labour market and educational institutions and practices in which they are embedded. There must be at least some understanding of the political, economic and educational context in which qualifications exist in each country before a qualification can be properly understood and compared. The relationship between qualifications and occupations must also be clarified: For example, qualifications can have a gate-keeping function towards occupations. This gate-keeping function can be a formal prerequisite for entering an occupation, but a qualification can also be only a desired or recommended asset for practicing a particular occupation. A qualification may be linked to a particular occupation (and based on a particular occupational profile) or it may be more widely applicable in the labour market. However, qualifications must be distinguished from occupations because they are not the same: 'Qualifications are awarded on the basis of particular knowledge or know-how and may or may not be congruent with occupations, which are associated with a particular division of labour within a sector of any given society' (Brockmann et al., 2011, p. 5).

(b) Occupations and related qualifications may receive the same name in different jurisdictions (e.g. Bricklayer in England, *Maurer* in Germany, *Maçon* in France). But the range of activities, personal characteristics and know-how that each of these nationally anchored professional qualifications

signals varies greatly ([1]). Each qualification in each jurisdiction requires close scrutiny before meaningful comparisons can be made.

(a) The content of qualifications is described in different ways, making use of different concepts, terminology and structures, and in different types of documents with different functions and referring to different levels of regulation and/or implementation.

One approach that is thought to prove promising is to adopt a learning outcomes approach: Although qualifications might not be exhaustively described by learning outcomes alone ([2]), it is expected that a systematic characterisation of what a learner knows, understands and is able to do upon completion of a learning process (irrespective of the method, time/timing and location of learning) can provide a basis for comparison across education systems and countries, or between labour market demand and supply. The learning outcomes approach is supposed to enhance transparency and comparability of qualifications (Cedefop, 2014):

(a) Transparency of qualifications refers to the 'degree of visibility and legibility of qualifications, of their content and value on the (sectoral, regional, national or international) labour market and in the education and training systems'. This can also be understood as 'face value' of a qualification and refers to a broad comparability to facilitate transnational recognition of qualifications.

(b) Comparability of qualifications refers to the 'extent to which it is possible to establish equivalence between the level and content of qualifications (certificates, diplomas or titles) at sectoral, regional, national or international levels.' Equivalency determines the extent to which qualifications are similar. The establishment of equivalency is used when an individual requires his or her qualification to be recognised towards another qualification within or outside the country.

While the EQF is considered as a common 'reference framework' to serve a translation device between different qualifications systems and their levels and to improve the transparency, comparability and portability of people's qualifications, it is not sufficient to compare individual qualifications and their concrete learning

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([1]) cf. Brockmann et al., 2010a,b and 2011 – for bricklayers; Galla, 2014 – for the furniture professions.

([2]) Other characteristics also considerably shape the outcome of VET programmes, e.g. entry requirements, duration, ratio between work-based and school-based learning, applied assessment strategies, existing quality assurance, professionalism of teachers, national VET governance etc.

outcomes. The shift to learning outcomes, however, provides an opportunity to analyse and compare qualifications.

Although studies carried out in recent years – including several by Cedefop – highlight that progress has been made in implementing learning outcomes approaches, they also show that countries interpret and apply learning outcomes in different ways. While this reflects diverse national contexts, some of these differences reduce transparency and may prevent the comparability and portability of qualifications across countries. It has to be acknowledged that transparency can be achieved in different ways and does not necessarily lead to an easy way of comparing qualifications. Also, the experience from many European projects shows that comparison of initial (I) VET qualifications can be quite challenging. And of course, using different languages for describing qualifications and their learning outcomes is an additional challenge.

To overcome (at least some of) these challenges it is often considered useful to develop or use some sort of reference tools for supporting the comparison of qualifications. For example, many EU-funded projects have developed grids or matrices based on analyses of core work processes or core competences required in a specific occupational area, and have mapped national (I)VET qualifications to these reference tools in order to identify similarities and differences of their content and profile. Usually, experts from the respective economic sectors and occupational fields are involved in such activities.

A specific methodology for comparing individual IVET qualifications with a similar profile across countries was developed in the Cedefop project (in cooperation with ETF and UNESCO) on 'The role of learning outcomes in supporting dialogue between the labour market and education and training; the case of vocational education and training' ([3]). In this project, selected occupational profiles from the European classification of skills, competences, occupations and qualifications (ESCO) were used as the main reference points for the comparison of national qualifications ([4]). In one case a profile from the Occupational Information Network (O*NET), the USA's primary source of vocational intelligence, was used. The potential use of other reference tools, such as WorldSkills Standards Specifications (WSSS), was briefly discussed but not systematically followed up during the project. The WSSS 'Automobile Technology' ([5]) was used in a previous study (Cedefop, forthcoming-a) as

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([3]) Auzinger et al., 2017; Bjørnåvold and Chakroun, 2017.

([4]) A revised version of ESCO released in July 2017 (ESCO v1); the project was based on the previous version.

([5])   https://api.worldskills.org/resources/download/8464/9050/9960?l=en

reference point to compare the content and profile of car mechanic qualifications at EQF levels 3 and 4 from eight countries. Some strengths and weaknesses of these reference tools were identified then but not systematically explored.

1.2. Main research questions, methodical approach and structure of the working paper

1.2.1. Objectives and key research questions

The aim of this study is to explore and test appropriate 'reference points and systems' for the cross-country comparison of the content and profile of qualifications (⁶). In the context of this study, a reference point is understood as conceptual fixed point for mapping learning outcomes included in national qualifications in order to compare them and identify commonalities and differences of their content and profile. Reference points of this kind usually have the form of occupational skills profiles (OSP). In this study, OSP refer to profiles that describe the requirements or essential characteristics of occupations in terms of knowledge, skills, competences, professional interests, work values, etc. They can be independent profiles, e.g. referring only to a specific occupational profile, or they can be part of a more complex 'reference system'. A 'reference system' is a systematic approach to develop and maintain OSP for different economic sectors and occupational fields. It defines how OSP are developed and provides some kind of structuring the content of OSP. They can be developed at national and international level. Reference systems can also include other aspects. For example, they can show relations between OSP. In this study, we examine the possibility of a broader scope of use and therefore reference systems (which include reference points, i.e. OSP, are more interesting. However, since individual reference points (not specifically linked to a reference system) also have the potential to form the basis for the development of a reference system, they are not categorically excluded.

 The use of OSP to compare VET qualifications also has some limitations, though: OSP by definition have a strong focus on labour market aspects, while qualifications often have a larger scope and purpose, especially when they

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(⁶) The general definitions of a reference point refer, for example, to 'an idea or fact that you compare other things with or use to help to understand things' (https://www.macmillandictionary.com/dictionary/british/reference-point) or to 'a fact forming the basis of an evaluation or assessment' (https://www.collinsdictionary.com/dictionary/english/reference-point).

prepare not only for the labour market but also for further learning (and in particular for access to higher education). Nevertheless, they seem at present to be the best way to compare qualifications. There are no 'neutral' qualification profiles that could be used to compare VET qualifications. We could of course use a national qualification as a reference point – but that would mean emphasising a specific national qualification and its learning outcomes. This would probably lead to a bias in the comparison of qualifications. The use of a 'neutral' reference point, on the other hand, helps to overcome the viewing of qualifications with a specific national lens.

In-depth comparisons of the purpose, profile and content of VET programmes and their resulting qualifications have only been carried out in a few cases, and not in a comprehensive manner. The aim of this study is to address this gap in evidence and support mutual learning between countries so as to allow national policymakers and stakeholders to systematically judge their own priorities and solutions. The purpose is not to promote standardisation and harmonisation of qualifications but to provide countries with a better evidence base on which to increase the relevance and quality of their national qualifications.

In particular, this paper addresses the following questions:

Box 1.   **Core research questions**

1. Which are the relative strengths and weaknesses of ESCO (v1), O*NET and WSSS (and other potential reference points ([7]) when used as external reference points for comparison of VET qualifications?

1.1 To what extent are these references <u>sufficiently detailed</u> to capture the <u>intended learning</u> outcomes addressed by national qualifications?

1.2 To what extent are these references able to capture the <u>overall scope</u> of national qualifications (broad vs. narrow)?

1.3 To what extent are these references able to <u>support a weighting</u> of the different learning outcomes covered by the qualification, thus providing an insight into what are considered to be <u>essential and less essential</u> learning outcomes?

1.4 To what extent are these references able to distinguish between (what ESCO refers to as) <u>occupational-specific and cross-sectoral/transversal knowledge, skills and competences</u>?

2. To what extent can these reference points complement each other, and for which purposes?

Source: ToR (slightly amended: Question 3 is integrated in Question 1).

1.2.2. Applicability of the reference points beyond the scope of this study

The focus of this study is to identify or adapt existing reference points (as included in reference systems) that best fulfil the requirements for comparing qualifications. However, these reference points or systems also play a role in other parts (work assignments, WA) of the overall Cedefop project and this paper thus considers the requirements for using the reference points for gathering and analysing national qualifications data by using digital technologies (WA2) and for gathering data on the match/mismatch between qualifications and labour market requirements (WA3). Moreover, these reference points are relevant for activities related to the labour market, which are outside the scope of the project but are also considered to a certain extent (such as the Cedefop activities related to the vacancy project, the Skills Panorama or the European Skills and Jobs Survey).

Although the requirements for the different purposes of using the reference points are considered here, it is envisaged that they will be used in different ways. For example, WA1 and WA2 focus on the comparison of intended learning outcomes, whereas WA3 also refers to achieved learning outcomes. Furthermore, the automated data gathering (WA2) might focus on a part of a

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([7]) Question 3 as specified in the ToR ('Which alternatives, beyond ESCO, O*NET and WSSS, can be identified to potentially serve as reference points for international comparison of qualifications?') is integrated into Question 1. This was done in order to include at least one alternative reference point into the assessment of strengths and weaknesses.

reference point only (e.g. on broader categories of learning outcomes) or it might not be possible to cover specific aspects that are important for comparison in WA1 (e.g. the weighting aspect) with automated data gathering. Thus, a 'stage thinking approach' is applied: While WA1 will look for more 'holistic' reference points, other WAs might use them only in a limited way (based on what is or is not possible). These different ways of using them will also be reflected in the methodological toolbox (WA4).

Therefore, the output of the current study are reference points that have been tested for the comparison of IVET qualifications and that will be used and, if necessary, adapted in the following activities of the overall project.

1.2.3. Methodological approach

The methodological approach included the following steps and research activities:

In a first step, requirements that reference points should meet for different purposes and usage contexts were identified based on desk research. The preceding project ([8]) has already made a significant contribution to a methodology for the systematic comparison of learning. Building on this, the requirements are the result of analysing potential reference points in the context of different usage scenarios relevant for this study. In addition, some national competence classification systems were considered, and the results of this analysis also inspired the identification of requirements ([9]).

The definition of these requirements goes beyond the objective of this study (namely, to find an appropriate reference point for – manually and automatically – comparing VET qualifications) and also takes into account requirements that a reference point must fulfil in other relevant usage contexts. One can expect that the reference point finally identified as the most appropriate for comparing qualifications will provide a starting point for different purposes that require the identification of commonalities and differences in qualifications; further work (e.g. related to further development and adaptation) can start from this basis.

Desk research and own expertise were used to identify requirements that a reference point needs to meet in different usage contexts as well as to assess the importance of these requirements in each specific context. However, specific

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([8]) 'The role of learning outcomes in supporting dialogue between the labour market and education and training; the case of vocational education and training' (2015-2017; Contract notice 2015/S 092-164546 of 13/05/2015) – cf. Auzinger et al., 2017.

([9]) The national systems examined for this purpose are briefly presented in the Annex.

questions could not be fully answered by desk research alone. Thus, interviews were conducted with selected experts for some of the usage contexts.

In a second step, criteria were defined for examining the strengths and weaknesses of reference points with regard to the identified requirements. In order to support the analytical and comparative approach, a template for recording the analysis of reference points was developed.

In a next step, the following reference points or systems were selected for further study in this project:

(a) ESCO is the multilingual classification of European Skills, Competences, Qualifications and Occupations ([10]). ESCO describes occupations and knowledge, skills and competences of all sectors and levels relevant for 'build[ing] an integrated labour market across Europe' and for bridging 'the communication gap between the world of work and the world of education and training'. ESCO is organised in three interrelated pillars: the occupations pillar; the knowledge, skills and competences pillar and the qualifications pillar. The knowledge, skills and competences pillar, also referred to as the 'skills pillar', claims to provide a comprehensive list of skills relevant for the European labour market.

(b) The Occupational Information Network (O*NET) is the USA's primary source of vocational intelligence. O*NET consists of a conceptual framework for organising occupational information (the O*NET Content Model) ([11]) and a freely available database of occupational profiles ([12]) linking the model's variables to items of the Standard Occupational Classification (O*NET-SOC).

(c) WorldSkills Standards Specifications (WSSS) ([13]) are primarily designed for evaluations and comparison in global competitions, and thus aim at assessing the level of proficiency or excellence in a competitive setting ([14]).

(d) The VQTS (Vocational Qualification Transfer System) model was developed and further applied in a series of EU funded projects. ([15]). The VQTS model (competence matrix) was selected for this study because VQTS-based Competence Matrices are available for various fields, including professional

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([10])   https://ec.europa.eu/esco/portal

([11])   The O*NET Content Model is available at https://www.onetcenter.org/content.html

([12])   O*NET Online is available at https://www.onetonline.org/

([13])   https://www.worldskills.org/what/education-and-training/wsss/

([14])   There are no indications on the related educational levels, though its use in competitions for young professionals suggest that the WSSS lists refer to ISCED 2011 levels 3 and 4 and EQF levels 3 to 4.

([15])   http://www.vocationalqualification.net; Luomi-Messerer, 2009.

care (^{16}), and because this approach has already been proved successful for comparing VET qualifications in several projects (^{17}).

Other potential reference points could be the Common Training Frameworks (^{18}) and the Blueprint for Sectoral Cooperation (^{19}). These reference points are however still at early stages of development and are not further considered in this study.

The selected four reference points or systems were analysed based on desk research, own expertise and interviews with experts with substantial knowledge about them.

For the testing phase (i.e. mapping learning outcomes of IVET qualifications to the reference points), two profiles were selected (^{20}):

(^{16}) https://www.project-hceu.eu/

(^{17}) Next to the VQTS Competence Matrices there are also other potential reference points developed in (often ECVET-related) projects funded by the EU. ECVET (the European Credit system for Vocational Education and Training) is a European instrument designed to support lifelong learning, the mobility of learners and the flexibility of learning pathways to achieve qualifications. ECVET has been adopted by the European Parliament and the Council in 2009 (European Commission, 2009). These projects usually focus on one specific qualification or occupational profile only and their sustainability beyond the project duration is often unclear. Examples include: Roofer, Fitter and Finisher in the Construction Industry, Bricklayer-Plasterer – ECVET-Bud (Mobility in Building Construction Sector through ECVET – www.ecvetbud.eu), Health care assistant – Proper Chance (www.proper-chance.eu), European Hairdressing Certificate (www.euhaircert.eu).

(^{18}) Directive 2005/36/EC on the recognition of professional qualifications (as amended through Directive 2013/55/EU in November 2013 (http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013L0055) has created the possibility to introduce new routes for automatic recognition through the 'Common Training Principles', which aim to be similar in effect to the automatic recognition based on the harmonisation of the minimum training requirements of the five sectoral professions in the healthcare sector. Common training principles for other professions should take the form of common training frameworks (CTF) or common training tests (CTT) (cf. Articles 49a and 49b of the mentioned Directive).

(^{19}) This is a rather new initiative, a key action of the New Skills Agenda for Europe (http://ec.europa.eu/social/main.jsp?catId=1415&langId=en). The Blueprint is a framework for strategic cooperation between key stakeholders (e.g. businesses, trade unions, research, education and training institutions, public authorities) in a given economic sector. The aim is to develop concrete actions to satisfy short and medium-term skills needs to support the overall sectoral strategy. The first five Blueprint Alliances started to work in January 2018 and four additional Blueprint Alliances started their work in early 2019.

(^{20}) This study particularly builds on a previous Cedefop project on 'The role of learning outcomes in supporting dialogue between the labour market and education and training; the case of vocational education and training' (2015-2017; Contract notice 2015/S 092-164546 of 13/05/2015; Auzinger et al., 2017). In this study, a methodology for comparing ten IVET qualifications in the same ten European countries was developed. The following ten profiles were used for analysing and

(a) Healthcare assistant: Healthcare assistants (or assistant nurses) provide assistance, support and direct personal care to patients and residents in a variety of institutional settings such as hospitals, clinics, nursing homes and aged care facilities. They generally work in support or under the guidance of qualified healthcare professionals (often nurses) or associate professionals.

(b) ICT service technician: They provide ICT support and systems service in companies/institutions; the focus is on more technical aspects of ICT installation, service and maintenance.

Based on the previous steps, the respective reference points for these two profiles were slightly adapted so that they could be better used for a mapping without changing their content and research tools were developed for documenting the mapping of learning outcomes included in national qualifications to these reference points. The following reference points have been identified and prepared for the mapping exercise:

Table 1.   **Reference points used for testing**

Reference point	Healthcare assistant	ICT service technician
ESCO occupational profile	Healthcare assistant ([21])	ICT technician ([22])
O*NET	Nursing Assistants ([23])	Network and Computer Systems Administrators ([24])
WSSS ([25])	Health and Social Care (WSSS41) ([26])	IT Network Systems Administrator (WSSS39) ([27])
VQTS	VQTS-based Competence Matrix 'Professional Care' developed in the EU project HCEU ([28])	

Source: Authors.

comparing national qualifications: bricklayer/masonry; hotel assistant/receptionist; health care assistant; ICT service technician, plumber (cooling and heating), sales assistant, dental assistant, logistics technician, machine operator (automation/CNC), farm management (agriculture). The two profiles selected for the current study are included in these ten profiles; however, in some countries IVET qualifications have been updated or changed and therefore it was not possible to use the same qualification as in the previous study.

([21]) https://ec.europa.eu/esco/portal/occupation?uri=http%3A%2F%2Fdata.europa.eu%2F esco%2Fisco%2FC5321&conceptLanguage=en&full=false

([22]) https://ec.europa.eu/esco/portal/occupation?uri=http%3A%2F%2Fdata.europa.eu%2F esco%2Foccupation%2F3e7bf729-4442-4b9f-ad5e-83111963795c&conceptLanguage=en&full=true

([23])   https://www.onetonline.org/link/summary/31-1014.00
([24])   https://www.onetonline.org/link/summary/15-1142.00
([25])   In this study, the versions available in September 2018 were used.
([26])   https://api.worldskills.org/resources/download/8472/9058/9968?l=en
([27])   https://api.worldskills.org/resources/download/8470/9056/9966?l=en
([28])   https://www.project-hceu.eu/fileadmin/user_upload/HCEU-CM_fullversion.pdf

The four reference points were tested in ten countries (Austria, Bulgaria, Denmark, Finland, France, Ireland, Lithuania, the Netherlands, Spain, and United Kingdom-England). The table below provides an overview of the IVET qualifications analysed (including their EQF level) in the ten countries ([29]):

Table 2. **IVET qualifications analysed**

Country	Healthcare assistant		ICT service technician	
	Qualification	EQF	Qualification	EQF
Bulgaria	Health assistant	4	Computer Systems and Technology Technician	4
Denmark	Social and healthcare assistant	4	IT-supporter specialised in infrastructure	4
Ireland	Healthcare Support	4	Computer Systems and Networks	4
Spain	Technician assistant in nurse care	3	Higher Technician in Computer Network Systems Management	5
France	Healthcare Assistant	3*	ICT support technician	4
Lithuania	Carer - Social Worker	3	Service engineer of information and communication technologies	4
Netherlands	Healthcare provider (nursing and convalescent homes and home care)	3	ICT management assistant	3
Austria	Diploma nursing assistance (level 2)	n/a**	Certificate of Apprenticeship Information Technology Specialising In Systems Engineering	4

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[29] In principle, the same qualifications as for a previous Cedefop study were chosen for analysis (Auzinger et al., 2017). Only, in the following cases, a new qualification had to be chosen as the previous one was no longer active. In France, the *'Titre professionnel Conseiller(e) et assistant(e) en TIC'* (Ministry of Labour) was replaced by *'Technicien d'assistance en informatique'* (Ministry of Labour); however, this qualification is not considered as IVET In Austria, both qualifications had to be replaced. 'Certificate Assistant Nurse' was replaced by 'Diploma nursing assistance (level 2)', and 'Certificate of Apprenticeship Information Technology Specialising In Informatics' was replaced by 'Certificate of Apprenticeship Information Technology Specialising In Systems Engineering'. In Denmark, Finland and Lithuania (for the latter for IT service technician only), updated qualification documents were used for the analysis.

| Finland | Vocational Qualification in Social and Healthcare. Practical nurse. | 4 | Vocational qualification in information and telecommunications technology (Competence area in information and telecommunications technology - ICT Technician) | 4 |
| United Kingdom – England | Level 2 Diploma in Health and Social Care (Adults) for England | 3 and 4*** | Level 4 Diploma for ICT Professionals - Systems and Principles | 5**** |

Source: Authors. * will probably be moved to EQF level 4. **qualification not yet included in the NQF – level estimation based on Rottenhofer, 2018: 4 or 5. ***EQF level 3, but with some specialist units EQF level 4. ****It is a level 4 qualification in the UK and this level is referenced to EQF level 5; however, it can be argued that would fit better to EQF level 4.

The research tools were prepared as Excel files, with one sheet for each individual reference point, to allow for manual mapping. Each sheet listed the respective learning outcomes terms of the OSP, complemented by additional information in separate columns (e.g. categories/areas, more detailed descriptions). For each term listed, country researchers were asked to assess whether it was 'explicitly', 'implicitly' or 'not at all' covered in the national qualification description. In addition, country researchers would provide the exact wording of the learning outcomes in question (in national language and in English) and complementary information on whether the learning outcomes were optional or mandatory.

The mapping was done based on desk research and complemented by interviews with experts for the qualifications who also provided feedback on the usability of the reference points for comparing and analysing IVET qualifications.

In a final step, the mapping of the IVET qualifications to the research tools was analysed ([30]) and conclusions were drawn in relation to the core research questions. Questions addressed included the following: Which reference points seem to be most appropriate for comparing VET qualifications and why? How can their weaknesses be overcome? How and to what extent could/should

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([30]) For a more quantitative analysis, the results of the mapping exercises from all ten countries were merged into one Excel database, to allow for comparative assessment, in particular on the scope, and the overall strengths and weaknesses of each reference point. In assessing these aspects, we calculated coverage values, i.e. shares that indicate how many of the learning outcomes terms in a reference point, such as ESCO occupational profiles, are either implicitly or explicitly included in national qualification descriptions. For comparative assessment, median values were mostly given preference over average values, as they are considered more robust.

different reference points be combined? To what extent is transfer and upscaling possible? To what extent can these reference points be used for other purposes?

It should be noted that all four reference points analysed here, with the exception of the VQTS-based Competence Matrices, are not specifically designed for the international comparison of VET qualifications. Nevertheless, the analysis of their strengths and weaknesses is carried out in relation to this specific context of use (and selected others), irrespective of the actual purpose of these reference points or systems. The discussions and conclusions in this report should therefore be seen against this background and not as an evaluation of these reference points in general. However, the analysis also points to some conceptual aspects that are relevant regardless of their intended use.

1.2.4. The structure of this report

The following chapters present the findings of this stud:

Chapter 2 introduces potential usage contexts and discusses requirements that a reference point needs to meet when applied for different purposes. It introduces the key concepts used and discusses the importance of these requirements in each usage context.

Chapters 3-6 introduce the reference points selected for this study, assess their suitability for the different usage contexts and reflects on their strengths and weaknesses based on the experience from the mapping exercise.

Chapter 7 discusses the suitability of the reference points for the different usage contexts.

Chapter 8 presents conclusions in relation to the key research questions of this study and recommendations in view of the overall aim of the Cedefop project, to prepare methodologies allowing for a systematic comparison of VET qualifications.

Chapter 2.   Requirements for a reference point to meet in different usage contexts

In order to select a reference point and to decide which reference point could be used in which context and for which purpose, we first need to discuss the 'appropriateness' of each potential reference point. Hence, there is a need for defining the usage contexts that are envisaged in this study and to define the requirements a reference point should meet in these different contexts.

This chapter presents

(a)   the usage contexts that are considered in the requirements discussion,
(b)   the key concepts used as requirements and a discussion on the importance of these requirements in each usage context.

2.1.   Usage contexts

The following contexts of use or usage scenarios are considered in the requirements discussion.

First of all, the requirements need to consider what is to be done with reference points in the context of the different parts of the overall Cedefop project:

(a)   International comparison of VET qualifications (WA1): Cross-country comparison of qualifications in the context of this study means mapping of national qualifications – their learning outcomes – to selected reference points in order to identify similarities and differences in their content and profile. Comparison of qualifications can provide systematic insight into national priorities. This insight in turn provides added value in two ways (Bjørnåvold and Chakroun, 2017, p. 96): It strengthens the transparency and comparability of qualifications at international level. Information on shared characteristics could, for example, 'benefit education institutions and companies working at international level, and aid decisions on recognition and transfer of individual qualifications' (Bjørnåvold and Chakroun, 2017, p. 107). Moreover, a systematic comparison of qualifications can support mutual learning. The systematic presentation of similarities and differences between qualifications allows national actors to reflect on their own choices and priorities: for example, are significant differences in expected learning outcomes contained in qualifications the result of different national

approaches and requirements, or are they simply due to lack of information and oversight?

(b) Automated text processing of qualifications data (WA2: Exploring, gathering and analysing national qualifications data): This WA explores how qualification data – and potentially those included in national qualification databases with a common meta-data structure – can be gathered and analysed by using digital technologies, thereby enhancing the efficiency, reliability and scalability of the methodology. A specific focus is to be put on exploring the role of ESCO in this approach. The reference points identified in WA1 form the basis for this automated data gathering. However, it is expected that automated systems can only be used for obtaining rough estimates based on the reference point used and that further interpretation of the results will be needed. Hence, it will be necessary to achieve a balance between automated data gathering and qualitative interpretation. Therefore, the output of WA2 will be a discussion on how to gather and analyse qualification data (in particular those included in emerging national qualification databases) more efficiently, notably by exploring methods as well as technologies for 'automated' text processing. Based on the approach taken in this feasibility study, we will assess whether and under which conditions it is feasible to follow this road.

(c) Exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements (WA3): Since comparative data on how the actual outcomes of VET qualifications ('achieved learning outcomes') are experienced are not systematically available, this WA addresses this gap by looking systematically into existing data on the relevance of VET qualifications to labour market stakeholders and by outlining and testing a survey methodology for gathering data to find out to what extent the intended learning outcomes are consistent with the achieved learning outcomes perceived by employers. The role of the survey methodology to be developed is to complete the feedback cycle between VET and the labour market by not only focusing on intended learning outcomes but also taking into account achieved learning outcomes (that have been put into practice). For example, both graduates one year after graduation and in a job as well as their direct supervisor / line manager could be contacted (after one year, graduates will already have had some time to settle in). The workload needed for organising such surveys needs to be kept in mind since scalability of the methodology is important. This also needs to be reflected in the reference point that will be used for gathering and analysing data on the match/mismatch between qualifications and

labour market requirements. One can expect that it will have to be less detailed than for automated text analysis, and contain concepts for assessing achieved learning outcomes at a lower level of granularity.

Additionally, the discussion on requirements needs to go beyond the current Cedefop study and look at the use of reference points in the context of other Cedefop projects, including:

(a) EU Skills Panorama [31]: The EU Skills Panorama (EUSP) is a central access point for data, information and intelligence on skill needs in occupations and sectors that provides a European perspective on trends in skill supply and demand and possible skill mismatches, while also giving access to national data and sources. The ultimate goal is to create a lively interactive platform with data and features responding to the needs of different types of users, whether they are policy-makers, practitioners working in employment agencies and guidance services or experts in skill needs anticipation. The Skills Panorama website includes a search engine that is based on the ESCO classification.

(b) Big data analysis from online vacancies [32]: Cedefop is setting up a pan-European system for gathering and analysing information from online vacancies across all EU countries (real-time labour market information, RTLMI). A well-developed reference system can strengthen the usability of this pan-EU tool for vacancy scrapping and analysis.

(c) European Skills & Jobs Survey [33]: The European skills and jobs (ESJ) survey, the first survey on skill mismatch carried out in the EU-28 Member States, examines drivers of skill development and the dynamic evolution of skill mismatch in relation to the changing complexity of the tasks and skills required in people's jobs. The survey asked 49,000 adult employees (aged 24 to 65) across all 28 Member States how their skills and qualifications match the needs of their jobs.

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[31] http://www.cedefop.europa.eu/en/events-and-projects/projects/eu-skills-panorama

[32] http://www.cedefop.europa.eu/en/events-and-projects/projects/big-data-analysis-online-vacancies

[33] http://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey

2.2. Discussion of requirements

Since the usage contexts envisaged in this study differ to some extent, the requirements that a reference point must meet also differ. In some contexts, certain characteristics may be a necessary or essential requirement, while in others they are simply desired or not needed at all. This section discusses the relevance of the requirements identified to the different contexts of use. This assessment takes into account the potential for up-scaling, i.e. for using a reference point or system beyond this specific project (e.g. in more countries and related to qualifications in different sectors of the economy). This means that while it may be possible to compare qualifications in this project using a stand-alone reference point available only in English, for a wider application across Europe (e.g. in all EU Member States, covering all IVET qualifications), the availability of the reference point in all working languages in these countries is a necessary or at least desirable feature.

The following clusters of requirements have been identified:

(a) Scope: in the context of this study, scope refers to the range of concepts, designations and languages to be covered by the reference point or system;
(b) Categorisation and structure of the terms and concepts included;
(c) Access and interoperability of the reference point or system;
(d) Validity of the terms and concepts included;
(e) Scalability of the reference point or system.

In each of the following subsections, the concepts used will be explained and the relevance of the requirements for the various usage contexts will be assessed.

2.2.1. Scope

2.2.1.1. *Comprehensiveness of concepts and designations*

The content of qualifications can be described in terms of learning outcomes. The reference point or system should also include items that correspond with the content of qualifications. This consistency is hampered by the fact that the qualification and the reference point may differ in their comprehensiveness, the concepts referred to and the designations used when referring to concepts. 'Comprehensiveness' refers to the extent to which the reference point or system is exhaustive in covering learning outcomes of a specific domain (e.g. vocational KSC). In the context of this study it refers to the coverage of learning outcomes related to the European VET qualifications and the European labour market by a reference system.

A reference system for comparing VET qualifications should comprise all learning domains and subjects covered by European VET qualifications, at least at a general level – to be supplemented with more detail, if required. If the reference system is meant to be used for collecting job requirements from vacancies or surveys as well, if it is also meant to be useful for analysing labour market mismatches, then it is advisable to also include frequently addressed labour market requirements, such as attitudes and values (e.g. 'meet commitments'), or work styles (e.g. 'attention to detail'), work experience (at least at a generalised level, e.g. 'job starter', 'at least one year of professional experience' or 'corporate experience').

Comprehensiveness, however, might be difficult to achieve. Some national profiles might include rather specific categories which are not used in other qualification systems (such as the Belgian OSP, that make extensive use of attitudinal factors). Nevertheless, a reference system offering a multitude of designations, and thus many naming alternatives for its concepts, broadens access to occupations and KSC concepts considerably, which is an asset for manual as well as automated usage scenarios. Although actual comprehensiveness of designations is impossible to achieve (across multiple languages it is even more utopian) the maintenance team of the ideal reference point should at least attempt to include frequently used expressions as comprehensively as possible.

Thus, comprehensiveness is a necessary requirement in all usage contexts:

(a) For the international comparison of VET qualifications, however, it is not the aim to have 100 per cent coverage of the learning outcomes contained in a qualification (i.e. a perfect match). Rather, it is important to have a 'maximum achievable comprehensiveness' that offers the possibility to visualise similarities and differences between qualifications.

(b) For the automated text processing of qualifications data and also for structuring online information of LM/VET related topics (e.g. EUSP), a comprehensive reference system is required that includes all learning domains and subjects covered by European VET qualifications, at least at a general level (to be supplemented with more detail, if required).

(c) For exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements and for big data analysis from online vacancies / European Skills & Jobs Survey, comprehensiveness is also important and the reference system should also include frequently addressed labour market requirements, such as attitudes and values (e.g. 'meet commitments'), or work styles (e.g. 'attention to detail'), work

experience (at least at a generalised level, e.g. 'job starter', 'at least one year of professional experience' or 'corporate experience').

2.2.1.2. *Coverage of different types of learning outcomes*

Comprehensiveness also refers to the coverage of different types of learning outcomes. Often a distinction is made between occupational or occupation-specific learning outcomes (usually specialised and relevant within a specific economic sector, context or occupation) and non-occupation-specific ones. The latter are often called 'transversal' learning outcomes.

Although transversal learning outcomes are often distinguished from occupational ones, there is a lack of terminological clarity related to these skills and competences. They are usually understood as relevant learning outcomes for a broad range of occupations and sectors and/or transferable into new educational environments. UNESCO (2014) defines transversal skills as 'those typically considered as not specifically related to a particular job, task, academic discipline or area of knowledge but as skills that can be used in a wide variety of situations and work setting'. Various definitions have been developed during the last years for different purposes and these learning outcomes 'are often referred to as core skills, basic skills or soft skills, the cornerstone for the personal development of a person. Transversal skills and competences are the building blocks for the development of the >hard< skills and competences required to succeed on the labour market' ([34]). Sometimes, reference is also made to learning outcomes related to 'general knowledge subjects' ([35]). These include languages, maths, history, geography, etc. These could also be considered transversal learning outcomes as these general knowledge subjects are often provided in VET courses that are not attached to occupational learning outcomes. One could however as well argue that within some of these courses, occupation-specific content is integrated (for instance in languages or math). In other cases, this is usually only the case to a limited extent, such as history or geography, but the learning outcomes associated with them are sometimes of high importance, in particular for preparation for higher education. In general, it

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([34])https://ec.europa.eu/esco/portal/escopedia/Transversal_knowledge%252C_skills_and
_competences

([35]) In the higher education (particularly university) context, a polarisation can be observed between 'disciplinary knowledge' (which 'is abstract and generally emphasises conceptual understanding that is defined and legitimised from within the disciplines and forms the ground for disciplinary identity') and 'relevant skills and knowledge'. Some researchers assert a risk that learning outcomes or 'know how' knowledge might replace conceptual disciplinary knowledge (Muller and Young, 2014, p. 137 – in: Prøitz et al., 2017, p. 33).

can be observed that there are no clear distinctions and that the different terminological approaches tend to emphasise different aspects and lead to a variety of different categories and structures ([36]).

Moreover, it is sometimes criticised that there is a lack of clarity related to the aspect of 'transversality': A distinction is made between *transferable* learning outcomes which are applicable across an occupational range and *transversal* in the sense of being multiply realisable (for example, the ability to communicate can require different mixes of skills in different contexts and vary according to the communicator/communicatee).

Nevertheless, since it is linked to the comprehensiveness requirement, the coverage of different types of learning outcomes is a necessary requirement in all usage contexts.

2.2.1.3. *Languages*

This study looks at 'languages' at the most relevant level for EU-wide VET comparison and labour market research and therefore considers the 24 official languages of the European Union. Additional national languages of predominantly regional relevance for national VET or labour markets are largely ignored – assuming that skills descriptions and labour market demand in languages such as Gaelic or Basque are either only of regional relevance or, if nationally relevant, are also available in the main official language(s) of a country.

An ideal reference system for the comparison of VET qualifications covers at least all 24 official and working languages of the EU. In case of automated text processing of qualifications data, also additional languages of regional importance (e.g. Catalan, Basque, Gaelic, Galician or Welsh) might be required, if regional qualifications have not been translated into the official language.

Additional languages of regional importance for the labour market (e.g. Catalan, Basque or Gaelic) are also needed for the automated processing of national job vacancies (e.g. Cedefop RTLMI system). Yet, for structuring online information systems of labour market or VET-related topics for an international audience English is usually considered to be sufficient. For example, the European Skills Panorama is only available in English and it is not planned to have it translated into other languages.

English also functions as the lingua franca in surveys for which a harmonised methodology has been agreed amongst Member States. Only for

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([36]) Cf. Note JAG 2-4: Meetings of the EQF Advisory Group and ESCO Member States Working Group, 5-6-7 February 2019: The need for an agreed terminology on transversal skills and competences.

qualitative analyses, such as country or sector case studies, national experts are asked to use national sources for enriching the information available. Thus, for exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements, all languages in which employers and education providers communicate their labour market requirements and learning outcomes are relevant.

2.2.2. Categorisation and structure

2.2.2.1. *Organisation/presentation format*

A reference system can be understood as a type of knowledge organisation system with the purpose of guiding the application and interpretation of domain-specific concepts and designations within different usage scenarios. With respect to its structural organisation, such a knowledge organisation system usually displays one of the following basic formats ([37]): term list (glossary), taxonomy, thesaurus, or ontology.

The simplest form is a term list (e.g. a glossary), arranging, for example, terms and their definitions, or acronyms and their full names in alphabetic order.

Slightly more structured is a taxonomy; it is based on a hierarchical classification of concepts, leading from the general to the more and more specific. Each term is connected to a broader term (unless it is situated right at the top of the hierarchy) and to one or several narrower ones. Taxonomies can either be organised mono-hierarchically (each term has only one broader term) or poly-hierarchically (one term may have several broader terms). The figure below provides an example.

Figure 1. **Example of a taxonomy**

([37]) Hybrid types or combinations of these formats can also be found, such as the *AMS-Kompetenzenklassifikation*, the Austrian PES' reference system for occupational requirements, which displays taxonomy as well as thesaurus format.

Broad field	Narrow field	Detailed field
00 Generic programmes and qualifications	001 Basic programmes and qualifications 002 Literacy and numeracy 003 Personal skills and development	0011 Basic programmes and qualifications 0021 Literacy and numeracy 0031 Personal skills and development
01 Education	011 Education	0111 Education science 0112 Training for pre-school teachers 0113 Teacher training without subject specialisation 0114 Teacher training with subject specialisation
02 Arts and humanities	021 Arts	0211 Audio-visual techniques and media production 0212 Fashion, interior and industrial design 0213 Fine arts 0214 Handicrafts 0215 Music and performing arts
	022 Humanities (except languages)	0221 Religion and theology 0222 History and archaeology 0223 Philosophy and ethics
	023 Languages	0231 Language acquisition 0232 Literature and linguistics
03 Social sciences, journalism and information	031 Social and behavioural sciences	0311 Economics 0312 Political sciences and civics 0313 Psychology 0314 Sociology and cultural studies
	032 Journalism and information	0321 Journalism and reporting 0322 Library, information and archival studies
04 Business, administration and law	041 Business and administration	0411 Accounting and taxation 0412 Finance, banking and insurance 0413 Management and administration 0414 Marketing and advertising 0415 Secretarial and office work 0416 Wholesale and retail sales 0417 Work skills
	042 Law	0421 Law

Source: ISCED ([38]).

A thesaurus in the field of information and documentation is an ordered compilation of terms and their (predominantly natural-language) designations, which serves in a documentation area for indexing, storing and retrieval. It is characterised by the following features:

(a) Terms and designations are clearly interrelated ('terminological control');

(b) Relationships between terms (represented by their designations) are displayed;

([38]) Example representing ISCED fields of education and training.

(c) It is prescriptive in that it determines, for its field of application, which conceptual units are made available and by which terms they are represented (Burkhart, 2004, p. 141).

Thus, a thesaurus is a knowledge organisation system seeking to specify not only the relationship of adjacent concepts but also that of their designations. It achieves this by defining which designation to prefer when referring to a given concept, and which alternative designation to equate with this 'preferred term'. Regarding structural organisation, a thesaurus is more differentiated than a taxonomy, including not only hierarchical relations such as super- and subordination, but also associative relationships. Usually, thesauri also contain a set of rules defining how to interpret (via 'definitions') and apply (via 'scope notes') preferred terms ([39]).

The most complex form of structural organisation is an ontology: It is an even more comprehensive and more structured representation of a knowledge domain, specifying its concepts' inherent semantic relationships in an ever more nuanced manner: e.g. hierarchical relations are further differentiated with respect to the specific character of this subordination, such as whether it is a part-of-relationship ('has members/is a member of') or whether 'broader' and 'narrower' terms have a possessive ('owns/ is owned by') or causal connection ('produces / is produced by'). Furthermore, the usage of terms is not just guided by semantic relations, definitions and scope notes, but also rests upon additional features like attributes and classes. Ontologies are recorded in machine-readable format and are used to support automated reasoning in artificial intelligence (AI) applications, such as natural language processing (NLP). The figure below provides an example.

([39]) See e.g. Aitchison at al., 1972.

Figure 2.   **Example: security ontology**
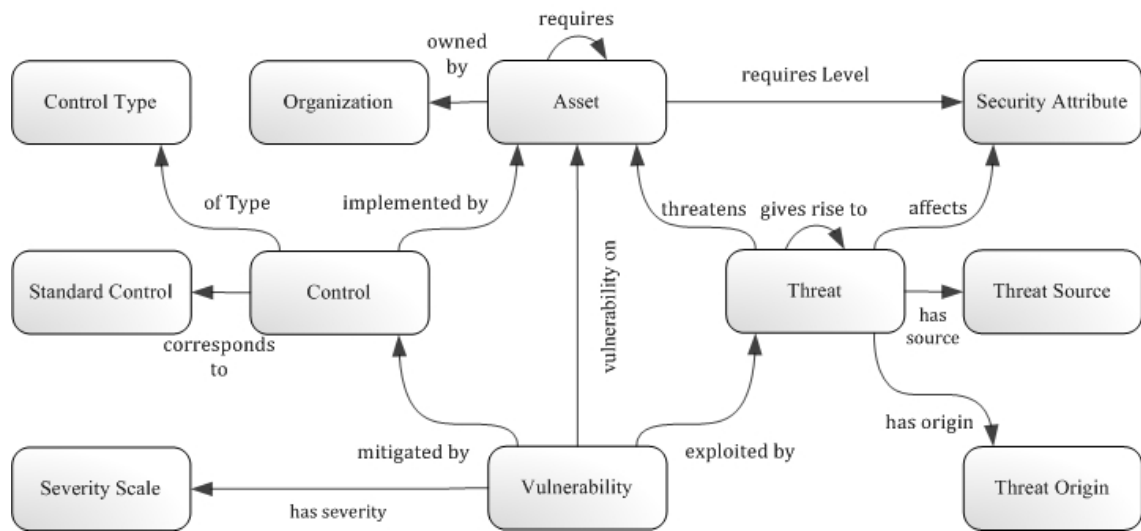
Considering that there is usually more than one way of referring to a given occupation or KSC, capturing the diversity of naming alternatives and structuring these with respect to their semantic relations – as done by thesauri and ontologies - does not only broaden access to concepts and ease their identifications, but also facilitates reasoning and the discovery of concepts related in meaning.

If the learning outcomes descriptions of VET qualifications are developed by humans and not by machines, as it is currently usually the case, a well-structured taxonomy which also displays semantic relations between terms (and hence thesaurus structure) would suffice: The provided hierarchical structure would offer overview and guidance with respect to content, and the thesaurus structure would control the terminology to be used for KSC and broaden access to concepts.

But as soon as machines are involved, an ontology structure provides a more sophisticated representation of background knowledge than classical thesauri, because ontologies also facilitate the storage of facts and axioms about a knowledge domain. Unfortunately, ontologies (especially comprehensive ones as needed in our context) are very complex systems – time consuming and hence expensive to compile and to maintain. It is doubtful whether the fuzzy and constantly evolving domain of KSC and occupations can be adequately captured

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([40]) Example taken from Stefan Fenz' research blog at
http://stefan.fenz.at/research/security-ontology/

and formally described in a manner that is sufficient from a national as well as from a transnational viewpoint.

To conclude, a system with thesaurus as well as taxonomy structure is desirable for the international comparison of VET qualifications, for exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements, and to structure online information of LM/VET related topics (e.g. EUSP). For automated text processing of qualifications data and for big data analysis from online vacancies / European Skills & Jobs Survey, at least a system having thesaurus as well as taxonomy structure is necessary, but an ontology would be even better.

2.2.2.2.   *Vocabulary control*

Terminologically controlled vocabulary labels naming variants of concepts with respect to their reference value: one variant per concept is marked as 'preferred term' and serves as unambiguous representation of the concept. All other naming variants are labelled 'non-preferred terms'. Terminological guidelines usually aim at consistent and thus for users foreseeable naming strategies – at least for preferred terms.

Vocabulary control may be applied across any of the above-mentioned publication formats, its main benefit being to ensure consistency when applying the vocabulary (such as for indexing learning outcomes) and to prevent ambiguity (for example, when interpreting indexed learning outcomes): No naming variant refers to more than one concept, and every concept has a single, unambiguous preferred name.

Rigorously applied vocabulary control is an asset in all usage contexts where information processing is mostly done by humans. If machines are taking over this task, the requirements on terminology control can be more easy-going: there is neither an imperative for consistent wording nor one for an explicit choice of unique concept names; the utilised ontology mainly has to specify which concepts have to be activated if certain text strings are detected, e.g. in vacancy text or in qualification descriptions. Thus, naming variants still need to be bundled with their associated concepts (but without the need to decide between 'preferred' and 'non-preferred' terms). Nevertheless, when it comes to publishing the results of automatically processed texts, their human recipients profit greatly from unique concept names and consistent wording, as provided by vocabulary control. Therefore, vocabulary control is a desirable aspect in all usage contexts.

Additional structural organisation

In addition to the structure established by alphabetic order, a classification of concepts, or a specification of semantic relations between terms, a reference system may use alternative structural organisation in parallel, grouping concepts also along broader categories generally understood amongst people working in this knowledge domain. Thesauri and ontologies are also easier to navigate (and also to maintain) if their concepts are grouped by broader categories.

In the case of VET qualifications, an obvious approach could be to group along types of learning outcomes (such as transversal learning outcomes, underpinning or general knowledge, occupation-/sector-specific knowledge or skills), along work-related activities or along 'educational units' (such as subjects or modules) or learning domains (e.g. knowledge, skills, responsibility and autonomy), or combinations thereof.

A first question is whether it is helpful if the reference system for comparing VET qualifications is also structured according to these categories and whether these groupings could then also be helpful in the other intended contexts of use.

Categorisations, such as one into learning domains, are the result of an analytic construction process, usually leaving more than one single option. Therefore, it is not surprising that the development of national qualifications frameworks (NQF) resulted in the adoption of nationally specific learning domains across Member States (Cedefop, 2017a, pp. 51). Some Member States, for example, distinguish between 'knowledge' and 'skills' domains (cognitive and psychomotor) and personal and social competences (emphasising autonomy and responsibility). Since these predefined domains are used in some countries for describing learning outcomes of VET qualifications, a reference system that structures its concepts (also) along these dimensions might be easier to use for these Member States; yet others not using these predefined domains will see little value in such an additional structuring, or even be misled by it [41].The same is true for 'educational units' and work-related activities: there is more than one way of sub-dividing these categories – depending on purpose, (national) practices and context. If unaccustomed to the one chosen for grouping, one might rather be confused than aided by it. An investigation analysing and comparing how learning outcomes are written for qualifications standards (VET) and education programmes (HE) across ten countries [42] also revealed a lot of diversity with respect to which learning domains are being explicitly described. It

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[41] However, it might also present them with 'choice points' inviting them to consider attributes which would otherwise have been ignored.
[42] Cf. Luomi-Messerer and Plaimauer, 2014.

also showed that there is no common way of structuring and grouping learning outcomes under generally agreed headlines like 'transversal', 'key' or 'professional' competences.

But how about alternative groupings, coming from the demand side? Vacancy texts, for example, sometimes structure job requirements under headlines like 'work experience' or 'tasks to be performed'. KSC taxonomies, such as the *AMS-Kompetenzenklassifikation* operated by the Austrian Public Employment Service*,* use broad fields of occupational activities as rough groupings. O*NET distinguishes worker- from job-oriented groupings, and within these between skills, knowledge, education, work activities, organisational context, work context etc.

On the basis of these considerations, we conclude that it is not necessary for the reference point for the comparison of VET qualifications to provide an explicit distinction and a reference to learning domains, e.g. separate knowledge from skills/competences (as done in ESCO), or between tasks, knowledge, skills, abilities, work activities, work styles and work values (as done in O*NET), or to use 'educational units' for roughly grouping concepts. However, some level of structure will be needed when working with a very comprehensive reference system, such as ESCO is.

A reference point or system should offer at least some type of rough subdivision – ideally one that is easy to comprehend and based on transparent categorisation criteria that can be followed when introducing new concepts. This could be achieved easily e.g. for the distinction between 'transversal', 'cross-sectoral', 'sector-specific' and 'occupation-specific', since a quantitative analysis of frequency distributions would automatically reveal which KSC/learning outcomes e.g. occur only within a single occupation, and which ones across occupations from several or even almost all sectors. Such an analysis, of course, is of significance only if the OSP have been compiled consistently on the basis of a common construction scheme (see below).

However, another important question is whether a reference point or system for comparing VET qualifications should actually specify whether a KSC concept is occupation-specific, sector-specific, cross-sectoral or cross-departmental. Leaving beside the fact that this differentiation is highly volatile and should be determined only empirically (by analysing a KSC's distribution across all OSP at a given moment in time), its importance for educational and labour market policy is evident (cf. the objectives underlying the 2006 Recommendation on Key Competences for Lifelong Learning, and its 2018 revision). Highlighting a qualification's transversally relevant learning outcomes therefore becomes an increasingly more important objective for national policy-makers and education

providers. Yet Member States (and maybe there is even variety across education providers) place different emphasis on occupational and transversal learning outcomes: two thirds of the qualifications analysed in the project preceding this current assignment focused on occupational KSC as opposed to an equal balance between general and occupational KSC within a qualification (Auzinger et al., 2017, p. 127). The Cedefop study on VET qualifications at EQF levels 3 and 4 also revealed that most VET qualifications have a very strong focus on occupational learning outcomes: 'More precisely, an average of 66% of the learning outcomes included in IVET qualifications focus on occupational learning outcomes. General subjects take up around 22% of the qualifications, and specifically labelled transversal learning outcomes account for only 12%' (Cedefop, forthcoming-a, p. 87). However, this study also revealed that IVET qualifications linked to EQF level 4 usually have a higher share of transversal learning outcomes and underpinning knowledge (necessary to gain access to higher education) compared to qualifications linked to EQF level 3. This, the distribution of types of learning outcomes, is considered as one of the 'key comparability criteria'.

Thus, a reference point that not only systematically describes all KSC relevant for a given occupation, but also highlights either key competences or transversally relevant KSC (or both) is helpful for identifying a qualification's implicit cross-occupational labour market potential. This is a desirable requirement for the comparison of VET qualifications, the exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements, and to structure online information of LM/VET related topics (e.g. EUSP). It is not necessarily needed, however, in the other usage contexts.

2.2.2.4. *Finely tiered structure leading from general to increasingly detailed concepts*

Occupational titles as well as words or phrases denoting KSC occur at different level of specificity: They may be rather generic (e.g. 'teaching professional', 'manage time'), or more specific (e.g. 'vocational education teacher', 'comply with schedule'), or very contextualised (e.g. 'cabin crew instructor', 'ensure compliance with electricity distribution schedule'). The most granular and detailed structured reference system offers a rich repertoire of concepts structured according to finely nuanced levels of specificity, ranging from the very contextualised to the increasingly decontextualised and general (and vice versa). Such a system offers human users as well as machines a broad option of choices for indexing, and it supports reasoning.

The level of detail used for describing learning outcomes shows great variety across qualifications and Member States, even across education providers, depending, for example, on whether whole qualifications or components (such as modules or units) thereof are characterised. Even VET qualifications expressing learning outcomes generally at a high level of 'granularity' might not keep up this level of detail for all sections of the qualification (Luomi-Messerer and Plaimauer, 2014, p. 47). Previous studies revealed that learning outcomes described at different levels of abstraction provide a challenge for comparing qualifications (see e.g. Cedefop, forthcoming-a, p. 81).

A cross-country comparison of VET qualifications aims to identify commonalities as well as differences in learning outcomes. Commonalities are identified by discovering the smallest common denominator of the objects of comparison, usually involving a certain process of abstraction from the complex, multi-faceted, context-bound way used for describing learning outcomes. Differences, on the other hand, are usually assessed by analysing the detail distinguishing the objects of comparison. Therefore, a reference system used as a reference point for comparing VET qualifications must be so well structured that it offers sufficient levels of detail and thus a multitude of opportunities to 'climb' up and down these gradations of specificity. Obviously, a simple term list would not suffice – at least a finely graded taxonomy is needed to provide the required hierarchical structure. Such an organisation of concepts facilitates a focussed and accelerated search; it is also a precondition for automated reasoning, such as for extrapolating from the specific to the more general, or for deriving the specific from the general. If occupational requirements are being described in a highly contextualised manner, a taxonomy's hierarchical structure supports generalisation from the narrow occupational context, revealing the more reusable, general, transversal core ([43]) of job-specific KSC. The rather complex and multifaceted language prevalent in learning outcomes descriptions also benefits from a reference point which is able to support generalisations and reduce complexity to a level of detail which enables comparison.

For comparing VET qualifications, another aspect demands attention: learning outcomes descriptions generally serve different purposes. In qualifications, they 'define the expected outcomes of the learning process,

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([43]) Currently ESCO's KSC pillar shows significant deficits regarding structure, only transversal skills being organised hierarchically. Apparently, this inadequacy has been acknowledged by the ESCO team. According to ESCOpedia strategies and solutions are already under development – see: https://ec.europa.eu/esco/portal/escopedia/Skills_and_competences#Knowledge%252C_skills_and_competences

leading to the award of a full or partial qualification' (Cedefop, 2017a, p.19). These descriptions can be used for informing prospective students, guiding the teaching and learning process (delivery of qualifications), identifying links to other qualifications and comparing qualifications, supporting validation of non-formal and informal learning, informing potential employers about the profile of graduates, etc. They can also have an important role in the communication between the education system (supply-side) and the labour market (demand-side) for developing and renewing qualifications.

They might also have competing goals: For example, learning outcomes might intend to describe an individual qualification as accurately as possible to inform the delivery process. Less detailed descriptions of learning outcomes are important in rapidly changing sectors (such as ICT) to provide for sufficient flexibility for adapting the precise content of the delivery to changing needs. In these cases, learning outcomes need to be described at a slightly higher level of abstraction, not referring to specific tools, processes, and products to avoid being outdated once implemented (Auzinger at al., 2017, p. 94). Abstraction also facilitates the comparability of qualifications and the identification of overlaps with other qualifications.

One can identify two obvious ways for resolving this tension between specificity and abstraction:

(a) Via the text structure used for describing learning outcomes: Qualifications are characterised using a hierarchically organised text structure, leading from general headlines (e.g. 'transversal competencies') to more (e.g. 'social interaction') and more specific ones (e.g. 'negotiate compromise'), presenting highly contextualised learning outcomes descriptions (e.g. 'negotiate with employment agencies') only at the lowest level of this hierarchical text structure. This way the qualification would be described in specific as well as in general terms.

(b) Via the reference system used to index learning outcomes descriptions: A well-structured reference point offers several levels of detail – contextualised / occupational as well as decontextualised / transversal KSC. Thus, the extrapolation from detailed learning outcomes descriptions to generic core concepts can be achieved when learning outcomes descriptions are linked to the KSC of this reference point.

One has to keep in mind that this field of tension between complete and accurate description of learning outcomes, on the one hand, and focussing more or less on the generic core of the learning outcomes for supporting comparability, on the other, probably cannot be fully released by – even the best – reference system alone: it will also need accompanying measures like a prescribed unified

text structure for learning outcomes descriptions (prescribing a format that leads from generic headlines to more and more detail, thus offering several levels of abstraction besides detailed descriptions) and more guidance.

To sum up, a finely tiered structure leading from general to more and more detailed concepts is desirable in a reference system used for the international comparison of VET qualifications. This is also the case for structuring online information of LM/VET related topics (e.g. EUSP), but here generic concepts are more important than an abundance of detail. This aspect is a necessary requirement for automated text processing of qualifications data (because it supports automated reasoning), for exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements and for big data analysis from online vacancies / European Skills & Jobs Survey.

2.2.2.5. *Consistent and transparent construction scheme for occupational skills profiles (OSP)*

Every occupation requires a different mix of KSC and involves a variety of activities and tasks. If a reference point describes these characteristics of OSP not only from the viewpoint of the respective occupation, but also from a systematic viewpoint – in relation to all other occupations contained in the taxonomy ([44]) – this results in OSP being not only descriptive (at the level of individual occupations) but also distinctive (capable of clearly distinguishing between more or less similar professions), ideally revealing shared and differing characteristics ([45]) at a glance. If implicit requirements, which are occasionally skipped in vacancies, qualifications descriptions or occupational standards, are also considered, the resulting profiles can be expected to deliver a full characterisation of an occupation's KSC requirements.

([44]) Ideally a transparent construction scheme for OSP is consistently applied across all sectors and skill levels, optimally using a standardised, measurable set of variables. Best practice example of this approach is O*NET which uses a uniform Content Model as construction scheme and an impressive survey scheme for compiling and updating OSP. The Cross-Sector Reference Group (CSREF) had recommended a similar approach for ESCO, taking a grid of transversal KSC as starting point for the systematic development of OSP (see European Commission, 2015, pp. 3).

([45]) For such a reference point the distinction of KSC along 'skill reusability levels' (transversal, cross-sectoral, sector-specific and occupation-specific characteristics) automatically follows from the quantitative analysis of KSC' frequency distributions. Whereas an upfront editorial definition of certain KSC as e.g. 'cross-sectoral' or 'occupation-specific' (as done in ESCO) will always lag behind actual usage in OSP(and, besides, also requires considerable maintenance efforts).

OSP are consistently drawn up according to a transparent construction scheme. As such, they are valuable references for comparison and they can serve as a matrix against which vacancies or qualification descriptions (of which the main objective is usually not systematic appropriateness) can be analysed.

According to a 'landscaping exercise' (Cedefop, 2017b) undertaken in the context of Cedefop's ongoing RTLMI project, vacancies commonly do not contain a comprehensive listing of transversal and job-specific requirements. There is also a lot of variation across Member States. In some countries, for instance, transversal skills are usually not sufficiently mentioned (such as in EL, CY, HU), whereas in others they seem to be overemphasised (such as in NL, SE). A quantitative analysis of skills demand can only be interpreted correctly if these differences in the 'visibility' of skills are considered, for example via assessing potentially ill-balanced job descriptions against the background of equilibrated OSP, followed by a correction of detected bias.

Likewise, there is no guarantee that all learning outcomes are being made explicit in qualifications descriptions: some, e.g. important transversal skills like social interaction (cf. Auzinger et al., 2017, p.127) are sometimes implied only, others are considered mandatory requirement for starting a given VET programme and are thus visible only in the qualification being precondition for entering the programme. To arrive at the complete picture, therefore, not only explicit but also implicit learning outcomes would have to be referenced – as done within the pilot project preceding the current assignments (Auzinger et al., 2017; Cedefop, forthcoming-a). Having a reference point at hand which provides complete and also systematically adequate OSP would help identifying learning outcomes left implicit in qualifications descriptions. Yet, the question where to draw the line between presumed KSC acquired before starting and implicit KSC acquired whilst undergoing a VET programme (cf. Auzinger et al., 2017, p.146) remains open.

To conclude, a consistent and transparent construction scheme for OSP is necessary for the international comparison of VET qualifications and the automated text processing of qualifications data, whereas it is only a desired requirement for the other usage contexts.

2.2.2.6. *Explicit performance levels ('vertical' dimension)*

Performance levels or levels of mastery refer to the 'vertical' dimension of learning outcomes. All national qualifications linked to EQF have an explicit level assigned, ranging from basic (EQF level 1) to advanced (EQF level 8), thus enabling easy transnational comparison. But at the level of individual learning outcomes, levels are expressed in a less formal and transparent manner:

Individual learning outcomes are usually characterised on a 'horizontal axis identifying learning domains (such as knowledge, skills and competences)' but also on a vertical one showing 'how the complexity of learning increases from [one] level to another' (Cedefop 2017a, p. 17), thus demonstrating how 'the complexity of tasks that can be mastered as well as the degree of autonomy and responsibility' (Cedefop, forthcoming-a, p. 15) increases. Within this study we are concerned with the performance level achieved within individual learning outcomes, not with the EQF- or NQF-level assigned to the overall qualification. We also need to acknowledge that not all learning outcomes included in a qualification have to refer to the same level, since qualifications are in many cases assigned to NQF/EQF levels based on the principle of 'best fit' (and not 'full fit) (cf. Cedefop, forthcoming-a).

Statements 'specifying the depth/breath of learning to be demonstrated' (Cedefop, 2017a, p. 47) for individual learning outcomes are indicated by an action verb, and further specified via reference to the object of learning and the occupational or social context. Furthermore, the degree of autonomy and responsibility involved in demonstrating these learning outcomes in anticipated occupational contexts may be characterised. Sometimes specific systems or concepts are used for indicating the performance level of learning outcomes. The one most often used is the Bloom's taxonomy, others include the Dreyfus and the SOLO taxonomies (cf. Cedefop, 2017a, pp. 33-36; Auzinger et al., 2017).

Thus, when comparing learning outcomes descriptions of VET qualifications, it is not sufficient to look only at the KSC a learner should have acquired at the end of education/training, but also at the required level of expertise. Previous studies revealed ([46]) that this level reference cannot always be clearly identified in learning outcomes descriptions. Action verbs or accompanying performance criteria (e.g. methods, contexts, degree of autonomy) are often not systematically used for specifying the expected level of expertise. Explicit reference to the expected level of expertise, however, can more frequently be detected on the demand side, e.g. in job vacancies (e.g. 'good command of…', 'advanced knowledge in…', 'long-time experience with…').

No matter how transparent levels are being codified in VET profiles, they are extremely difficult to compare across education systems and countries, because they constitute expected and not achieved levels and are not expressed with

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([46]) Luomi-Messerer and Plaimauer, 2014; Cedefop, forthcoming-a. The latter study revealed that the difference between IVET qualifications linked to EQF levels 3 and 4 were most often expressed in the requirements to mastering the increasing complexity of tasks.

reference to an objective scale of performance (⁴⁷). The VET-LSA project adopted an interesting strategy for dealing with this challenge (Baethge, M. et al., 2008/9): The identified common elements of VET qualifications were compared internationally only after experts had rated outcomes achieved by graduates at national level.

Previous studies (Auzinger et al., 2017; Cedefop, forthcoming-a) have shown that qualification descriptions express the degree of complexity (which makes learning progress, the 'vertical' dimension of complexity, visible), if at all, usually through action verbs, and thus indicate the desired achievement levels only implicitly and often not systematically. It can also not be taken for granted that the choice between individual action verbs is decided in a uniform manner across Member States, qualification authorities, or even education providers. Both factors make it rather unlikely that these level descriptions would fully 'survive' their translation into a reference taxonomy, or into another language.

More transparency might be achieved when using a uniform, language-independent procedure for making performance levels explicit (⁴⁸). Yet, even then, if only the intended but not the achieved learning outcomes receive performance ratings, this still bears the danger of producing misleading comparisons (Baethge, et al., 2008/9; Baethge, 2010).

Nevertheless, explicit performance levels are desirable in reference points used for the international comparison of VET qualifications, the automated text processing of qualifications data, exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements, and for big data analysis from online vacancies / European Skills & Jobs Survey. This is, however, not a necessary requirement to structure online information of LM/VET related topics (e.g. EUSP).

2.2.2.7. *Weighting of individual learning outcomes*

OSP provided by international or national reference systems usually contain more than just an accumulation of occupational requirements without any further differentiation. For fine-grading profiles, knowledge, skills, competences, tasks etc. are frequently weighted with respect to attributed importance (essential,

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(⁴⁷) And even if performance level statements would be expressed with reference to an objective scale of performance, the problem that there are so many different scales in use even within a single VET provider remains, making it impossible to compare proficiency level statements across Member States, sectors and VET providers.

(⁴⁸) An overview of different practices is given in Tutlys at al., 2018.

optional skills; key competences), frequency of demand ([49]), centrality within the overall profile (core skills, basic skills), or relevance for assuring long-term employability or access to a broader range of occupational opportunities (transversal KSC, key competences, general knowledge) ([50]).

When comparing VET qualifications, there is a need for 'indicating the importance of specific learning outcomes (i.e. [...] support weighting of outcomes within a qualification) or for showing differences between qualifications linked to different levels' (Cedefop, forthcoming-a, p.17). Therefore, the ideal reference point for comparing VET qualifications should offer occupational profiles indicating the weight of KSC within the overall profile (see also Cedefop, forthcoming-a, p.104), at least distinguishing e.g. between 'core' and 'supplemental', or between 'essential' and 'optional'. Ideally, this distinction is drawn in a concise, systematic manner, based on empirical evidence and further specified by a numerical indication ranking KSC within the overall profile.

Weighting (i.*e.* indicating the importance of specific learning outcomes) is desirable but not necessary in all usage contexts.

2.2.3. Access and interoperability

'Interoperability' usually refers to a reference system's potential to be used in different applications, implementations, or software systems. This requirement has a technical (e.g. using a standardised interoperable data format like e.g. Linked Open Data, or considering the international standard for multilingual thesauri) and a conceptual side. In the context of this study, we are discussing the latter only, understanding 'interoperability' as a reference system's ability to be accessed via an external reference point's categories (e.g. ISCO unit groups) as well, be it an international or a national one.

2.2.3.1.   *Linkage to international standard taxonomies of related content (e.g. ISCO, ISCED, NACE)*

If categories from an international standard taxonomy of related content are used in a reference system for e.g. grouping content, this provides alternative access to concepts and provides a basis for international comparison.

([49])   Such as the Austrian PES' occupational information system (see http://www.ams.at/bis/)

([50])   This differentiation according to skills type can be found in systems like the Austrian PES' occupational information system (distinguishes '*fachliche'* and '*überfachliche Kompetenzen*' – sector-/occupation-specific and transversal competencies) highlighting transversal KSC.

A reference point for the VET comparison would benefit in several respects if it were linked to widespread classifications of related content, such as the International Standard Classification of Occupations (ISCO) ([51]), the International Standard Classification of Education (ISCED) ([52]) or the Statistical classification of economic activities in the European Community (NACE) ([53]). Qualifications described with variables from such an interconnected reference point could, for example,

(a) automatically also be accessible with variables from ISCO, ISCED or NACE (e.g. ISCO unit codes could be used to systematically retrieve all relevant qualifications, which otherwise would only be related to isolated occupations);

(b) systematically be related to data collected/displayed on the basis of ISCO, ISCED or NACE (e.g. (un)employment figures, statistics on educational attainment, labour market forecasts);

(c) provide a point of contact for national taxonomies (e.g. all national occupational taxonomies of Member States are mapped onto ISCO).

Such a link to internationally used classifications would also be an advantage for the other usage scenarios, for example, would it make results from Cedefop's RTLMI tool (which matches vacancies via machine learning techniques onto ISCO unit groups) compatible with qualifications descriptions.

Thus, a link to internationally used classifications is desirable in all usage contexts.

2.2.3.2. *Linkage to national (European) taxonomies of related content*

If variables of national taxonomies are linked to variables of an international reference system, then access and exchange at national level is improved.

A reference point for VET comparison would also benefit from a link to national occupational or KSC taxonomies. Thus, the reference point's concepts (occupations, KSC) would be directly linked to their national equivalents, reducing the risk of the reference point to only provide (more or less well chosen) translations of designations, which are only the outer 'shell' of concepts.

This linkage to national taxonomies usually is developed via an editorial mapping of concepts of one taxonomy onto those of the other. During this process, mis-leading translations would be detected and amended. It can be expected that the quality of a reference point offering designations in multiple

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([51]) http://www.ilo.org/public/english/bureau/stat/isco/

([52]) http://uis.unesco.org/en/topic/international-standard-classification-education-isced

([53]) http://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF

languages (e.g. like ESCO in its current version) is likely to be boosted if it is linked to national taxonomies of related content ([54]).

Thus, a link to nationally used classifications is desirable in all usage contexts.

2.2.4. Validity

2.2.4.1. *Regular updates at frequent intervals*

No reference system has ever been finalised: not only are the knowledge domains (the 'real world' phenomena and its associated ideas) that they are attempting to capture constantly evolving, also the terminology referring to its concepts, or their implementation by users is subject to change. Furthermore, the application context may convert, such as being extended from human users to automated processors. Therefore, all reference systems have to be updated – either continually or periodically.

Demands on Europe's workforce are constantly evolving. Technological developments, globalisation and growing diversity (to name just a few influencing factors) trigger advances in methodologies, tools and operational work organisation. If these diffuse into VET and the labour market, they manifest themselves as new requirements for vacancies or new learning outcomes for qualifications. A suitable reference point for VET comparison and all other use cases considered within this study should monitor these developments and ensure that the need for change and amendment is dealt with promptly.

Thus, regular updates at frequent intervals are necessary in all usage contexts.

2.2.4.2. *Traceability of amendments*

In order to be able to apply newly added or changed terms also to previously indexed content ('retroactive indexing') or interlinked external reference points (e.g. national taxonomies of related content) without unreasonably high efforts, any amendment to a reference system must be documented in a standardised, ideally machine-readable form, thus allowing for a seamless traceability of changes.

Changes that go beyond simple corrections of typing errors, such as the introduction of new occupations and KSC, a splitting of existing concepts or

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([54]) The same is true for linking a taxonomy to international classifications of related content: This also entails a mapping between the concepts of different systems, almost automatically coming along with a validation of their conceptual structure.

changes in their scope, must be systematically documented and published together with new versions of the reference point to ensure traceability of changes. This documentation can be used to take measures to ensure that vocational qualifications described with variables from this reference point can be interpreted, or that time series of qualification requests can be generated from vacancies, even if individual variables of the reference point have changed over time. Reliable documentation of the changes is also essential for efficiently maintaining the reference point's linkage to external systems (e.g. international or national taxonomies of related content).

Thus, traceability of amendments is necessary in all usage contexts.

2.2.4.3. *Public commitment to long-term development of a reference system*

Regular maintenance, as already discussed, is an important quality feature of any reference system. Yet sometimes, e.g. if major changes to the overall structure need to be implemented, or if maintenance had been neglected for too long, a major revision is necessary, in severe cases even an abandonment of the old reference system. In any case, such serious interruption in taxonomy development gives rise to considerable difficulties and, as a consequence, investment needs on the side of its users.

It is expected that a significant number of people will work with the final reference point or system chosen for VET comparison. A technical and organisational infrastructure will be created to support, document and publish the results of this comparison. Related projects such as Cedefop's RTLMI project or Skills Panorama will use the reference point to process, structure and display information on supply and demand. The public investment needed to make these developments possible will be substantial. If the reference point had to be replaced one day, e.g. due to a renunciation of its further development or a loss of quality due to decreasing commitment, the strain on public funding would increase even further.

Thus, public commitment to long-term development is necessary in all usage contexts.

2.2.5. Scalability

Scalability in the context of this project is about developing methods and tools (including the reference point selected) to be used beyond this particular project, preferably to support systematic mutual learning within the framework of VET cooperation in Europe. The scalability requirement refers to the overall Cedefop project and to the preparation of methodologies (including reference points) which can be used in a broader context and which can be repeated in the future

(e.g. in more countries than the ones covered in the project, beyond the lifetime of this project). This requirement entails, for example, that the resources needed for using the methodologies (including usability of the reference points) and for maintaining the reference point (keeping them updated) should not be too extensive. Furthermore, a reference point also needs to have the potential to serve as the basis for developing a more complex and overarching reference system.

Thus, scalability is a necessary requirement in all usage contexts.

2.3. Overview and conclusions

The table below gives an overview of requirements that a reference point needs to meet in different usage contexts and rates their importance with regard to the different application scenarios. The rating distinguishes between 'necessary', 'desirable' and 'not necessary'.

For all usage contexts, the following requirements are considered as necessary:
(a) Comprehensiveness of concepts and designations;
(b) Regular updates at frequent intervals;
(c) Traceability of amendments;
(d) Public commitment to long-term development of a reference system;
(e) Scalability.

Other requirements are generally considered as desirable but not absolutely necessary:
(a) Vocabulary control;
(b) Linkage to international standard taxonomies of related content (e.g. ISCO, ISCED, NACE);
(c) Linkage to national European taxonomies of related content.

With respect to all other characteristics, requirements differ between usage scenarios.

To be able to use a reference point or system in all described usage contexts, the usage context with the 'highest' requirements must be identified, since it must form the basis for the selection of the reference point or system. This means that when evaluating selected reference points, particular attention must be paid to whether they fulfil the respective requirements of this context of use. The table below indicates that all usage contexts involving Natural Language Processing (NLP) are the most demanding ones with respect to language coverage and organisation/presentation format as well as structuring of the reference point or system.

Table 3.   **Overview of requirements a reference point needs to meet in the different usage contexts**

Usage context → Requirements ↓	International comparison of VET qualifications (WA1)	Automated collection/analysis of national qualifications data (WA2)	Exploring, gathering and analysing data on the match/ mismatch between qualifications and labour market requirements (WA3)	Structure online information systems on LM/VET related topics (e.g. Cedefop Skills Panorama)	(Automated) collection/analysis of national vacancy data (e.g. Cedefop RTLMI project, Skills & Jobs surveys)
Scope					
Comprehensiveness of concepts and designations	necessary ('maximum achievable comprehensiveness')	necessary ('maximum achievable comprehensiveness')	necessary (should also include attitudes and values, work styles, work experience)	necessary	necessary (should also include attitudes and values, work styles, work experience)
Coverage of different types of LOs (occu-pational, transversal, general knowledge subjects)	necessary	necessary	necessary	necessary	necessary
Languages	available in EU's 24 official and working languages	available in EU's 24 official and working languages as well as in minority languages (if regionally used in qualification descriptions)	available in EU's 24 official and working languages	English	available in EU's 24 official and working languages as well as in minority languages (if commonly used in national labour market)
Categorisation and structure					
Organisation / presentation format	a system having thesaurus as well as taxonomy structure is desirable	a system having at least thesaurus as well as taxonomy structure is necessary; ontology is desirable	a system having thesaurus as well as taxonomy structure is desirable	a system having thesaurus as well as taxonomy structure is desirable	a system having at least thesaurus as well as taxonomy structure is necessary; ontology is desirable

Vocabulary control	desirable	desirable	desirable	desirable	desirable
Additional structural organisation	desirable ([55])	not needed	necessary	necessary ([56])	not needed
Finely tiered structure leading from general to more and more detailed concepts	desirable	necessary	necessary	desirable	necessary
Consistent and transparent construction scheme for OSP	necessary	necessary	desirable	desirable	desirable
Explicit performance levels	desirable	desirable	desirable	not necessary	desirable
Weighting	desirable	desirable	desirable	not necessary	desirable
Access and Interoperability					
Link to international standard taxonomies of related content (e.g. ISCO, ISCED, NACE)	desirable	desirable	desirable	desirable	desirable
Link to national European taxonomies of related content	desirable	desirable	desirable	desirable	desirable
Validity					
Regular updates at frequent intervals	necessary	necessary	necessary	necessary	necessary
Traceability of amendments	necessary	necessary	necessary	necessary	necessary
Public commitment to long-term development of a reference system	necessary	necessary	necessary	necessary	necessary
Scalability					

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[55] E.g. type of learning outcome, educational domain/subject field, occupational activity.

[56] E.g. type of learning outcome, educational domain/subject field, occupational activity; skill reusability level, further job and work- oriented groupings (e.g. experience requirements, organisational context of work, occupational interests).

	high	high	high	high	high

In the following chapters, the requirements identified will be applied to the selected reference points or systems (⁵⁷). Each of the reference points or systems is presented in a separate chapter with the following structure:

(a) Introduction: history, responsible organisation, main purpose;

(b) Assessment against requirements

    (i)   Scope: comprehensiveness of concepts and designations, coverage of different types of learning outcomes, languages;

    (ii)   Categorisation and structure: organisation / presentation format, vocabulary control, additional structural organisation, finely tiered structure leading from general to more and more detailed concepts, consistent and transparent construction scheme for OSP, consistent and transparent construction scheme for OSP, explicit performance levels, weighting;

    (iii)   Access and interoperability: link to international standard taxonomies of related content (e.g. ISCO, ISCED, NACE) and to national European taxonomies of related content;

    (iv)   Validity: regular updates at frequent intervals, traceability of amendments, public commitment to long-term development of a reference system;

    (v)   Scalability (⁵⁸);

(c) Results of the mapping exercise: The results will be analysed to reflect on the match between the reference point and the national qualifications descriptions. Moreover, the reflection on strengths and weaknesses is based on the experience made in the mapping exercise and presents a summary of the feedback from the country experts involved and the sectoral experts consulted.

(⁵⁷) A table in the Annex provides an overview of this analysis.

(⁵⁸) The scalability requirement can actually not be assessed separately from other characteristics of a reference point and the extent to which it meets other requirements. It is understood more as a 'concluding assessment'. It is added in this section, however, to make the scalability aspect explicit. The assessment distinguishes between 'high', 'medium', 'low', 'not at all'.

Chapter 3. ESCO

3.1. Introduction

The Commission services launched the ESCO project in 2010 with an open stakeholder consultation. ESCO is structured into three pillars: occupations, skills and competences, and qualifications. In October 2013, a demo version of ESCO (ESCO v0) was published, which was based on the EURES classification but included an enhanced semantic structure, a preliminary version of cross-sectoral skills and competences and an initial small sample of qualifications. Between 2011 and 2017, a 'first full version' of ESCO (ESCO v1) was developed and finally released in July 2017. According to Commission information, the 'development of the ESCO qualifications pillar is an ongoing process. This pillar will be populated with qualifications from national databases linked to the Learning Opportunities and Qualifications in Europe portal (LOQ) that have been developed according to the qualifications metadata schema included in the EU calls for proposals of 2014, 2015 and 2016, as well as with international qualifications directly included in ESCO' ([59]).

DG Employment, Social Affairs and Inclusion manages the development of the ESCO classification, supported by stakeholders and by the European Centre for the Development of Vocational Training (Cedefop).

ESCO intends to develop a shared understanding of occupations and skills, competences and qualifications and thereby create a common reference terminology for the European labour market, thereby also bridging the communication gap between the world of learning, education and training and the world of work. The ultimate goal is to increase the transparency of occupations, qualifications, skills, competences and learning outcomes in order to facilitate information exchange between people, languages, Member States and the electronic systems in place for administrating educational as well as vocational information.

Every occupation in the ESCO occupational pillar has a job profile. The profiles contain an explanation of the occupation in the form of a description,

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([59]) EQF Advisory Group, 2017. LOQ is the Learning Opportunities and Qualifications portal of the European Commission that presents information about courses, work-based learning and qualification: https://ec.europa.eu/ploteus/en?cookie=no.

scope note and definition. They also list the KSC (included in the skills pillar), which experts consider relevant terminology for this profession at European level. In this study, the ESCO occupational profiles are used as reference points.

3.2. Assessment against requirements

3.2.1. Scope

ESCO describes occupations and knowledge, skills and competences of all sectors and levels relevant for 'build[ing] an integrated labour market across Europe' and for bridging 'the communication gap between the world of work and the world of education and training' (European Commission, 2017b, p. 5). As of May 2019, ESCO v1 (released on 28th of July 2017) provides descriptions of 2,942 occupations and 13,485 skills (knowledge, skill and competence concepts) linked to these occupations. The qualifications pillar contains 8,155 qualifications from Estonia (463), Greece (674), Hungary (3516), Latvia (1874), Lithuania (146), and Slovenia (1482) ([60]). It is envisaged that it will progressively display information on qualifications provided by the Member States as well as by awarding bodies for private, sectoral and international qualifications and certificates.

ESCO's occupational profiles in their present stage of development reveal the essential as well as the optional knowledge, skills and competences usually required when working in a specific occupation, furthermore regulatory aspects, if they exist.

The occupations and the skills/competences pillar of ESCO v1 is available in 27 languages (the 24 EU languages, Icelandic, Norwegian, and Arabic), whilst the qualifications pillar partly contains data in national languages, coming from local authorities. The ESCO Handbook's chapter on the formulation of terms in ESCO languages (p. 44-46) describes workflow and actors involved in the process but does not give any information on comprehensiveness and character of applied vocabulary control ([61]).

([60]) The qualifications displayed in ESCO come from databases of national qualifications held and managed by the EU Member States, which provide this information to ESCO on a voluntary basis.

([61]) The only information given with respect to the standardisation of designations in 27 languages is: 'The whole process required compliance with terminological rules that took into consideration the grammatical and linguistic characteristics of each language' (European Commission, 2017a, p. 44).

3.2.2. Categorisation and structure

The occupations pillar is organised hierarchically using ISCO-08 as conceptual superstructure: All ESCO occupations are either unambiguously assigned to ISCO's lowest level of specificity (unit groups), or are narrower term of such an ESCO occupation (e.g. 'pump operator' is unambiguously subordinated to 'firefighter', which itself has only one ISCO unit group super-ordinated: '5411 Fire-fighters'). Thus, ESCO occupations are organised as a mono-hierarchical taxonomy. The figure below demonstrates how ISCO is used to structure ESCO occupations.

Figure 3. **Accessing ESCO occupations via ISCO (ESCO occupations marked by red square)**
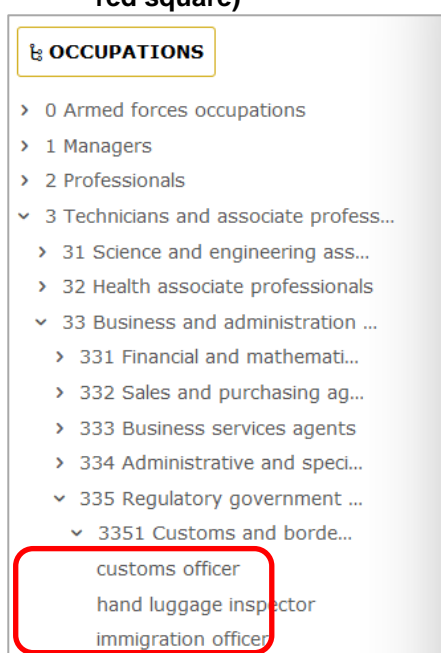
Source: ESCO [62]

Furthermore, they also display thesaurus structure: Each occupation concept has a unique preferred term assigned, and any number of non-preferred terms and hidden terms, providing alternative designations and search terms – in each of the ESCO languages.

For browsing the ESCO's skills pillar, four KSC subsets are distinguished: 'skills' [63], 'transversal skills and competences', 'digital competences', and 'languages'. The skills pillar also has thesaurus structure, in the sense that

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[62] https://ec.europa.eu/esco/portal/occupation (accessed 04/06/2019)
[63] These are referred to in this report as 'occupational KSC' and 'digital competences' and 'languages' are both also classified as 'transversal KSC'.

concepts are expressed by a unique preferred term, and supplemented by non-preferred and hidden terms – in all currently covered 27 languages. But a fully developed hierarchical structure so far has only been developed for the relatively small subset of transversal skills and competences (which are further structured into application of knowledge, attitudes and values, social interaction, and thinking), As a first step towards a hierarchical structure for the remaining skills, those having a meaning overlapping with a transversal KSC have been allocated as a narrower term to these (e.g. the transversal skill 'ensure safety of healthcare users' is indicated as the 'broader skills/competence' concept for the essential skill 'ensure safety of healthcare users' as part of the healthcare assistant profile).

According to the publicly available documentation of discussions within ESCO's Maintenance Committee ([64]) the Commission is well aware of this shortcoming and already taking measures to overcome these ([65]). The ESCO team recently explored three alternative strategies, bearing in mind that, for statistical purposes, 'a mono-hierarchy of skills would be the most suitable structure' (European Commission, 2018b, p. 6) ([66]). They concluded that ISCED-F ([67]) and NACE ([68]) should be further tested for structuring ESCO's skills pillar (see Förster and Sylla, 2018, p. 26).

For developing ESCO, NACE has been used to roughly structure the knowledge domain. In ESCO v1 this additional structure is not visible any more (at least not in the version available for the public). ISCO-08 seems to be the only additional structuring element used.

Furthermore, a distinction is being made with respect to
(a) 'skill type', differentiating between 'knowledge' and 'skill/competence' concepts;
(b) 'skill reusability level', indicating how widely a KSC concept can be applied and distinguishing between
  (i) 'transversal KSC' (broad range of occupations and sectors, such as work in teams),

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([64]) Already in 2015 representatives of the Cross-Sector Reference Group (CSREF) pointed out the need for a fine-grained structure for all KSC - see Plaimauer, 2015; ESCO [McSkeane, E.; Plaimauer, C.], 2015.
([65]) Shortly before the publication of ESCO v1 plans for exploring structuring strategies were discussed (see European Commission, 2015).
([66]) 'Mono-hierarchy' means that each concept can only have one broader concept.
([67]) See http://unesdoc.unesco.org/images/0023/002350/235049e.pdf
([68]) See https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF

(ii)   'cross-sectoral KSC' (relevant to occupations across several economic sectors),

(iii) 'sector-specific KSC' (specific to one sector, but relevant for more than one occupation within that sector) and

(iv)   'occupation specific KSC' (usually applied only within one occupation and its specialisms) ([69]).

Other than this, no additional structure is being used to subgroup ESCO's occupations or KSC. A fine-grained structure so far is only available for ESCO's occupations pillar and a relatively small sub-sections of its skills pillar, transversal KSC and their contextualisations.

The compilation of OSP ([70]) is mainly based on functional analysis of individual occupations identified via a sectoral breakdown, and validated in a public online consultation, which was designed for reviewing OSP individually. The published ESCO documentation gives no indication of a general construction scheme having been used neither for the compilation nor the quality assurance of OSP across sectors.

ESCO's occupational profiles contain no explicit indication of the performance level required in KSC. Nevertheless, the action verbs ([71]) used in ESCO's skills/competence concepts clarify up to a certain extent which level of expertise is expected for carrying out tasks in particular occupational contexts. For example, the skill concept 'set quality assurance objectives' implies a higher level of complexity than 'follow clinical guidelines', or 'apply quality standards in social services'.

ESCO rates the importance of a KSC within the overall OSP and distinguishes between 'essential' and 'optional'. The former are 'usually required when working in an occupation, independent of the work context or the employer' ([72]), the latter 'may be required or occur when working in an occupation depending on the employer, on the working context or on the country' ([73]). Neither ESCOPedia nor the ESCO handbook make transparent the method used to rate KSC in this way.

([69]) ESCOPedia – see https://ec.europa.eu/esco/portal/escopedia/Skill_reusability_level
([70]) ESCOPedia – see https://ec.europa.eu/esco/portal/escopedia/Functional_analysis; European Commission, 2017a, pp. 40
([71]) https://ec.europa.eu/esco/portal/escopedia/Action_verbs
([72]) ESCOPedia – see https://ec.europa.eu/esco/portal/escopedia/Essential
([73]) ESCOPedia – see https://ec.europa.eu/esco/portal/escopedia/Optional

3.2.3. Access and interoperability

So far, ISCO is the only international standard classification that ESCO is linked with: ISCO unit groups are used to group ESCO occupations. Currently, it is being explored whether NACE and ISCED-F could be exploited to provide structure to the skills pillar.

The EURES Regulation (EU) 2016/589 lays down that Member States will either adopt ESCO or map their national occupational and KSC classifications to it within three years. Thus, within the foreseeable future ESCO, should be linked to all national KSC and occupations taxonomies currently used by Member States.

3.2.4. Validity

A detailed plan for managing the continuous improvement has been developed already (see European Commission, 2018). Furthermore, ESCOPedia acknowledges the need for regular maintenance: 'Only if ESCO is updated continuously, it will remain fit-for-purpose for the use in various IT applications' ([74]). Yet more detailed information on the frequency of updates and their format is not yet publicly available.

According to information from the ESCO Secretariat, minor ESCO updates will not follow a pre-defined schedule, but will be implemented on an ad hoc basis, based on stakeholders' feedback (e.g. to correct a typo or amend a label) and other needs. The target date for the next major release is 2021.

The ESCO handbook declares that new releases of ESCO will guarantee full backward compatibility, because URIs will be stable and a history note will document any amendments (see European Commission, 2017a, p. 35).

The European Commission has committed itself to a long-term development of ESCO ([75]).

3.2.5. Scalability

Since so far only ESCO's occupations pillar exhibits a finely tiered structure leading in several steps from the very general (ISCO major groups) to the more

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([74]) ESCOPedia – see
https://ec.europa.eu/esco/portal/escopedia/Continuous_improvement_process

([75]) See 'Feedback of the MSWG on the English version of ESCO', p.7: 'The Commission is fully committed to the long term maintenance and update of the ESCO classification', available at https://ec.europa.eu/esco/resources/escopedia/20161007_115547/c8d89241-d268-4c8c-8e8c-b709e316c99906_Feedback_of_the_MSWG_on_the_English_version_of_ESCO.pdf

and more specific (ESCO occupations), scalability is only supported in this domain.

3.3. Results of the mapping exercise

3.3.1. Introduction

It is important to take into consideration that the original purpose of ESCO occupational profiles is not to map and compare qualifications and their intended learning outcomes (education side), but to reflect on what knowledge and skills are usually required for a particular occupation (labour market side). Moreover, links between qualifications in ESCO and the occupational pillar are only presented if they already exist at national level. Nevertheless, the ESCO occupational profiles were used here as reference points for the mapping exercise ([76]).

To this end, some changes were made to the ESCO occupational profiles. The purpose of the changes was to adapt them so that they could be used for a mapping without changing their content. The main purpose of the amendments was therefore to replace overly granular terms with their broader/superordinate ones in specific cases – on the one hand to avoid an overly strong focus on digital competences within transversal competences in ESCO, and on the other hand to keep in check the overall length of the reference points so that an individual list would consist of no more than 125 terms. Taking the ICT technician profile in ESCO as an example, the following adaptations were made: Occupational KSC terms were reduced from 76 to 36 by subsuming a number of optional KSC terms into their broader term. E.g. the terms 'C++', 'COBOL', 'Perl' and many more were integrated into their broader KSC term 'computer programming'. A small number of terms have been complemented by their respective broader KSC term for a better understanding of the term, e.g. 'R' became 'R (statistical analysis system software)'. In addition, occupational KSC

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[76] The EU-funded TALQ-project has also developed and tested a research activity to map national qualifications and certificates to ESCO-based international profiles from the artistic and cultural field also followed the approach to map national qualifications and certificates to ESCO-based profiles (https://talqproject.org). The TALQ project found that the ESCO profiles 'show a lack of sector specific detail in the description, which is due the transversal focus of the ESCO competence descriptions' (TALQ, 2017, p. 7). Furthermore, the following critical points were identified: 'The ESCO profiles do not have a defined volume that can be referred to a qualification nor to an EQF level; The division between essential and optional is rather arbitrary; The ESCO profiles foresee no "general education competences"' (TALQ. 2017, pp. 6-7).

were structured according to WSSS sections. In the list of transversal KSC, adaptations concerned the group of digital competences. Whereas with all other groups, narrower terms where used when available, digital competences were reduced to their five broader terms (although narrower terms would be available).

This section discusses how ESCO can be used in practice for mapping national qualifications, and to what extent ESCO can support comparisons between national qualifications. For this purpose, this section concentrates on how well the ESCO profiles are able to reflect the scope of national qualifications; i.e. how well they are covering the learning outcomes as presented in national qualification documents. Furthermore, section 3.3.1 discusses some ESCO-specific groupings of items and section 3.3.2 reflects on strengths and weaknesses of the ESCO reference point.

3.3.2. Match between the reference point and the national qualifications descriptions

3.3.2.1. *Comprehensiveness and relevance (scope/coverage)*

An indication of how well a reference point is able to reflect the learning outcomes of a national qualification is whether all learning outcomes of the qualification are represented in the reference point ('reference point is comprehensive'). A second aspect is whether the reference point does not exceed too much the learning outcomes of national qualifications ('reference point is relevant').

Concerning **comprehensiveness**, when looking at the experts' mapping of the healthcare assistant national qualifications to ESCO, six out of ten assessments indicated that there are learning outcomes not covered by ESCO. In some countries (Denmark, France) this concerns only a few learning outcomes, in others (Bulgaria, the Netherlands, Austria, Finland), this concerns a larger set of learning outcomes not covered. For the ICT service technician, for five countries (Bulgaria, Denmark, France, Austria, Finland) there are national learning outcomes not covered by the ESCO reference point. In the Irish, Lithuanian and Spanish assessments, the ESCO profiles seem to be sufficiently inclusive to capture the content of the national qualifications. The box below contains a country example to illustrate the problem of insufficient coverage:

Box 2.   **Assessment from Austria**

The ESCO profiles (but also all other reference points) fail to describe a 'complete profile' of the Austrian qualifications analysed. Regarding the healthcare assistant qualification, for example, many of the competences listed under 'Participation in

Source: Country feedback - Austria.

Concerning **relevance**, when looking at the experts' mapping, ESCO profiles show a median coverage (corresponding to the share of terms that are either implicitly or explicitly covered in the national qualification) of 63 per cent for the healthcare assistant and 65 per cent for the ICT service technician which is lower than for the other reference points. Coverage oscillates between 30 per cent (ICT service technician in Lithuania) and 98 per cent (healthcare assistant in Finland).

Figure 4. **ESCO healthcare assistant and IT service technician - coverage**

	Median values	
	Health-care assistant	ICT service technician
ESCO	63%	65%
WSSS	80%	79%
ONET	72%	82%
HCEU	n/a	n/a
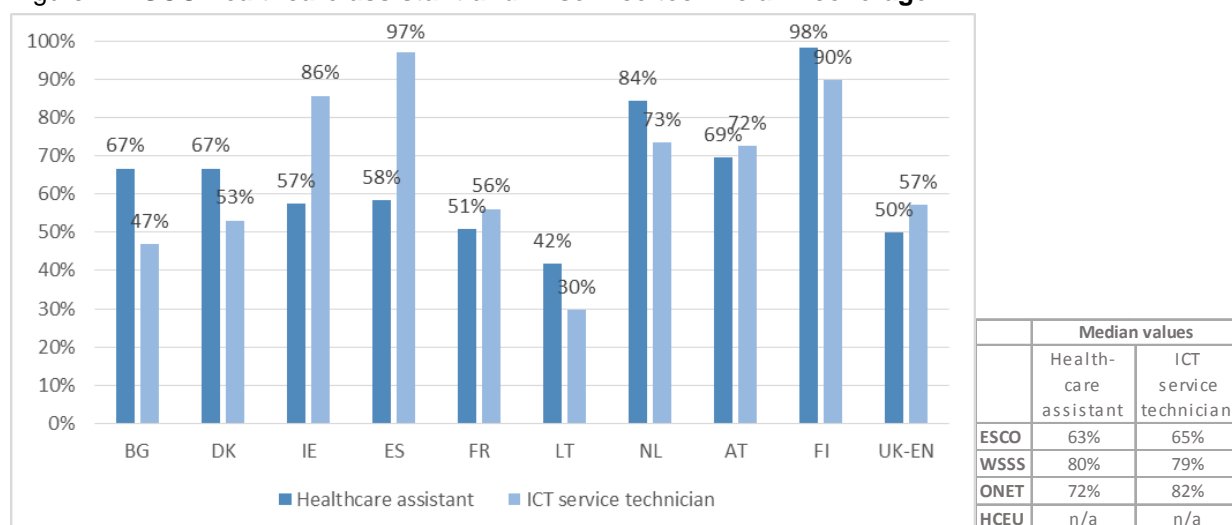
Source: Database.

While in general, it can be observed that the scope (both in terms of comprehensiveness and relevance) of the qualifications is to a certain extent covered by the ESCO profiles, there are quite many limitations related to the level of detail in which learning outcomes are described. Related to this is also the extent to which learning outcomes are assessed as explicitly or implicitly captured. The experts indicated whether an ESCO item was explicitly or implicitly included in a national qualification description. This obviously relies on

interpretation but the differences between countries are large. For the healthcare assistant, in Lithuania and Bulgaria more the 80 per cent of those learning outcomes covered are covered in an implicit manner, meaning that the items can be 'read into' the learning outcomes. In Spain and the Netherlands, on the other hand, this percentage is below 20 per cent. For the IT service technician, the percentages are a bit more concentrated (fewer high percentages of implicitly covered). The box below provides some qualitative assessments and explanations related to some countries.

Box 3.   **Assessment from Bulgaria, the Netherlands, UK-England**

On the one hand, the ESCO profile is considered as sufficiently detailed for **Bulgarian** qualifications. On the other hand, however, some learning outcomes included in the reference points are only very implicitly included in national qualifications, which means that the match is incomplete. The ESCO KSC are much more specific compared to the broader national formulations in Bulgaria. Moreover, regarding the ICT service technician profile, the national VET standard has a different focus: It is regarded predominantly as a hardware specialist, while the ESCO profile focuses more on a software specialist (e.g. less programming and more installation and set-up of programmes).

In the **Dutch** case, the ESCO profiles cover more or less the national qualifications and are able to capture the broadness of the qualification. Although it needs to be mentioned that in drafting the Qualification Files, choices have to be made on which 'competences' (out of a broad list of 25) to include as the most important ones. The developers are instructed to focus on what really matters in the occupation. This is especially true for the more transversal learning outcomes and values. Thus, the competences are generally formulated in a rather broad manner, as the examples included in the healthcare assistant profile show: collaborate and consult, follow instructions and procedures, deal with pressure and setback, show attention and understanding, guide, present, use materials and resources, meet the needs and expectations of the 'customer'.

For **UK-England**, in terms of both intended learning outcomes and overall scope of the national qualification from England, ESCO profiles with their relatively narrow range of learning outcomes compared to the other reference points are quite adequate, but only because the overall scope of these qualifications is relatively narrow. The autonomy element but not the knowledge element is fairly well captured in ESCO, which brings out the instances of transversals as well as the areas in which they are lacking quite well. Still, ESCO 'flattens out' implicit hierarchies in the ICT qualification to too great an extent.

Source: Country feedback – Bulgaria, the Netherlands, UK-England.

It is also interesting to observe that while for the Lithuanian qualifications this reference point fits less well compared to others, for the French qualifications it is assessed as the closest one:

Box 4.   **Assessment from Lithuania, France**

From the **Lithuanian** perspective, the mapping is rather complicated, especially since the source of information for mapping is an occupational standard which describes a qualification in terms of holistically formulated competencies without distinguishing knowledge, skills, key skills and abilities. This challenge was experienced in mapping the ICT technician qualification based on the occupational standards of the ICT industry sector of Lithuania. Thus, in general, for mapping the two Lithuanian qualifications (both designed based on work-processes and holistically described competencies), the ESCO profiles are less suitable, compared to O*NET and VQTS/HCEU.

The ESCO profile is – compared to the other reference points used – the closest possible match to the **French** qualifications, for both healthcare assistant and ICT support technician. However, when mapping French qualifications to the ESCO profile, the box 'implicit' has been ticked more often, indicating more detailed phrasing in the French qualification.

Source: Country feedback – Lithuania, France.

The issue of 'implicit coverage' is a challenge for comparison, since the assessment of whether an item is implicitly or explicitly covered is a question of interpretation by the experts. Another issue is that all descriptions are somehow abstractions from a context; challenging the interpretation. For example, the ESCO profile reflects very well the general nature of what a Spanish qualification implies and what the world of work requires of people who have obtained that qualification. ESCO profiles (but also the other reference points) fit quite well with the Spanish model, as national qualifications are described very similarly. In any case, however, it should be taken into account that the profiles used as reference points are generic descriptions for mapping learning outcomes of the corresponding qualifications and that the actual practice of the activities carried out in the exercise of the profession can be broader, since the characteristics of the jobs are very varied in both profiles analysed, especially in the case of the ICT profile. In the case of the healthcare assistant, it can also vary a lot depending on whether an individual works in a hospital, residential environment or in a doctor's office.

3.3.2.2. *Categorisations within the reference point*

The ESCO profiles include two kinds of categorisations of learning outcomes. Firstly, they distinguish between occupational KSC and transversal KSC. Secondly, they distinguish between essential and optional KSC.

The ESCO profiles are the only reference points (as used here) that distinguish between **essential and optional KSC**. Figures from the mapping show that the median coverage of the set of essential KSC is significantly higher

than for the set of optional KSC, both for the healthcare assistant and the ICT service technician. There are variations across countries, though. For the Irish healthcare qualification, for example, reference was more frequently made to optional elements owing to the inclusion of learning outcomes like 'geriatrics' or 'older adult's needs'. In a few countries, coverage of optional KSC is even higher than for essential KSC (e.g. healthcare assistant in Lithuania and ICT service technician in England). This might be an indication that the focus of these national qualifications deviates from what is the core of the ESCO profile.

Concerning the difference between **occupational and transversal KSC**, the country assessments show some difficulties. The list of transversal KSC is very detailed and the **distinction between occupational and transversal KSC is unclear** and sometimes considered as too complex and multi-faceted. In the Irish case, for example, the granularity in the occupational KSC of the ESCO profiles is sufficient but there are too many detailed transversal KSC.

Furthermore, it was observed that transversal skills and competences mainly relate to transferable skills. Moreover, the ICT-descriptors often clearly have a transversal dimension to them even if they are not always badged as transversal. The separation of transversal and occupationally specific learning outcomes might work better if there were fewer transversal learning outcomes within each category (e.g. within 'mathematics'). However, it is unclear how useful it is to have them separated at all, compared to the more integrated approaches followed in other reference points.

In some cases, transversal KSC are presented without context (as mentioned above); in other cases, there is an overlap – transversal KSC are included in occupational KSC and in the separate list – which leads to duplications. For example, the occupational profile for healthcare assistant includes as optional skills/competences 'communicate in foreign languages with health service providers' and 'employ foreign languages in care'. 'Language' is also an additional concept in the ESCO skills pillar. Similarly, the occupational profile includes 'ensure safety of healthcare users' as essential skill/competence, while the list of transversal skills/competences includes 'follow safety precautions in work practices'.

ESCO, with its separation of occupational and transversal KSC concepts, makes it hard to distinguish national priorities in terms of learner/worker competence in specific tasks – e.g. whether they can be carried out with or without supervision. This has been observed, for example, for the Danish context: In Danish qualification standards, most learning outcomes are task-oriented, and contain indications of the level of competence at which the learner is expected to perform, i.e. occupational and transversal learning outcomes are

to a certain extent integrated. In ESCO, the two are separated, which means that it is not possible to say anything about the level of competence required in relation to a specific occupational learning outcome (e.g. 'use e-health and mobile health technologies'). Thus, the distinction between occupational and transversal KSC functions less well in a Danish context, where the two are merged in task- or function-related descriptions.

Furthermore, while transversal learning outcomes indicating level of competence (for those related to e.g. responsibility, independence, reflection, critical thinking etc.) are generally integrated in Danish learning outcomes descriptions ('The learner can independently carry out…') rather than stated separately, transversal learning outcomes related to attitude and behaviour (e.g. 'make an effort', 'manage frustrations', 'meet commitments') are generally implicit. Learners are apprentices, who have spent two years in an enterprise as part of their formal training. If they have not been able to live up to such requirements, they would not have survived at the workplace and never finished their qualification – so the thinking goes.

In Finland, key competences for lifelong learning are defined as eleven individual competences in the VET qualifications. They are also integrated in the 'professional units' which makes it a really challenging task to map them to the ESCO profiles.

In Spain, the blocks of specific technical competences and transversal competences included in a qualification also do not appear so clearly differentiated, as described in ESCO. Moreover, in the Spanish case, the technical competences are described in more detail compared to the transversal aspects.

From the Lithuanian perspective, it is questioned whether the distinct listing of transversal and occupational skills and competences is helpful at all, since the national qualifications do not include the explicit descriptions of transversal skills and competences. This is the case for the ICT service technician qualification with holistically described competences expressed in the formulation of work processes or tasks. This makes the mapping to O*NET (and, if available, probably also to a VQTS matrix) easier. For mapping the healthcare assistant qualification, however, the VET curriculum was used, which outlines knowledge, skills and some key skills and abilities, making the mapping of this profile to the ESCO profile (and to WSSS) easier.

Some **transversal concepts** are also considered as **too granular and hence too numerous** as well as rather vague, making it difficult to understand

what is intended in the specific occupational context, for example, those related to 'attitudes' (such as 'deal with uncertainty') ([77]) or 'think creatively'. These terms are very difficult to map without any additional information on the context and purpose in/for which they are to be used. Some of them are usually not included in the national qualification descriptions: For example, French VET qualifications usually do not include learning outcomes related to language skills In France, the concept of 'attitude' is understood but it is more used in the recruitment process rather than in the qualification descriptions and 'value' is clearly not part of the French approach. 'Attitude and values' are also not included in the VET qualifications from the Netherlands. They are considered as difficult to teach and to assess.

In some countries, such as Finland, the **key competences for lifelong learning** have an important role in national qualification descriptions. However, almost all of them **are missing** from the ESCO profiles (as well as the other reference points).

This assessment is broadly confirmed by the mapping figures. The coverage of ESCO occupational KSC is on average higher than that of transversal KSC; in addition, transversal KSC tend to show a higher share of items that are implicitly covered. The figure below illustrates the shares of explicitly and implicitly covered KSC terms within the set of transversal KSC terms (above) and occupational KSC terms (below).

([77]) It can be questioned whether attitudes and values should be in at all.

Figure 5.   **Differences between occupational and transversal KSC – coverage**

UK-EN	43% / 17%
FI	70% / 28%
AT	30% / 54%
NL	83% / 7%
LT	2% / 48%
FR	50% / 13%
ES	74% / 2%
IE	35% / 33%
DK	54% / 33%
BG	17% / 59%

■ Coverage ESCO occupational (share) explicit
■ Coverage ESCO occupational (share) implicit

UK-EN	21% / 21%
FI	71% / 27%
AT	21% / 37%
NL	65% / 16%
LT	2% / 34%
FR	24% / 18%
ES	34% / 11%
IE	13% / 37%
DK	35% / 16%
BG	6% / 53%

■ Coverage ESCO transversal (share) explicit
■ Coverage ESCO transversal (share) implicit
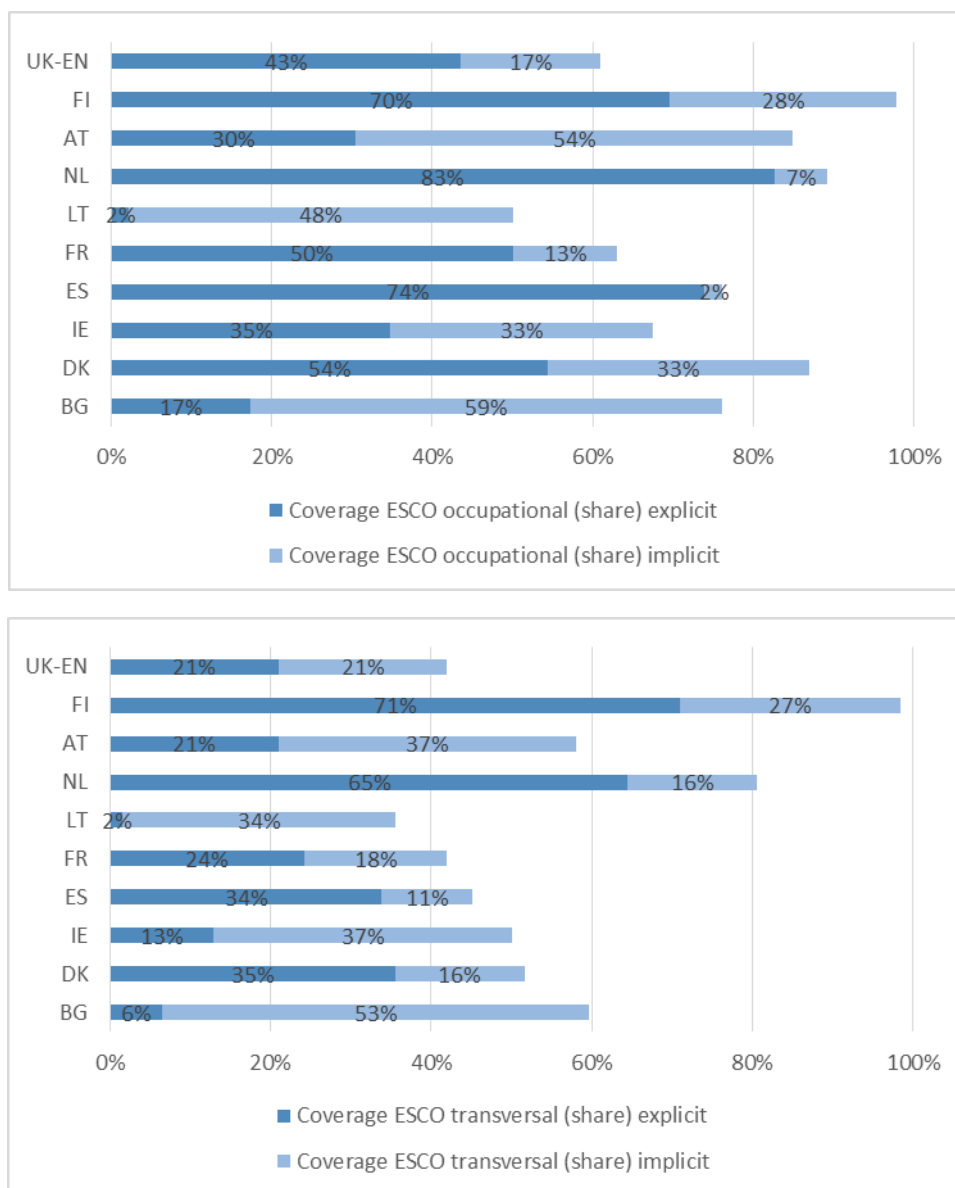
Source: *Database.*

3.3.1.   **Strengths and weaknesses**

3.3.1.1.   *Strengths*

The testing in the ten countries revealed a number of strengths of the ESCO profiles as reference points for comparing qualifications.

In the Netherlands, for instance, the single reference points for ICT service technician and healthcare assistant are considered as quite **comprehensive and complete**. Another strength is that ESCO combines both shorter and longer

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descriptions: besides the short phrases (KSC concepts), ESCO provides more **detailed descriptions** as well. The descriptions are considered as very useful since they help to better understand the KSC concepts and to look for similar ones in the national VET qualifications even though they are not explicitly mentioned there. Furthermore, the ESCO statements and descriptions focus on **one specific aspect only**, i.e. they do not mix different concepts. For the ICT service technician, this is a relative strength when compared to WSSS and O*NET. Finally, in ESCO, the **distinction between transversal or occupational skills and competences** (see also discussion above) provides additional information and (even though this approach is different to the ones used in most of the countries) is considered as useful in some cases (e.g. in the French case). The fact that ESCO is able to pick up a good range of transversal KSC and to make clear that there is a lack of these in some national qualifications (e.g. in the UK-England) was also acknowledged.

3.3.1.2. *Weaknesses*

Besides the strengths identified, the testing revealed a significant number of weaknesses of ESCO profiles to operate as reference points.

The mapping exercise reveals the **lack of conceptual quality and coherence** of ESCO concepts: The **use of the concepts of knowledge and skills/competence is not always clear** and ESCO profiles are sometimes considered as inadequate in terms of knowledge specification. Furthermore, the use of concepts differs to some extent to the approaches applied in some countries. For example, 'knowledge in context' clearly is a competence in the French approach. In fact, in the French approach, it is a necessary condition that a competence statement includes reference to the context. The ESCO approach remains unclear about this. For example, 'define firewall rules' in the ICT service technician profile belongs to 'essential skills and competences'. In the French qualification, it is referred to as 'knowledge in context': 'Knowledge of the whole bases of the security in computer science (confidentiality of the data, vulnerablity of the software, threat, hazard, coding, security TCP/IP, firewall...) (*Connaissance de l'ensemble des bases de la sécurité informatique (confidentialité des données, vulnérabilités des logiciels, menaces, risques, chiffrement, sécurité TCP/IP, pare-feu…)*'.

The **knowledge items** included in ESCO are presented as **nouns**, whereas the learning outcomes statements in many national qualifications are mainly formulated as 'can do' statements with an action verb. Thus, knowledge concepts in the ESCO profiles can only implicitly be identified. For example, the optional knowledge 'older adults' needs' seems to be underpinning knowledge for the

following competence descriptions that refer to 'age' and which are presented in the Austrian healthcare assistant qualification: S/he 'reacts to and approaches people with empathy, appreciation and congruence, especially according to their age, development, social and cultural background'; s/he 'instructs care recipients as well as caring relatives and other persons close to them in accordance with their age and developmental needs in the independent implementation of care measures in the area of life activities'.

Some KSC items are not clear and can only be understood when **reading their description**. The descriptions also sometimes provide a slightly different understanding that influences the mapping of learning outcomes. In some cases, there is no match when looking at the short phrase only, but matching terms can be identified in the descriptions. These issues are illustrated in the box below with examples from the Austrian qualifications.

Box 5.   **Examples from Austria**

Healthcare assistant

Example 1: ESCO essential skill/competence: 'interact with healthcare users': This is a very broad term/concept that would cover many of the learning outcomes statements in the Austrian qualification (at least all those listed under 'nursing process' and 'forming relationships and communication'). The description presents a narrower understanding – it focusses on communication: 'Communicate with clients and their carers, with the patient's permission, to keep them informed about the clients' and patients' progress and safeguarding confidentiality.'

Example 2: ESCO essential skill/competences 'support nurses' and 'work with nursing staff': These concepts can only be more clearly distinguished when reading the descriptions: 'Support nurses with the preparation and delivery of diagnostic and treatment interventions.' and 'Work together with nurses and other health professionals in supporting the delivery of basic patient care.' While the first one is about diagnostic and treatment, the other one is about basic care.

Example 3: ESCO essential skill/competence 'accept own accountability': The description does not only refer to accountability but also refers to the reflection of one's limits: 'Accept accountability for one`s own professional activities and recognise the limits of one`s own scope of practice and competencies.'

Example 4: ESCO essential skill/competence: 'promote inclusion' – Description: 'Promote inclusion in healthcare and social services and respect diversity of beliefs, culture, values and preferences, keeping in mind the importance of equality and diversity issues.' While 'inclusion' as such is not included in the Austrian qualification description, reference is made to respecting different cultures, values, attitudes.

ICT service technician

The difference between 'administer ICT system' and 'maintain ICT system' cannot be identified without reading the more detailed descriptions.

- Maintain ICT system: Select and apply system and network monitoring techniques. Identify and fix operational problems. Ensure that system's capabilities and efficiency match company specifications.

- Administer ICT system: Handle components of ICT system by maintaining configuration, managing users, monitoring resource use, performing backups and installing hardware or software to comply with the set requirements.

Source: Austrian feedback report.

Furthermore, some **translation issues** have been observed. For example, the ESCO essential skill/competence 'advise on healthcare users' informed consent' (with the description: 'Ensure patients/clients are fully informed about the risks and benefits of proposed treatments so they can give informed consent, engaging patients/clients in the process of their care and treatment.') is translated into German as follows: '*Patienten/*Patientinnen *nach Aufklärung zur Zustimmung raten*'. In this case, the translation in German actually refers to a meaning other than that expressed by the concept/phrase in English. In German, this means something like 'advise patients to give their consent after having received information'.

There is also a scattering of **normative terms** like 'develop a collaborative therapeutic relationship' which makes matching with some actual qualifications difficult, such as in the Irish case.

In general, there is **quite some variation between the learning outcomes in terms of scope and detail**. This creates an impression of randomness, a strange and non-intuitive mixture of the general and the specific and a feeling that, as a result, there might be gaps.

While some experts found the descriptions of learning outcomes as generally balanced (being neither too broad or too narrow), others identified some of the **KSC concepts** as **too broad**, for example in France: In cases where different forms of knowledge are included under the same heading, it is difficult to say whether it is covered in the French qualification, because some are and others are not. Thus, in these cases the KSC concept from the ESCO profile is only partially covered and it was indicated as 'implicitly included' ([78]). The Austrian healthcare assistant qualification is also sometimes more detailed. Thus, in some cases, more than one ESCO concept is covered implicitly in one learning outcomes statement listed in the Austrian qualification description. For example, the ESCO essential skill/competence concepts 'monitor basic patients signs' and 'identify abnormalities' are both (implicitly) covered in each of the following statements:

(a) 'continuously collects information on the general condition and state of health as well as on the family situation and life situation, interprets it with regard to the immediate need for action and contributes to planning';

(b) 'assists members of the senior service for health and nursing care in nursing planning by providing information and assessments about the person to be cared for and their social environment';

(c) 'recognises potential threats to the state of health and acts in a manner appropriate to the target group (e.g. violence in the family, towards women and children, dangerous environment)'.

Concerning the Austrian ICT service technician qualification, a distinction can be made in this regard between the occupational KSC and the transversal ones: For occupational KSC, the Austrian qualification is much more detailed in its learning outcomes statements, with statements often including several sub-phrases and listings of terms in brackets, also explaining work processes in a much more detailed way. For example, 'knowledge of the procedures and process steps for planning and commissioning directory services and releases

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([78]) It might have been useful to add the categories 'partially' and 'totally' in the Excel sheet.

(e.g. cooperation and access control, user/applicant requirements, data security)' has been mapped to 'distributed directory information services'. This is different for transversal KSC. As for transversal KSC that relate to personal or social competence, the Austrian qualification describes them in an extremely generic way, and within a very small number of learning outcomes statements. E.g.

(a) 'Working principles, e.g. care, reliability, sense of responsibility, punctuality, etc.' covers at least five different ESCO statements;

(b) 'Social competence, e.g. working in teams, leading employees, etc.' covers at least six different ESCO statements.

ESCO attitudes and values, which comprise 18 items in total, are covered in a very small number (approx. five) of rather generic descriptions in the Austrian qualification. E.g. 'Working principles, e.g. diligence, reliability, sense of responsibility, punctuality etc. (Working principles, e.g. care, reliability, sense of responsibility, punctuality, etc.)' somehow covers the following ESCO terms: 'attend to detail', 'meet commitments', 'work efficiently', 'demonstrate consideration', 'demonstrate good manners'.

Also, in the Bulgarian national VET standard, transversal skills are formulated in a more general way. For example, 'communicate effectively within a team' may apply to both 'communication with nursing staff' as well as to 'interact with others', which are included in the ESCO profile.

In some cases, however, the **KSC concepts are considered as very specific** since they refer to rather specific tasks fleshed out in smaller components or target groups. For example, the ESCO profile for healthcare assistant specifies 'geriatrics' as a specific outcome for healthcare assistants, whereas the Danish qualification speaks of 'patients' or 'citizens' in general without breaking this down in particular groups, taking for granted that elderly people are an important target group for the work of healthcare assistants. Compared to the Dutch qualification, the KSC concepts in the ICT service technician profile are too detailed. For example, references to specific software programmes are not included in Dutch descriptions.

Moreover, the detailed profiles with the long item lists run the risk of becoming outdated quite quickly. This applies in particular to the profile of the ICT service technician since in current ICT work, there is, for example, more emphasis on cloud work, less on physical infrastructure.

Due to the simple and short way of presenting KSC and due to the long list of singular tasks/competences/skills, ESCO also fails to capture the **work processes** in which required skills and competences are to be used (which the

several national qualification descriptions do, making the mapping more difficult) ([79]). For example, the following statement, included in the Austrian IT service technician, is a very work process-oriented description of learning outcomes: 'Recording the needs (including security requirements) of customers and users and transferring them to a network topology, designing the appropriate network infrastructure and installing and configuring the network components'. When taking all ESCO terms that are somehow related to IT networks, one still does not get a clear picture of what the profile actually entails, what is its scope. Thus, the ESCO profile does not appear to have been effectively moderated within occupational fields. Also, Finnish experts interviewed confirmed that ESCO captures quite poorly the principles by which vocational qualification requirements (VQR) are designed in Finland (such as the relation to the work processes). However, in terms of the healthcare assistant qualification, the ESCO profile seems to cover the Finnish requirements most comprehensively in terms of content.

Moreover, ESCO concepts, especially from the knowledge category, often **lack any indication of context** which can make them difficult to map (for example, 'ICT networking hardware'; 'R'; 'computer programming'). Also, transversal learning outcomes are presented in a very general way without context information (i.e. information on what they mean in the specific context is usually not included).

ESCO does **not clearly express a level of proficiency**. It is quite noticeable, however, that the verbs used in the ICT descriptors (also in the other reference points) are at a higher cognitive level, for example: analyse, communicate, monitoring, problem solving etc.

Moreover, as discussed above, some weaknesses related to the **distinction of occupational and transversal KSC** and to the conception of KSC (long list of KSC, some very detailed concepts) were identified.

([79]) One possibility to improve ESCO would be to expand ESCO skills with occupation-specific 'detailed work activities' as included in O*NET.

Chapter 4. O*NET

4.1.   Introduction

In 1998, the U.S. Department of Labor launched the Occupational Information Network (O*NET) as the nation's primary source of vocational intelligence, replacing its predecessor the Dictionary of Occupational Titles (DOT). O*NET consists of a conceptual framework for organizing occupational information – the O*NET Content Model) ([80]) – and a freely available database of occupational profiles ([81]) linking the model's variables to items of the Standard Occupational Classification (O*NET-SOC).

O*NET is being developed under the sponsorship of the US Department of Labor/Employment and Training Administration (USDOL/ETA) through a grant to the North Carolina Department of Commerce which operates the National Center for O*NET Development ([82]).

'The main motivation for the development of the O*NET model has been to address three needs: the ability to describe occupations in many ways, a common language of work descriptors that can be applied across all occupations, and a taxonomic classification system' (Peterson et al., 2001, in Fahrenbach et al., 2019). O*NET's main purpose (National Research Council, 2010, p. 6) is to support

(a) individuals in making education and training decisions and investments ([83]);

(b) businesses and communities in developing a globally competitive workforce ([84]);

(c) state workforce development offices in matching labour market supply and demand;

(d) employers in recruiting, hiring, and developing skilled workers.

([80]) The O*NET Content Model is available at https://www.onetcenter.org/content.html
([81]) O*NET Online is available at https://www.onetonline.org/
([82]) https://www.onetcenter.org/about.html
([83]) O*NET's Ability Profiler, Interest Profiler, and Work Importance Locator are available under https://www.onetcenter.org/tools.html
([84]) The O*NET Toolkit for Business is available under https://www.onetcenter.org/toolkit.html

4.2. Assessment against requirements

4.2.1. Scope

In mid-2019 the last update of O*NET (O*NET 23.3) was released in May 2019. ([85]). It contains occupational profiles of all sectors and levels, as relevant for the US labour market – currently 968 ([86]). These are characterised by a rated assignment of the approximately 277 O*NET Content Model variables and supplemented by additional descriptors for e.g. 19,636 'tasks', 37 'general', 332 'individual' and 2,070 'detailed work activities' and 26,940 'tools & technologies' concepts.

O*NET covers different types of learning outcomes: Occupation-specific learning outcomes (such as descriptors referring to occupation-specific tasks or to work-related attributes), transversal learning outcomes (such as problem solving or social skills), and to some extent general knowledge subjects (such as specific academic subjects and functional knowledge, e.g., biology, foreign language, mechanical knowledge) ([87]). Moreover, descriptors for worker characteristics are included (cognitive, psychomotor, physical, sensory abilities; interests; values; work styles).

The O*NET content model is available in American English only; Spanish translations of at least some categories of the content model (e.g. knowledge, skills, abilities, tools & technology) have been made available to feed into an application called '*Mi próxomo Paso*' targeted at Spanish speaking jobseekers.

4.2.2. Categorisation and structure

O*NET currently still makes use of the Standard Occupational Classification (SOC) in its 2010 version, planning a stepwise transit to its 2018 update. SOC 2018 is just like its predecessor version structured hierarchically (hence a 'taxonomy'), in addition also offering almost 60,000 alternate – or 'lay' – occupational titles for the O*NET-SOC classification system ([88]).

Variables of the content model are organised as a taxonomy, leading from the general to the more and more specific. Descriptions clarify the content of every concept. An example is presented in the table below.

([85]) It is available for download at https://www.onetcenter.org/database.html#overview.
([86]) https://www.onetcenter.org/database.html#overview
([87]) In the O*NET context, transversal learning outcomes are referred to as 'cross-occupational descriptors'.
([88]) https://www.onetcenter.org/dictionary/23.0/excel/alternate_titles.html

Table 4. **Descriptions clarifying concepts**

Element ID	Element Name	Description
1.A	Abilities	Enduring attributes of the individual that influence performance
1.A.1	Cognitive Abilities	Abilities that influence the acquisition and application of knowledge in problem solving
1.A.1.a	Verbal Abilities	Abilities that influence the acquisition and application of verbal information in problem solving
1.A.1.a.1	Oral Comprehension	The ability to listen to and understand information and ideas presented through spoken words and sentences.

Source: O*NET.

The procedures used for compiling and naming variables are standardised and tailored towards individual domains, e.g. occupations having other compilation and naming conventions than variables of the 'Tools and Technologies' or the 'Tasks' domain. All guidelines are made accessible to the public ([89]).

Variables of the content model characterising various occupational requirements are grouped under worker- as well as job-oriented characteristics. A amongst these, also a distinction of learning domains into abilities, knowledge, skills is provided.

Furthermore, all concepts contained in the 'Tools and Technologies' taxonomy are classified with categories of the United Nations Standard Products and Services Code (UNSPSC). 'Work activities' are used to group 'Detailed work activities', and 'Detailed work activities' are used to group 'Tasks'.

Only occupations and the less than 300 variables of the content model are structured in a multi-level hierarchy, whereas the other domains only display a 2-level hierarchy: they are structured via their linkage to variables of other domains:
(a) Work activities are used to group detailed work activities;
(b) United Nations Standard Products and Services Codes (UNSPSC) are used to classify Tools and Technologies;
(c) Detailed work activities are used to summarise subgroupings of Tasks.

The O*NET content model is systematically used as construction scheme 'to be applied across jobs, sectors, or industries (cross-occupational descriptors) and within occupations (occupational-specific descriptors)' enabling users 'to focus on areas of information that specify the key attributes and characteristics of

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([89]) Documents are available for download at the O*NET Resource Center under https://www.onetcenter.org/research.html

workers and occupations' (⁹⁰). Standardised procedures have been put in place for compiling and updating occupational profiles (⁹¹).

The content areas 'abilities', 'knowledge', 'skills', and 'work activities' are associated with variable and item specific 'scale anchors' ranging from 1 to 7 to express performance levels. Appended descriptions provide easy to understand translations of their numerical value into real-life examples, e.g. 'spatial orientation' at level 2 means 'Use the floor plan to locate a store in a mall' whereas 'spatial orientation' at level 6 means 'Navigate an ocean voyage using only the positions of the sun and stars. Knowledge of 'physics' at level 1 enables you to 'Use a crowbar to pry open a box', whereas level 6 means you can 'Design a cleaner burning gasoline engine' (⁹²).

Furthermore, individual requirements in O*NET occupational profiles are associated with ratings such as 'importance' (e.g. of certain tasks, knowledge, skills, abilities, work activities), 'frequency' (e.g. of tasks), 'extent' (e.g. of work values).

Each scale has a minimum and maximum value (e.g., 'importance': 1 - 5; 'level': 0 - 7). The anchors of the 'Level' scale are unique for each variable. Since each of these scales covers a different numerical range, a 'descriptor mean' (rating) of 3.0 signifies something different in each scale. For example, the O*NET profile 'Nursing Assistants' includes the knowledge descriptor 'Customer and Personal Service — Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction'. The importance was rated at 3.98 (on a scale of 1-5) and the level at 4.77 (on a scale of 0-7).

O*NET's original occupational database (O*NET 98) contained analyst ratings of importance, level, and frequency (where appropriate) of allocated variables taken from the Content Model. After migrating to the new occupational taxonomy, these profiles have been revised on an annual basis ever since.

The figure below gives an overview of scales used within the different domains (⁹³).

(⁹⁰) https://www.onetcenter.org/content.html
(⁹¹) More information on procedures, guidelines and reports are available at https://www.onetcenter.org/dataCollection.html
(⁹²) Examples taken from https://www.onetcenter.org/dl_files/database/db_22_0_excel/Level%20Scale%20Anchors.xlsx
(⁹³) https://www.onetonline.org/help/online/scales

Figure 6. **Definition of scales per domain**

Scale	Domains	Definition
Importance	Tasks [2], Knowledge, Skills, Abilities, Work Activities, and Work Styles	This rating indicates the degree of importance a particular descriptor is to the occupation. The possible ratings range from "Not Important" (1) to "Extremely Important" (5).
Level [3]	Knowledge, Skills, Abilities, and Work Activities	This rating indicates the degree, or point along a continuum, to which a particular descriptor is required or needed to perform the occupation.
Relevance	Tasks	The percentages reported for relevance refers to the proportion of job incumbents who rated the provided task relevant to his/her job.
Frequency	Tasks	Frequency refers to how often a task occurs within a given time period. Values of "frequently", "occasionally", and "rarely" are used to report the percentage of time job incumbents reported that a given task was performed. • **Frequently** - includes daily, several times a day, hourly or more • **Occasionally** - includes more than once a month, more than once a week • **Rarely** - includes once a year or less, more than once a year
Occupational Interest	Interests	O*NET occupations are rated on 6 types of interests: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional and are compatible with Holland's R-I-A-S-E-C Interest Structure (Holland, 1985).
Extent	Work Values	This rating indicates the degree to which an item affects the nature of an occupation.
Context	Work Context	Context includes a variety of scales with some unique and specific work context variables.

[1] **Not Available** - Standards of data precision were applied to all updated incumbent and analyst ratings. The rating of an item for a particular occupation is suppressed or "not available" if its level of precision does not meet the minimum standard. For a detailed description of the suppression rules, see Appendices 1 and 2 of the O*NET Data Dictionary, available on the Database page of the O*NET Resource Center.

[2] Two categories of tasks are identified. **Core** - tasks that are critical to the occupation. The criteria for these tasks are (a) relevance ≥ 67% and (b) a mean importance rating of ≥ 3.0. **Supplemental** - tasks that are less relevant and/or important to the occupation. Two sets of tasks are included in this category: (a) tasks rated ≥ 67% on relevance but < 3.0 on importance, and (b) tasks rated < 67% on relevance, regardless of mean importance.

[3] **Not Relevant** - The level rating for an item is identified as "not relevant" for a particular occupation when a majority (75% or more) of the incumbents or occupational analysts rate the corresponding importance item as "not important."

Source: O*NET.

An elaborate methodological framework with transparent working rules and working methods for conducting the survey was developed in the course of a prototype data collection, and has been adapted ever since. The rating process neither relies on editorial choice nor on empirical data alone, but is the outcome of an editorial process combining those two methods, supplemented by web research. For example, information on the importance and level of skills and abilities associated with occupations is provided by occupational analysts (Tsacoumis and Willison, 2010). To ensure sufficient interrater reliability, at least eight trained professional analysts per occupation were responsible for assessing the importance and level of skills for each of the O*NET occupations.

4.2.3. Access and interoperability

O*NET is not linked to any international standard taxonomy of related content. Yet crosswalks are provided between O*NET-SOC the O*NET version of the Standard Occupational Classification, and other US reference systems:

(a) the Classification of Instructional Programs (CIP);

(b) the Dictionary of Occupational Titles (DOT);

(c) the Military Occupational Classification (MOC);

(d) the Occupational Outlook Handbook (OOH);

(e) the Registered Apprenticeship Partners Information Data System (RAPIDS);

(f)   the Standard Occupational Classification (SOC).

O*NET is not linked to any European taxonomy. Yet some EU Member States have adopted O*NET for national use, e.g. Italy ([94]).

4.2.4.   Validity

The National Center for O*NET Development and its partners have established a continuing data collection programme ([95]) to populate and maintain information on five of the six domains of the O*NET Content Model. The 'workforce characteristics' domain is updated via linkage to the employment, wage, and long-term employment projections databases produced by the U.S. Bureau of Labor Statistics and state and local employment agencies ([96]).

Occupational profiles selected for data collection ([97]) are sampled from the industries in which they are most prevalent. The survey selects incumbent workers through their place of work, based on a national sample, across all relevant industries. Job incumbents and occupation experts who respond to survey questionnaires are the source for updating the categories 'Education', 'Job Titles', 'Knowledge', 'Tasks', 'Work Activities', 'Work Context', 'Work Experience' and 'Work Styles'. Occupation analysts rate 'Abilities' and 'Skills'. Web-based research by occupational analysts is used to develop 'Detailed Work Activities', 'Tasks', 'Tools and Technologies'. Quarterly updates of occupational profiles are being published, with a primary update in the 3rd quarter of each year. The variables in use as well (especially O*NET-SOC, 'Tools and Technology', 'Tasks', and 'Detailed Work Activities'), whereas the O*NET Content Model has been only slightly revised since put in place in 1998.

The O*NET Resource Center ([98]) provides not only public and free access to current as well as historic versions of the O*NET database in various formats, but also makes transparent which methodology is being used (e.g. working guidelines, job analysis questionnaires) and to what effect (e.g. technical reports of revisions).

Amendments are traceable since all previous versions of the database are still available for download in the O*NET Resource Center ([99]). An update

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([94]) The   Italian   labour   market   information   system   can   be   viewed   at
        http://fabbisogni.isfol.it/
([95]) Details on data collection can be found at https://onet.rti.org/index.cfm
([96]) National Research Council, 2010, p. 9.
([97]) Updates of O*NET focus on in-demand occupations and innovative job-practices.
([98]) See at https://www.onetcenter.org/
([99]) See at https://www.onetcenter.org/db_releases.html

summary ([100]) highlights type and quantity of amendments. All changes to the database are recorded in a transparent manner.

There is public commitment to long-term development of O*NET which being developed under the sponsorship of the US Department of Labor/Employment and Training Administration (USDOL/ETA). Since the release of the first version of the database ('O*NET 98') in August 2000, the system has received at least one update per year. It is regarded as 'the nation's primary source of occupational information' ([101]).

4.2.5. Scalability

Occupations as well as variables of the content model are hierarchically structured and hence scalable, when used as referent points for e.g. surveys of for structuring online information. The updates published over the last almost two decades showed that O*NET was expanded with respect to categories like occupations, tasks, tools and technologies, but not with respect to the content model, which seems to be solid as a rock in the ever-changing world of work, probably due to its high degree of abstraction.

4.3. Results of the mapping exercise

4.3.1. Introduction

In this case it should also be noted that the O*NET profiles were not developed to map qualifications and their learning outcomes. It is important to take into consideration that the aim of O*NET is to provide descriptions of the world of work, while the discussion here focuses on their use as a reference point for mapping and comparing qualifications.

To reduce the number of elements contained in the reference point and the complexity of this exercise, only the following categories were used for mapping in this study: detailed work activities, knowledge and skills. The discussion of the mapping results and the strengths and weaknesses of this reference point must be understood against this background.

([100]) See at https://www.onetcenter.org/dl_files/Database_Update_Summary.pdf
([101]) See at https://www.onetcenter.org/about.html

4.3.2. Match between the reference point and the national qualifications descriptions

Following a similar structure as the previous chapter on ESCO, this section discusses how O*NET can be used for mapping national qualifications, and to what extent it can support comparisons between national qualifications.

4.3.2.1. *Comprehensiveness and relevance (scope/coverage)*

In terms of comprehensiveness, in the experts' mapping of the healthcare assistant and ICT service technician qualifications to O*NET profiles ([102]), five out of ten assessments indicated that the qualifications are not well covered by the reference point (Bulgaria, Denmark, the Netherlands, Austria, Finland).

Box 6. **Assessment from Bulgaria, Denmark, the Netherlands, Austria and Finland**

For the **Bulgarian** qualifications, O*NET profiles are assessed as not specific enough to capture the intended learning outcomes.

Of the four reference points, O*NET with its fairly basic descriptions does not quite cover the complexities of the **Danish** qualifications – especially not for the healthcare assistant.

The three-fold qualification purpose of the **Dutch** VET system (preparing for occupation, social integration, and further learning) cannot easily be grasped through the O*NET profiles. Thus, they do not capture the full range of learning outcomes included in the Dutch VET qualifications. Moreover, the O*NET healthcare assistant profile does not match the Dutch qualification at all since it refers too much to care provision in institutions.

The O*NET profile (as the other reference points) fails to describe a 'complete profile' of the **Austrian** qualifications analysed. Regarding the healthcare assistant qualification, for example, learning outcomes related to 'Participation in medical-diagnostic and therapeutic tasks (including emergencies)' are nearly not at all covered by the O*NET items.

The O*NET profile also fails to capture the full set of requirements (skills and competences) of a **Finnish** IT technician qualification and a practical nurse and the key competences for lifelong learning are very scarcely included. It seems to work better with the ICT qualification but in the case of practical nurse it was seen to be much too simple and failing to capture the comprehensiveness of the Finnish qualification and the profession of a Finnish practical nurse.

Source: Feedback reports - Bulgaria, Denmark, the Netherlands, Austria and Finland.

([102]) For the mapping exercise, the following descriptors from the O*NET occupational profile 'nursing assistant' were used: detailed work activities, knowledge, skills. This selection was made in order to reduce the amount of the descriptors to be mapped.

Taking a look at the experts' mapping in terms of relevance, O*NET profiles show a median coverage (again corresponding to the share of terms that are either implicitly or explicitly covered in the national qualification description) of 72 per cent for the healthcare assistant and 82 per cent for the ICT service technician. As with the ESCO profiles, the spread is rather large, with coverage oscillating between 45 per cent (ICT service technician in Bulgaria) and 100 per cent (ICT service technician in Spain, both qualifications in Finland).

Figure 7. **O*NET healthcare assistant and IT service technician – coverage**

	Median values	
	Health-care assistant	ICT service technician
ESCO	63%	65%
WSSS	80%	79%
ONET	72%	82%
HCEU	n/a	n/a
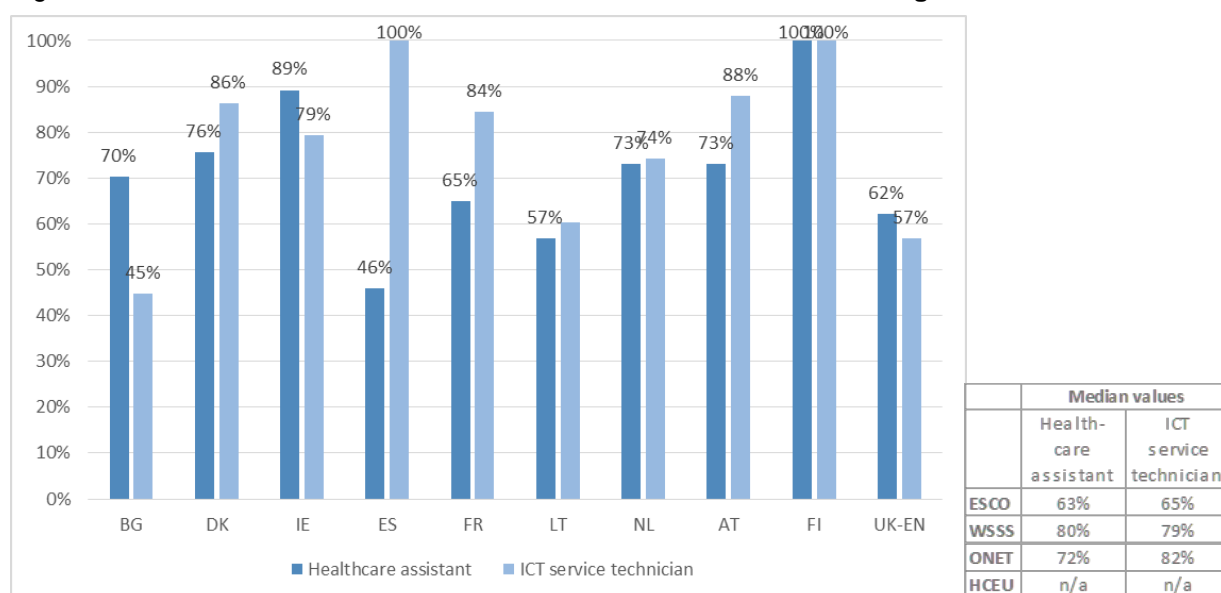
Source: Database.

O*NET profiles manage to sufficiently capture the scope (in terms of comprehensiveness and of relevance) of qualifications, although there seem to be differences between the healthcare assistant and ICT technician profiles. Mapping the national qualification descriptions against the ICT service technician profiles yields a median coverage of 82 per cent of learning outcomes covered, paired with a comparatively low share of 35 per cent of learning outcomes covered only implicitly. The overall median coverage is thus highest among all reference points, and the share of learning outcomes that are implicitly covered the lowest of all reference points for ICT service technician. The mapping results from Spain, Bulgaria and France show the largest differences between healthcare assistants and ICT service technicians, with a higher coverage observed for the ICT service technician in Spain and France.

The list of additional learning outcomes not included in the reference point is meanwhile comparable to that with other reference points. The parameters for the healthcare assistant appear slightly less favourable (i.e. with a smaller

median coverage of 72 per cent, and a higher share of learning outcomes that are implicitly covered, 41 per cent). It is worth noting, however, that the share of learning outcomes implicitly covered for the healthcare assistant ranges between 0 per cent for the French qualification and 100 per cent for the Lithuanian, thus displaying a very large spread. The qualitative assessment however also shows a number of limitations that might not be immediately visible when analysing the parameters from the mapping, as the following example shows:

Box 7.   **Example from France, Ireland, UK-England**

All expected learning outcomes included in **French** qualifications are present in the O*NET profiles. While there is generally a good match, the 'knowledge' category is a bit too underrepresented in O*NET, so that for the healthcare assistant or the ICT support technician it is not possible to show the full breadth of the expected knowledge. It should be noted, however, that in the case of the French healthcare assistant only one knowledge element contained in the O*NET profile is also contained in the French standard, while for ICT support technician qualification there are several matches (almost all except one). It is not so much that some knowledge elements are missing in the O*NET profiles but they are included elsewhere (i.e. embedded in skills and detailed work activities). In some cases, however, the language used for describing knowledge is less precise in the qualification description compared to the items in the O*NET profile. For example, 'English Language — Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar' is included in the O*NET profile, while the French standard refers to 'read documents in English'.

From the **Irish** perspective, the level of granularity for the detailed work activities was assessed as seemingly ideal as it leads to clear and concise statements, with few if any normative statements/words. The knowledge and skills categories have quite holistic KSC which make it relatively easy to tick boxes, but seems like a first step in comparing qualifications – they give a broad-brush picture.

Similar to the other reference points, the O*NET profiles are sufficiently detailed to capture the intended learning outcomes (including the assessment criteria) of qualifications from **UK-England** because the overall scope of these qualifications is relatively narrow. Compared to other reference points, O*NET profiles (as well as ESCO profiles) can also capture the detailed work activities embodied in the assessment criteria in a better way (but also with limitations). O*NET also manages to capture the limited knowledge requirements associated with these qualifications.

Source: Feedback reports - France, Ireland, UK-England.

4.3.2.2. *Categorisations within the reference point*

The O*NET reference point uses one level of categorisation, i.e. learning outcomes belong to one of three groups: 'detailed work activities', 'skills', and 'knowledge'. While for the learning outcomes in 'detailed work activities' and 'skills' of the reference point for healthcare assistant, coverage is of comparable size (77 and 81 per cent, respectively), it is considerably smaller for the group of

learning outcomes labelled as 'knowledge', with a median coverage of 50 per cent. For qualifications in Spain, France, Lithuania, and UK-England in particular, this group of learning outcomes seems a poorer-fitting component of the reference point for healthcare assistant (with a coverage below 30 per cent in these four countries).

For the ICT service technician, this effect cannot be observed; in fact, median coverage of learning outcomes seems quite evenly distributed between 78 per cent and 79 per cent per group of learning outcomes.

4.3.3. Strengths and weaknesses

4.3.3.1. *Strengths*

O*NET is a **well-developed and differentiated system**. The reference point was assessed as user-friendly, simple and logical and not too detailed, making mappings easy compared to the other reference points. It is **rather short and it is relatively easy to gain an overview** (however, as indicated further below this also means that the statements are often rather broad, which can also be considered as a weakness). It uses a relatively simple categorisation and a clear and understandable structure. For example, for the English qualifications it is noted that the distinct knowledge specification is useful and is successful in picking out the relatively minimal knowledge requirements for both the ICT and the healthcare assistant qualifications.

The **absence of an overarching structure did not seem to be a problem**, which is interesting, as with the other reference points it seemed to help. Perhaps this suggests that with clear and concise KSC, such structures might be less important?

The KSC items are presented in short, clear and concise statements (such as 'feed patients') referring to **detailed work activities**. The breakdown of tasks is considered as intuitive, logical and clear, without many normative phrases/words. This is especially true in the case of the ICT service technician profile. Here, the use of little subheadings like 'Operation and Control' and 'Quality Control Analysis' is helpful.

For the Austrian ICT service technician qualification, this reference point was easiest for the mapping process – especially the 'detailed work activities', less so the 'knowledge' and 'skills' sections. This is maybe because the Austrian descriptions are also very much orientated to work tasks, though much more extensively formulated. This however does not mean that it is the most suited reference point (it is not).

Weaknesses

Some O*NET statements are **very broad and formulated in a more general** (less detailed) **way** which creates challenges in comparing them with learning outcomes included in national qualifications. In some cases, this leaves quite some room for interpretation and also leads to the fact that several learning outcomes statements of national qualifications (such as in the Austrian healthcare assistant) can be linked to one O*NET statement. The Austrian ICT service technician qualification, for example, provides more detailed statements related to occupational KSC – it includes longer descriptions and listings in brackets (as with ESCO and WSSS, though, it is the reference point that is much more detailed than the Austrian qualification when it comes to transversal KSC, in particular personal and social competence).

Since the O*NET profiles are very broad and basic, this reference point is considered as not really suited for capturing the level of competence required of e.g. a healthcare assistant in Denmark.

In the Finnish context, the O*NET profile seems to be more suitable for the field of ICT but for the healthcare assistant it is seen as too simplistic from the structure and presentation. It is regarded as very 'thin' and one-dimensional, lacking the comprehensiveness of the occupation and the learning requirements. The content does not comprehensively meet the requirements (skills and competences) of a Finnish ICT service technician and a practical nurse, and the key competences for lifelong learning are hardly taken into account.

The statements included in the O*NET profile are also somewhat narrower as those for the French qualifications. For example, the detailed work activity 'troubleshooting problems with computer applications or systems' can be contrasted with a full page of descriptions of repair in the French standard. In other words, O*NET contains very precise statements that do not cover the breadth of the French qualification.

The statements in the O*NET profiles used do **not express the level of proficiency** of learning outcomes. O*NET's cognitive hierarchy is quite limited and would be difficult to use in any 'levelling' exercise.

There are **no clear distinctions between occupational and cross-sectoral/transversal learning outcomes**. For example, in the description of 'detailed work activities', only occupational aspects can be identified. However, in the description of 'skills', both occupational and transversal elements can be found. Moreover, the 'detailed work activities' often presuppose knowledge and skills that are not explicitly mentioned. In particular for the healthcare assistant (e.g. in Denmark), it is less suited for capturing transversal skills, like the ability to carry out a task or a function independently and without supervision. The Dutch

healthcare assistant qualification also does not match this reference point very well, as it focuses too much on care provision in institutions. Moreover, the O*NET profile lacks important skills sets related to social interaction and self-development, which are very important for Dutch VET qualifications.

There is a much **longer list of skills in the O*NET reference point for the ICT service technician** qualification than for the healthcare assistant qualification. The longer list in the ICT service technician profile seems to give a more detailed picture and gives the impression of providing better coverage.

Chapter 5. WSSS

5.1.   Introduction

WorldSkills Standards Specifications (WSSS) were developed as a basis for the biennial WorldSkills Competition (initially: International Vocational Training Competitions – IVTC; also: Skill Olympics). According to the WorldSkills International 60th Anniversary Book (IVTO n.d., p 36), 'Technical Descriptions' were introduced under the presidency of Manuel Valentín-Gamazo y de Cárdenas (1974 – 1985), and can be accessed on the WorldSkills International (WSI) webpage since 2001 ([103]). The WSSS themselves are relatively new and were introduced in 2013 (Shackleton and Messenger, 2017).

WSI, as the responsible organisation, covers 77 member organisations (countries and regions), from all continents (Africa, the Americas, Asia, Australia, Europe) ([104]). It is defined as 'a not for profit membership association open to agencies or bodies which have a responsibility for promoting vocational education and training in their respective countries/regions. WorldSkills International operates worldwide and is politically and denominationally neutral' ([105]).

WorldSkills International declares a threefold purpose of the WSSS:
(a) To serve 'as the reference points for the WorldSkills Competition';
(b) To 'provide a benchmark for national and regional standards';
(c) To 'support young people and adults to survive and thrive' in increasingly international economies and markets.

The use of the WSSS for international comparison is also emphasised: the competitions are 'a showcase of performance against global standards' (Messenger, 2016). The WSSS attempt to be a broad representation of one or more work roles, as required across the world by expansive, competitive organisations. Their purpose is to enable participants from 80 or more member countries to test the outcomes of their VET arrangements against a common standard for occupational demand. For some members the WSSS act as additional source material to accompany their own consultations with business

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([103]) https://www.worldskills.org/about/history/; WorldSkills International 60th Anniversary Book
([104]) https://www.worldskills.org/about/members/
([105]) https://www.worldskills.org/about/organization/

and industry, for the design of their VET systems and capacity building. This offers feedback to member countries on the outcomes of their VET arrangements with regard to their occupational value. It completes the feedback loop between education and the labour market in this respect, relative to a progressive international reference point for work. Participants are expected to have completed their initial formation and have joined the labour market within the previous two years. For most competitions, the maximum age of competitors is 22 years; for those competitions with an entry age up to and including 25 years, participants are often graduates or the equivalent of graduates. Participants from the more developed countries generally come to the competitions with significant added work experience, learning and maturity than is delivered by a qualification. [106].

5.2. Assessment against requirements

5.2.1. Scope

The WSSS are not designed to cover the full range of economic sectors or occupations or to provide for a comprehensive representation of qualifications at all levels. Their primary usage context are competitions which are focussed on high performance work practice in medium work areas; higher or lower levels are therefore excluded from this reference point from the outset. This implies that skills which are typically acquired at higher education levels are not to be expected here, even if some of them might be found in rare cases. This leads to gaps both in the coverage of skills and occupations, as well as a narrow limitation to ISCED and EQF levels. The specifications combine the specialist, technical, and generic skills 'that comprise intermediate work roles across the world'. Within the Standard Specifications, an implicit distinction between technical/occupation-specific and transversal skills can be observed (see below). There are no indications on the related educational levels. In preparing for the competitions, members may or may not draw on VET programmes at ISCED 2011 levels 3-5 equivalent for the craft and trade competitions, and 4-6 equivalent for the technician and (associate) professional competitions (such as Cyber Security). However, practice varies across the world, and as an occupational mirror this is not the WSSS's concern [107].

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[106] Interview 10-06-2019
[107] Interview 10-06-2019

There will be competitions in 56 skills at WorldSkills Kazan 2019 which are grouped into six sectors, with an emphasis on Construction and Building Technology (13) and Manufacturing and Engineering Technology (16) ([108]).

Table 5.   **WSSS in six sectors**

Domain	Listed WSSS
Construction and Building Technology	13
Creative Arts and Fashion	6
Information and Communication Technology	7
Manufacturing and Engineering Technology	16
Social and Personal Services	8
Transportation and Logistics	6

Source: https://www.worldskills.org/what/education-and-training/wsss/

The current competitions portfolio is historical, based on members' demands over 70 years, when VET was largely equated to craft and trade. There is now a managed trend towards greater diversity and balance. The WSSS are designed to reflect occupations worldwide, with a defined place occupationally but not for VET, since the level of performance depends on labour markets, supply and demand. The breadth of WSSS is designed for accessibility across a wide range of practice; to provide flexibility for the design of marking schemes and test projects; and to enable differentiation between competence and excellence ([109]).

The standards are clearly referred to as 'Skills'. Despite this, a considerable part of them coincide with occupations or work roles, e.g. 'Industrial Mechanic Millwright', 'Bricklaying' (occupation: bricklayer), 'Landscape Gardening' (occupation: landscape gardener). Other skill titles resemble work activities, like 'Heavy Vehicle Maintenance', or economic activities, like 'Patisserie and Confectionery', 'Health and Social Care', 'Bakery'. WSI uses the term 'Skills' as shorthand for 'occupational competitions': 'Within WorldSkills International (WSI), skill is used in two ways. WSI follows the OECD in using skill to refer to a particular expertise, which is normally gained by education, training and practice. Examples of this are computer programming skills; high level skills such as self-management and problem solving; and thinking skills. Through the WorldSkills Standards Specification (WSSS), each World Skills Competition (WSC)

([108]) https://worldskills2019.com/en/event/skills/ Additionally, 'Future Skills' are mentioned as a new area for the 2019 competitions: It 'is a specialized zone for showcases and competitions in skills, which are in demand in the era of high-tech production and digital economy' - https://worldskills2019.com/en/event/future-skills-2019/

([109]) Interview 10-06-2019

represents a coherent mix of skills, which together reflect best practice in industry and business across the world. Informally, these competitions may be referred to as skills' ([110]).

English is the common language in the WorldSkills competitions. Therefore, WSSS are available in English only. Most of them can be downloaded from the WSI webpage ([111]). Some members produce translations for use in preparation for the competitions (cf. specifications of skills in German, for disciplines with German participation in the international competitions) ([112]). National language versions are not centrally approved nor reviewed; the responsibility lies with the member ([113]). Although the WSSS are published separately on the public website, for use, they are embedded in Technical Descriptions, which are the competitions' control documents. Each Technical Description comprises (Section 1) an occupational description, (Section 2) the WSSS, and from Section 3 onwards instructions and guidance on assessment and all associated matters. Two further documents, the Marking Scheme and Test Project, and the Competition Information System, complete the set of documents and materials that form an entity for end testing.

5.2.2. Categorisation and structure

The WSSS do not represent a knowledge organisation system. There is no such thing as a structured organisation of the 'Skills'. The representation of the documents containing the World Skills Standards online could be comprehended as a Term List at the utmost, although this is not the primary intention ([114]). Instead, the purpose of the listing of the standards documents is simply to provide users with access to download the documents.

However, the list of the 'Skills', each presented as an isolated document, are roughly structured by six headings, referring to domains, as described in the table above. This could be understood as a first step towards organisation of the WSSS.

WSSS do not rely on standardised vocabulary. However, the setting of standards as well as the designing of the standards specifications follows a specified procedure and a set of rules. 'Guidance notes' have been developed

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([110]) https://glossary.worldskills.org/#/alpha/S
([111]) https://www.worldskills.org/what/education-and-training/wsss/
([112]) https://www.worldskillsgermany.com/berufswettbewerbe-national-international/wettbewerbsdisziplinen/
([113]) Interview 12-09-2018
([114]) Cf. https://www.worldskills.org/what/education-and-training/wsss/

from 2012/2013 (WSI, 2013b), soon after the introduction of the WSSS, and were constantly reviewed and updated since ([115]).

In an unpublished paper ([116]) which aims at specifying rules for reviews and updates of WSSS, the emphasis lies on work rules for the updating process and on content related issues. However, there are a few remarks touching on vocabulary control, in a quite general manner, such as: 'Does the level of detail … fall within the acceptable range; are the statements … in suitable language and format' ([117])? However, there is no concrete specification how an acceptable range or a suitable language might be defined.

Transversal skills are systematically listed and described before technical skills, each of them represented as 'section' ([118]). In particular the technical/occupation-specific skills refer to work activities. For example, the order of sections in Health and Social Care (Skill 41) is:

(a) 1 Work organization and management [transversal];
(b) 2 Communication and interpersonal skills [transversal];
(c) 3 Problem solving, innovation and creativity [transversal];
(d) 4 Assessing needs and planning client care [technical/occupation specific];
(e) 5 Managing and delivering client care [technical/occupation specific];
(f) 6 Evaluating client care [technical/occupation specific].

Sections are mostly, but not always further structured into (a) knowledge and understanding and (b) abilities, as the following example under the heading 'Work organization and management' shows:

(a) 'The individual needs to know and understand: Health, safety, environmental and hygiene legislation, obligations, regulations, and documentation (…);
(b) The individual shall be able to: Follow health, safety, and hygiene standards, rules, and regulations' ([119]).

The example above clearly shows that the distinction is not only expressed by a concrete reference to 'knowledge' and 'abilities', but also by using different wording schemes. For knowledge and understanding, nouns and noun phrases are used, and verbs and verb phrases for abilities.

The table below shows the structure of the WSSS:

([115]) Interview 12-09-2018
([116]) WorldSkills Standards Specification 2012
([117]) WorldSkills Standards Specification 2012, p 2
([118]) 'Section' of a Standard Specification more or less corresponds to learning domains and / or grouped skills.
([119]) Skill 41, Health and Social Care; download:
https://www.worldskills.org/what/education-and-training/wsss/

Table 6.   **Structuring of WSSS**

No.	Level	Equivalent	Example [120]
1	Sector/Domain	Economic sector or sub-sector	Social and Personal Services
2	Skill	Occupational skills profile, work role	Health and Social Care
3	Section	Learning domain, grouped skills	Assessing needs and planning client care
4	Type of KSC	*Knowledge and understanding* separately listed from *abilities*	Standard introductory phrases: The individual needs to know and understand vs. … shall be able to
5	Descriptions of KSC	Learning outcomes, KSC	The role of nutrition and special diets [knowledge and understanding]; Identify nutritional status and requirements [ability]

Source: Authors based on WSSS; examples are based on Skill 41, Health and Social Care.

No hierarchic structuring for concepts is applied in the WSSS. As described above, the WSSS were not designed for organising (occupational and/or skills) concepts. Moreover, it is not clear which level of the WSSS should be comprehended as the key concept level. If we understand the 'Skills' as core unit, then the corresponding elements (sections, descriptions) can only be taken as describing elements, rather than as sub-ordinated terms. The phrases used in the descriptions, on the other hand, cannot be considered as concepts, as they are worded and expressed in such a way that they can by no means serve as standardised vocabulary.

How to design a WSSS is defined and described in Guidance notes (WSI, 2013b). Each WSSS follows the same scheme and is structured in 'sections', representing learning domains or grouped skills. Within sections, knowledge is separated from abilities, and both types of KSC are further detailed by learning outcomes or KSC (see table 'Structuring of WSSS' above). Conceptually, the WSSS draws the theory of expansive and restrictive work environments, which offers a framework that can embrace diverse workplace cultures and practices (Fuller and Unwin, 2004). The perspective is labour market and socioeconomic. They draw on Bloom's taxonomy, and find that this enables some read-across to level descriptors where members wish to do this. Whilst the basis for WSSS is occupational, to reflect workplace practice and evolution, a few WSSS are multi-

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([120]) Cf. WSC2017_WSSS41_Health_and_social_Care, download:
https://www.worldskills.org/what/education-and-training/wsss/

occupational. A number of older competitions for which WSSS have been prepared, but which will soon be culled, are closer to jobs than occupations. This will be an early benefit of referencing to established occupational classifications as well as directly to international business and industry ([121]).

The standards were primarily designed for comparison in competitions, and thus aim at assessing the level of proficiency or excellence in a competitive setting, rather than providing a framework of performance levels. The general focus lies on excellent VET students, and therefore excellence or high levels of performance are favoured. This might be the reason why performance levels are not explicitly mentioned. However, modifying elements (adjectives, adverbs) referring to levels of proficiency are sometimes used in phrases, such as:' excellent', 'accurately', 'professionally', etc.

For each section, a percentage is indicated, showing the relative importance of the section within the respective skills standard. The percentage weightings given to each WSSS section are based on WSI experts' assessment of the relative importance of that sub-set of KSC, thus ultimately reflecting the importance in the sector or industry. In Health and Social Care for instance, 'Work organization and management' has a score of 10%, whereas in other standards specifications it may have a different score (IT Network Systems Administration, WSSS39: 5%).

5.2.3. Access and interoperability

The WSSS are not linked to any international or to national (European) taxonomies. According to information gained in an interview, a direct connection to ISCO 08 is likely to be considered in the future. Future linking with NACE is not absolutely excluded, while linking to ISCED is not considered to be very helpful. In general, linking to occupational taxonomies provides more benefits for WSSS' aims than linking with educational classifications ([122]).

However, for every WSSS, 'provisional reference' is given both to ESCO occupations and to O*NET. Referencing will be reviewed and refined in the future. 'Skill 41 – Health and Social Care' for instance is referenced to 'ESCO 5321 Healthcare assistants' ([123]); and 'O*NET 31-1014.00 - Nursing Assistants' ([124]).

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[121] Interview 10-06-2019
[122] Interview 12-09-2018
[123] Cf.
https://ec.europa.eu/esco/portal/occupation?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fisco%2FC5321&conceptLanguage=en&full=true&skillFilterIndex=0
[124] Cf. https://www.onetonline.org/link/summary/31-1014.00

Background information on the benefits of comparing the WSSS with ESCO and O*NET as well as findings and recommendations are summarised in an unpublished paper ([125]).

5.2.4. Validity

In general, the long-term application of the WSSS, as well as constant efforts in innovation, point to high reliability and trust. Nevertheless, the theoretical background is not transparent. Maybe due to the strong emphasis on practice and the use in competitions, information on the methodological background is not publicly available.

The WSSS are reviewed and updated following each WorldSkills Competition, which take place every second year ([126]). As mentioned above, WSSS are operationalised through a control document (Technical Description), Marking Scheme and Test Project, and Competition Information System, each of which is updated biennially. Rules for the procedure, for the persons and organisational bodies involved, rough standards and quality assurance measures are described in unpublished papers which are circulated among the experts' involved in the updates ([127]). Updates are also mentioned in one of the Annual Reports, reporting that WSSS have been approved by the General Assembly; and that 'the Technical Committee meetings … provided Members with … an update on the development and industry audit of the WorldSkills Standards Specification' (). To date WSI has prioritised engagement and capacity building with business, industry and members, but should soon be able to strengthen the framework in order to combat an uneven quality within the WSSS ([129]).

Detailed information on updates or traceability of amendments of WSSS is not publicly available. For members, documentation of the review process is internally available, and a report is delivered to the WSI General Assembly. The 'Technical Descriptions' of each 'Skill' (which are distributed among the experts responsible for the Competition and for WSSS updates) inform on the

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([125]) WSI 2018a
([126]) WorldSkills Standards Specification 2012, p 2; confirmed in an interview on 12-09-2018. The next competition will be in 2019, in Russia; cf. https://worldskills2019.com/en/; the 2017 competition took place in Abu Dhabi; cf. https://www.worldskills.org/what/competitions/worldskills-competitions
([127]) WSI 2013a, WSI 2013b; WSI, n.d., pp. 11-13.
([128]) 2014 Annual Report, https://www.worldskills.org/about/organization/wsi/annual-report/
([129]) Interview 10-06-2019

organisations who participated in the consultation in Section 12 (^{130}). The updated WSSS as the result of the updating process are publicly available on the WSI webpage.

WSI, as the responsible organisation, is a not for profit membership association. Members are described as 'agencies or bodies which have a responsibility for promoting vocational education and training in their respective countries/regions' (^{131}). The development of the WSSS hence relies on their members, and a public commitment to long-term development cannot be expected (except for possible public support of members on a national level).

5.2.5. Scalability

Some features of the WSSS facilitate their adoption in other contexts, most of all the international nature and the multinational context of WorldSkills. However, as a collection of descriptions of (more or less) occupational skills profiles, designed primarily for use in competitions, a considerable effort must be expected to create conditions for the use in other contexts. Efforts would be necessary with regard to

(a) Comprehensiveness: qualification levels above and below intermediate level;
(b) Relation to and mapping with standard taxonomies (education; economy; labour market);
(c) Further development: organisation of content, structuring and additional terms, including relations between them.

5.3. Results of the mapping exercise

5.3.1. Introduction

Before presenting the results of the mapping of qualifications and their learning outcomes on WSSS, we would like to give the following consideration: As mentioned earlier, the WSSS are intended to stand in place of the expansive workplace: to enable participants to test their KSC against the needs of high-performance workplaces. They seek to assess actual outcomes against the demands of work. Their design is entirely based on occupational need and demand. Qualifications have purposes and elements that the WSSS respect but are otherwise unconcerned with. Therefore, the affinity or lack of it between

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(^{130}) WSI 2018b. Technical descriptions are used as 'control documents' for the competition. They specify 'the minimum requirements' for a skill for the WorldSkills Competition. The WSSS e.g. are included in section 2.

(^{131}) https://www.worldskills.org/about/organization/

qualifications and the WSSS may be an indicator of the closeness or otherwise of the qualifications to the occupations for which they are preparing. It may be worth noting that the greatest affinity between the WSSS and qualifications may be found where industry qualifications are available (such as Cisco qualifications which are relevant to ICT support). Thus, it needs to be kept in mind that WSSS stand for actual work performance, with a complementary, but distinct, purpose to that of qualifications ([132]).

5.3.2. Match between the reference point and the national qualifications descriptions

5.3.2.1. *Comprehensiveness and relevance (scope/coverage)*

In terms of comprehensiveness, in the experts' mapping of the healthcare assistant and ICT service technician national qualifications to WSSS, five out of ten assessments indicated that there are learning outcomes not covered by the reference point.

For the healthcare assistant, for France, this concerns only few learning outcomes, while the list of additional learning outcomes is more extensive for Bulgaria, the Netherlands, Austria and Finland. For the ICT service technician, additional learning outcomes have been reported for Bulgaria, France, the Netherlands, Austria and Finland.

Taking a look at the experts' mapping in terms of relevance, WSSS profiles show a median coverage (again corresponding to the share of terms that are either implicitly or explicitly covered in the national qualification) of 80 per cent for the healthcare assistant and 79 per cent for the ICT service technician. Coverage oscillates between 33 per cent (ICT service technician in Bulgaria) and 100 per cent (both Finnish qualifications).

([132]) Interview 10-06-2019

Figure 8. **WSSS healthcare assistant and IT service technician - coverage**

	Median values	
	Health-care assistant	ICT service technician
ESCO	63%	65%
WSSS	80%	79%
ONET	72%	82%
HCEU	n/a	n/a
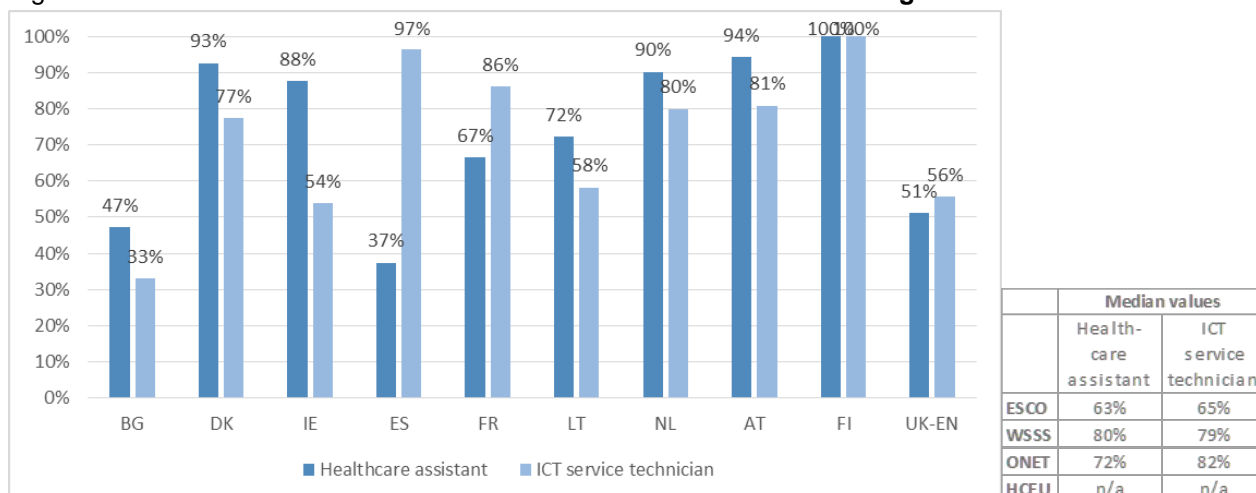
Source: Database.

WSSS profiles, both for the ICT service technician and the healthcare assistant, manage to sufficiently capture the scope (in terms of comprehensiveness and of relevance). In purely quantitative terms, WSSS profiles would appear much better suited than ESCO profiles: with ESCO profiles, for both the healthcare assistant and the ICT service technician, the overall coverage is higher, the share of learning outcomes covered only implicitly is smaller, and with a similar list of additional learning outcomes. However, there are also number of limitations that particularly show in the more qualitative assessment. For example, while the WSSS profiles are assessed as not specific enough to capture the intended learning outcomes included in Bulgarian qualifications, they were assessed as too detailed for the Irish qualifications. Further feedback is presented in the box below.

Box 8.   **Example from Denmark, Ireland, Lithuania, UK-England**

With their focus on excellence, WSSS contain many learning outcomes that are not found in the e.g. the **Danish** IT-supporter qualification, and which can be used to identify the exceptional learner, but which do not necessarily make sense as a description of the average learner/worker.

The ICT service technician qualification in **Ireland** has a technical focus which makes it almost impossible to map robustly against the general/transversal elements in the WSSS - the Irish qualification probably takes the transversal KSC for granted.

For the **Lithuanian** qualifications, WSSS (and ESCO) provide a wider range of categories (knowledge, skill, competences) for mapping of qualifications. This makes the comparison of terms more detailed and explicit. The WSSS profiles are sufficiently detailed to capture the intended learning outcomes. However, the WSSS (and ESCO) are less suitable for the comparison of work-process based and

holistically described competencies, as in the case of the ICT service technician profile, compared to O*NET and VQTS/HCEU.

As the other reference points, WSSS are sufficiently detailed to capture the intended learning outcomes (including assessment criteria) of qualifications from the **UK-England**. As threshold knowledge and competence is required for these qualifications, WSSS in particular were over-specified. The English ICT qualification expects more autonomy, problem solving and project management from the qualification holder, and to some extent, the WSSS profile is able to capture this as well as knowledge requirements.

Source: Feedback reports – Denmark, Ireland, Lithuania, UK-England.

The extent to which learning outcomes are assessed as explicitly or implicitly captured, however, varies significantly across the examples studied (although experts' interpretation probably plays a role, too). As indicated earlier, 'implicitly covered' can also have different meanings. For example, it can mean that the specific learning outcomes statement is included as the item is described at a higher level of abstraction; but it can also mean that a specific item requires another learning outcome that is then assessed as implicitly covered. This is illustrated with an example from Austria in the box below:

Box 9. **Example from Austria**

When mapping the Austrian ICT service technician qualification to the WSSS profile, the terms 'address schemes' or 'networking protocols e.g. IPv6', which are both terms from the WSSS list, are not referred to in the Austrian qualification description at all, neither the term 'protocol' or 'address' is mentioned.

Yet, when studying the national qualification description in detail, it becomes obvious that it includes learning outcomes that absolutely require the knowledge of networking protocols and address schemes such as the following example: 'Recording the needs (including security requirements) of customers and users and transferring them to a network topology, designing the appropriate network infrastructure and installing and configuring the network components.' I.e. for an individual to be able to design a network topology and implement it, they will need to have a knowledge of internet protocols and address schemes.

Source: Feedback report – Austria.

For the healthcare assistant, in Lithuania, 97 per cent of learning outcomes are covered in an implicit manner, compared to two per cent for the Finnish qualification. The same can be observed for the ICT service technician qualifications, although the spread is somewhat less dispersed, i.e. percentages of implicitly covered learning outcomes range from 9 per cent (for the French qualification) to 87 per cent for the Lithuanian one. Moreover, from the French perspective, for example, the following differences between the profiles were observed: While the WSSS profile for ICT was assessed as sufficiently precise

and providing a good understanding of the learning outcomes at stake, this is less the case with the 'healthcare assistant', for which the highly technical aspects of the job are missing. In general, it is considered as very complex profile compared to the French qualification, and broader than the French qualification.

As with the other reference points, the qualifications from the Netherlands, Austria, Finland are not well captured by the WSSS for several reasons:

Box 10.   **Example from the Netherlands, Austria, Finland**

Th three-fold function of the **Dutch** qualifications (preparation for occupation, social integration, further learning) is not easy to grasp with the WSSS profiles. Thus, they do not capture the full range of learning outcomes included in the Dutch VET qualifications.

The **Austrian** descriptions operate with a higher level of detail. However, WSSS seem to have a quite strong focus on transversal learning outcomes (but with contextualisation to a certain extent). The Austrian qualifications (and in particular the ICT one) have a stronger focus on occupational learning outcomes.

WSSS also does not seem to be very suitable to describe the comprehensive qualification requirements in the **Finnish** context it and is missing comprehensive descriptions of required skills and competences in these qualifications. As described by one of the interviewees, the WSSS list would serve as a checklist for some part of the vocational skills demonstrations used in assessing students' skills and competences but it does not capture the full scope of the VET qualification.

Source: Feedback reports – Netherlands, Austria, Finland.

5.3.2.2. *Categorisations within the reference point*

Learning outcomes in the WSSS reference points are grouped into a number of sections. There are six sections for the healthcare assistant profile, and seven sections for the ICT service technician profile. For the healthcare assistant, three of these sections can be considered as rather transversal, while the others are more technical/occupation-specific in nature. For the ICT service technician, two of the sections can be considered as rather transversal.

For the ICT service technician, the more 'transversal' WSSS area of 'Communication and interpersonal skills' has a lower median coverage (67 per cent, compared to an overall median coverage of 79 per cent) than the more occupation-specific WSSS areas. For qualifications from Bulgaria, Denmark and Lithuania in particular, less than 35 per cent of the learning outcomes from this section are covered in the qualification description. This however does not apply to the second rather transversal WSSS area of 'Work organization and management', which shows coverage shares comparable to those of the more occupational WSSS areas.

Mapping against the healthcare assistant reference point shows a slightly different picture. While median coverage within the section 'work organization and management' at 71 per cent is below the overall average median coverage of 80 per cent, the other two more transversal WSSS sections in this profile show above-average median coverage. For the WSSS section 'Communication and interpersonal skills', median coverage is of 89 per cent, while for the section 'Problem solving, innovation, and creativity', 83 per cent of the learning outcomes of the reference point are covered.

Each WSSS section furthermore distinguishes between knowledge and understanding ('The individual needs to know and understand') and abilities ('The individual shall be able to'), though no significant differences can be reported when analysing the mapping results between these groups.

5.3.3. Strengths and weaknesses

5.3.3.1. *Strengths*

WSSS has good descriptions of the contents required from a learner, they are **clearly described and understandable**. The list of learning outcomes (in particular for the healthcare assistant) is more coherent (for example, compared to the ESCO profile) with a similar level of granularity between them (although the learning outcomes also overlap quite a lot – see below).

WSSS also use **a clear and logical structure** that supports navigating through the reference point. The breakdown in 'sections/areas' is logical and convincing (even though the structure differs from that used in national qualifications). WSSS distinguish between broad competences which can be seen as transversal, as they are realisable in different ways and form the components of project management abilities. With its hierarchy of transversal abilities under which more specific abilities, knowledge and understanding fall, WSSS are equipped to provide a more nuanced account of attributes than either the ESCO or O*NET profiles.

In principle, they **integrate occupational and transversal skills** (e.g. 'Maintain excellent professional conduct including appearance'). The WSSS profiles seem to be most comprehensive when it comes to balancing occupational and cross-sectoral learning outcomes and presenting them in a structured manner.

The descriptions are more **activity oriented** (for example, compared to ESCO and O*NET) and generally clear (one does develop at least a certain sense of what the learning outcomes in a specific area are meant to be about).

The use of precise verbs, introduced by 'to be able to', considerably supports the mapping of qualifications (for example, for Austrian and French qualifications).

Weaknesses

WSSS are structured in a clear manner. What remains unclear with WSSS, however, is **how to interpret the role that the areas/headings play**: What is the basis for the structure and the division, according to which principles is the division made? Is this just an element for structuring, or does one need to read a learning outcomes statement together with its area heading? Take the following WSSS term from the ICT profile as an example: 'Discuss the proposed solution for role/feature and agree with relevant parties e.g. users, colleagues and managers'. Does this refer exclusively to the set-up of operating systems (as it is included in this WSSS area), or may it also refer to the design of networks, security measures?

The **division into 'know and understand' and 'be able to'** makes the KSC lists rather long, **seems to be a bit artificial** and does not fully match to the practice of work and work process reality. For instance, the WSSS section 'Work organization and management' includes the following statement: 'The individual needs to know and understand: The techniques of planning, scheduling, and prioritizing'. This can appear in the national qualifications simply as 'managing one's tasks', 'being flexible', etc. The WSSS distinction is logical and constructive. It is, however, a moot point when assessing expert activity where it is always necessary to specify detailed work activities. The distinction applied can also lead to some redundancies in the descriptions. For example, this leads to situations where there is one apparently perfectly fine KSC on 'Plan how the client-centred care will be delivered' followed by a more specific (but already covered by the former KSC) on 'Plan how to support client rehabilitation' – and it is not intuitively clear why this one area has been singled out.

In particular for the ICT profile, the KSC tend to suffer from being **verbose**, having a sense of randomness (as in the ESCO case) and are sometimes quite bizarre (such as this one: 'Seek support when further expertise is necessary and avoid temptation to >be consumed< by the challenge of the problem') and/or applicable at almost any time and place (such as 'The importance of methodical working practices'). It is furthermore not possible to intuitively understand why one field would include the latter learning outcome while another one would not. Thus, it undermines trust in the system that produced them.

The learning outcomes described **do not relate to detailed work activities**. The overall context (real working life processes) is missing and therefore WSSS are merely presenting itself as a listing of skills and competences. The

statements are also **rather broad** and leave room for (different) interpretations. In some cases, several learning outcomes statements from national qualifications can be linked to one WSSS statement. For example, the WSSS statement 'The individual shall be able to: Assess the client's capabilities and the capabilities of the family' can be linked to six more specific learning outcomes included in the Austrian healthcare assistant qualification.

Some WSSS statements **merge KSC that do not necessarily always go hand in hand** (this is also sometimes the case in other reference points). A national qualification description may cover one part quite explicitly, while not covering the other part at all. For example, the WSSS profile for the ICT service technician includes the statement: 'Plan the work area to maximize efficiency and maintain the discipline of regular tidying'. The Austrian qualification descriptions somehow covers the first part ('Design workplace ergonomically'), while it does not refer at all to the aspect of tidying.

More **transversal aspects are not sufficiently covered**. The way in which occupational and transversal learning outcomes are separated in WSSS is not always helpful, because it leads to repetition and too much detail. Another issue is that some of the learning outcomes in the reference points are so blindingly obvious. For example, the statement included in the WSSS 'work efficiently and check progress and outcomes regularly' could apply to anything anywhere as a goal. However, the integration of transversal learning elements into the occupational context works well.

There is a **risk** that the learning outcomes descriptions (in particular in the ICT field) are **outdated rather quickly**. The ICT profile also does not really match the Dutch qualification, because references to the virtual dimension are missing (focus is too much on on-site activities). Furthermore, the three-fold qualification function of the Dutch VET (preparation for occupation, further learning, and social integration) is not easy to grasp in the WSSS profile.

WSSS do not give any indication of level. However, the descriptors are used in general to describe **high levels of performance** rather than threshold competence since they are meant as guidelines for judging excellence in international competitions. Reaching the level of WSSS would pose considerable cost challenges for VET systems in certain jurisdictions. For example, the WSSS profiles work well for both English qualifications and clearly show limitations of these qualifications.

Chapter 6. VQTS model (VQTS Competence Matrix)

6.1. Introduction

The VQTS model was initially developed in the Leonardo da Vinci project 'Vocational Qualification Transfer System (VQTS)' (2003-2006; Luomi-Messerer and Markowitsch, 2006; Becker et al., 2007) and further developed in the VQTS II project (LLP-LdV, 2007-2009; Luomi-Messerer, 2009). The VQTS projects were closely aligned with the aims of the 'Copenhagen Process' wherein the EU Member States declared their willingness to foster employability and lifelong learning in Europe by strengthening cooperation and increasing mobility in VET. According to the 'Copenhagen Process', it should be possible to utilise competences acquired through formal, non-formal and informal learning throughout Europe. Furthermore, studying or training abroad should not necessarily lengthen vocational training. Therefore, common tools and initiatives for VET are needed to enhance transparency and comparability of qualifications and mutual trust among stakeholders. One of these initiatives is the European Credit System for Vocational Education and Training (ECVET). The first VQTS project has received the Helsinki Award 2006 (in the category 'Recognition of competences and qualifications, ECVET') and the Lifelong Learning Award 2007 in Gold for its contributions to the aims of the 'Copenhagen Process'.

Since then, the VQTS model has been used in a series of EU-financed 'transfer of innovation' projects and transferred to various other sectors and occupational fields ([133]).

The VQTS I and II projects were coordinated by 3s, Austria, and carried out by partnerships composed of organisations from several European countries. Other EU-funded projects that developed Competence Matrices based on the VQTS model were coordinated by different organisations across Europe. The EU project HCEU, that developed the VQTS-based Competence Matrix 'Professional Care' (HCEU, 2018) was coordinated by the DEKRA Akademie GmbH in Germany and carried out in cooperation with partners from Austria (3s),

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([133]) For example in the projects MOVET (DE; www.gomovet.eu), VQTS Transfer (IT; www.vqtstransfer.com), expero2EU (IT; www.expero2.eu), IST (NL; www.servicetechnician.eu), and Equal-Class (www.equal-class-eqf.eu). Further information is available at www.vocationalqualification.net

Germany, Greece, Hungary, Poland ([134]).It describes the steps of competence development in the field of nursing starting with helper professions within nursing up to Bachelor level.

'Comparing training programmes and understanding qualifications from other countries' systems is one of the main challenges for implementing cross-country mobility and recognising competences gained abroad. This is because of the various approaches, concepts and traditions for designing and describing qualifications. The VQTS approach seeks to transcend the incomparability of qualifications and training contents by focussing on work processes. […] The VQTS model provides a >common language< to describe competences and their acquisition and also offers a way to relate these competence descriptions to the competences acquired in training programmes. On the one hand, the VQTS model focuses on competences related to the work process and identifies the core work tasks within the context of the particular occupational field. On the other hand, the VQTS model follows a >development logical< differentiation of a competence profile (known as a competence development or acquisition model) and thus can also describe the acquisition of competences. The description of competences in relation to core work tasks can be seen as an attempt to bridge the terminological and ideological gap between the world of education and the world of work. The core elements of the VQTS model are the Competence Matrix, Competence Profiles and Competence Profile Certificates (including credit points)' (Luomi-Messerer, 2009, pp. 10-11).

'The main aim of a Competence Matrix is to enhance transparency of competences and qualifications and thus mutual understanding between different countries and different contexts (for example, between the world of education and the world of work or between VET and HE) and to compare qualifications with one another. A Competence Matrix can be used for those purposes where the transparency of competence profiles is very important, such as:

(a) transferring vocational competences acquired abroad (mobility in VET);
(b) transferring and recognising competences acquired within the official VET system as well as competences achieved through non-formal or informal learning;
(c) developing qualifications;
(d) composing job profiles as well as personnel (human resources) planning;
(e) referencing qualifications to qualifications frameworks;

([134]) HCEU project consortium, nd.; Luomi-Messerer et al., 2016.

(f) enhancing permeability between VET and HE' (Luomi-Messerer, 2009, p. 30).

6.2. Assessment against requirements

6.2.1. Scope

The first VQTS projects developed Competence Matrices in technical fields (in the VQTS I project, a Competence Matrix for 'mechatronics' was developed and in VQTS II one for 'electronics/electrical engineering'). Further VQTS-based Competence Matrices are available in the following fields:

(a) tourism: receptionist, cook, catering – projects: ECVET-Tour, ECVET-Tour II ([135]), ECMO ([136]);

(b) healthcare: nursing, professional care, elderly care – projects: VQTS-PH ([137]), NoBoMa ([138]), HCEU ([139]);

(c) foreign trade – project: TRIFT ([140]);

(d) cleaning sector – project: VALBUK ([141]);

(e) event engineering – project: ECVAET ([142]);

(f) bakery, hairdressing, joinery / cabinet making, floristry – projects: SME Master and SME Master Plus ([143]).

In the first VQTS project and in some of the 'transfer of innovation' projects, the focus was on the skilled worker level and on VET programmes from secondary level education (EQF levels 3 and 4). The VQTS II project developed a Competence Matrix useful for identifying overlapping areas between VET and HE programmes and therefore the scope of the Competence Matrix 'electronics/electrical engineering' had to be broadened to include at least some steps of competence development relevant for HE. The Competence Matrix 'Professional Care' developed in the EU project HCEU describes the steps of

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([135]) www.ecvettour2.eu
([136]) www.ecmo-europe.de
([137]) http://www.ibw.at/de/europaeische-projekte/eu-projekte/7-foerderung-der-transparenz-von-lernleistungen/eu24/P355-vqts-ph
([138]) http://3s.co.at/en/node/1035
([139]) www.project-hceu.eu
([140]) www.trift.eu
([141]) www.valbuk.ch
([142]) http://www.ecvaet.eu/
([143]) www.sme-master.eu

competence development in the field of nursing starting with helper professions within nursing up to Bachelor level ([144]).

Unfortunately, there is no comprehensive overview for which occupational fields VQTS-based Competence Matrices have been developed so far. However, it is clear they are only available for a limited number of fields and thus can only be used in a limited way for mapping European VET qualifications.

VQTS-based Competence Matrices are usually available in English and translated into the languages of the partner countries. For example, the final version of the Competence Matrix 'Professional Care' developed in the EU project HCEU will be available in English, German, Greece, Hungarian, and Polish language.

6.2.2. Categorisation and structure

VQTS-based Competence Matrices are not comprehensive reference systems and cannot be linked to any of the four formats described (term list, taxonomy, thesaurus, ontology). A Competence Matrix is structured into competence areas (based on core work tasks) and steps of competence development. There is also no vocabulary control for the development of VQTS-based Competence Matrices.

Competence areas (based on core work tasks) are the main structural element of a VQTS-based Competence Matrix: A Competence Matrix displays competences structurally in a table according to core work tasks in a specific occupational field and the progress of competence development. Competence areas form the vertical axis of the table. The acquisition of competences by a person in training with reference to core work tasks is described for each competence area as steps of competence development (horizontal axis). Between two and six successive steps of the competence development process within certain core work tasks are described.

The HCEU Competence Matrix 'Professional Care' comprises the following competence areas:

([144]) https://www.project-hceu.eu/fileadmin/user_upload/HCEU-CM_fullversion.pdf

Table 7.   **Competence areas of the HCEU Competence Matrix 'Professional Care'**

Competence Areas
CA1: Assessment, diagnosis, planning professional care
CA2: Nursing Care
CA3: Nursing Intervention
CA4: Creating and maintaining a healthy and safe environment
CA5: Communication and collaboration with other professionals
CA6: Communication and collaboration with patients/clients
CA7: Management
TCA A: Monitoring, documentation, quality assurance
TCA B: Ethical, intercultural, legal competence
TCA C: Continuous professional development

Source: HCEU, 2018.

The publications related to the VQTS model state that soft skills and key competences are not presented separately, they are integrated in the context-related descriptions (Luomi-Messerer, 2009, p. 24). The Competence Matrix 'Professional care' developed in the EU project HCEU, however, includes three separate transversal competence areas (TCA). Moreover, in this matrix, competence areas are sub-divided into three to six 'sub areas of competence'. For example, 'CA1: Assessment, diagnosis, planning professional care' is sub-divided into the following three sub-areas: '1.1 Gathering data', '1.2 Nursing diagnosis', '1.3 Planning professional care'.

For each sub area of competence, two to four steps of competence development are described in the HCEU Competence Matrix. For example, for the sub area of competence '1.1 Gathering data', the following steps are described:

(a) '1.1.a To be able to assist in conducting professional care assessment;

(b) 1.1.b To be able to conduct professional care assessment;

(c) 1.1.c To be able to guide and supervise the complete professional care assessment'.

In the HCEU Competence Matrix, the steps of competence development are first described in a rather general way and are then presented in more details, structured in 'competence', 'skills' and 'knowledge' ([145]):

Table 8. **Learning outcomes divided into competence, skills and knowledge –
example from the HCEU Competence Matrix 'Professional Care'**

Step of competence development	Competence	Skills	Knowledge

([145]) The original VQTS model does not contain such detailed descriptions of individual learning domains, but only the holistic descriptions of competences in the steps of competence development.

1.1.a To be able to assist in conducting professional care assessment	The professional caregiver is able to collect basic healthcare parameter/vital signs/personal abilities of patient's/client's. This is done autonomously and self-responsibly but according to instructions.	The professional caregiver is able to: - involve relevant others in the assessment of the patient/client (see also CA.6.1), - perform measurements of basic health parameters/vital signs (e.g. height, weight, body temperature, blood pressure, heart rate, breathing rate, abdominal girth), - collect information about the patient's/client's ability to self-care in daily living (e.g. eating, drinking, personal hygiene, dressing, excretion, mobility), - collect information about the patient's/client's daily routine (e.g. being awake and sleep, course of the day), - collect information about the patient's/client's preferences and dislikes (e.g. regarding foods and drinks), - collect information about the patient's/client's ability of cognition (e.g. consciousness, mood changes, orientation, behaviour), - collect information about the patient's/client's sensory functions (e.g. visual and auditory impairment), - collect information about the patient's/client's social behaviour (e.g. contact to others, relationships, loneliness), - report results of health assessment of patient's/client's to related professionals, - document the results of measurements	The professional caregiver is able to: - name the range of normal vital parameters (e.g. blood pressure, heart rate, body temperature), - explain one's own behaviour regarding abnormal vital parameters, - describe the support of patient's/client's with limitations (e.g. limited mobility urination, walk with the blind), - explain techniques of measurements of basic vital functions (e.g. temperature, blood pressure, breathing rate), - list technical equipment necessary for gathering the patient's/client's vital data, - describe differences between sleep and unconsciousness, - list cognitive functions (e.g. learning, recognising, comparison, thinking, memory, consciousness, emotions, mood), - list physical functions (e.g. movement, breathing, digestion), - list sensory functions (e.g. communication ability, speech, vision, hearing), - name different behaviours (e.g. aggressive, stable, apathetic, anxiety), - describe assessment methods in nursing care (e.g. observation, simple interview with the patient/client and relevant others), - discuss possible health assessment results.

Source: HCEU, 2018.

Each VQTS-based Competence Matrix only focuses on one occupational field and therefore usually does not consider any links to other occupational fields or reveal shared and differing characteristics. Moreover, the VQTS model (Luomi-Messerer, 2009) only provides general guidelines (such as core work tasks – the basis for competence areas – must be derived empirically) but there is no guarantee that VQTS-based Competence Matrices are developed in a consistent way.

Explicit performance levels are expressed in the descriptions of the steps of competence development: The steps of competence development illustrate the process of progression from the lower to the higher steps. For example, for the sub-area '3.5 Dealing with medical devices' of the HCEU Competence Matrix, four steps are described:

(a) '3.5.a Is able to assist in managing and, if applicable, placing medical devices according to medical products and guidelines.
(b) 3.5.b Is able to manage and, if applicable, place medical devices according to medical products and guidelines.
(c) 3.5.c Is able to assist in and perform related medical procedures.
(d) .3.5.d Is able to guide and supervise others in the use and maintenance of medical devices and related procedures.'

No specific determinants for differentiating the steps are given in advance; however, whenever it is reasonable, certain dimensions should be included as reference points to describe the competence development in addition to the context characteristics (such as tools). These dimensions are used to express the differences between steps and the progress of competence development, for example (Luomi-Messerer, 2009, p. 21):

(a) Ability to perform independent work tasks: marks the degree of necessary support or instruction;
(b) Ability to deal with a certain complexity;
(c) Ability to deal with quality standard demands: marks the degree to which demands and standards can be considered in fulfilling work tasks;
(d) Ability to deal with dynamic situations: marks the degree to which changing parameters of a problem or system can be taken into account;
(e) Ability to deal with a lack of transparency and ambiguity: measures the ability to deal with messy situations or with situations with variables not visible from the outset.

Qualifications can be mapped on a Competence Matrix by indicating the competence areas and the steps of competence development covered. This facilitates the visibility of differences and similarities of qualifications and can therefore be used, for example, for identifying differences between qualifications

linked to different EQF levels or to visualise the competences an individual has already achieved (for example through informal and non-formal learning) and the competences that still need to be achieved for obtaining a qualification.

A Competence Matrix does not indicate the weighting of the competences covered. However, weighting is possible when developing Competence Profiles through mapping qualifications on a Competence Matrix. Competence Profiles depict the stages of competence development to be achieved for obtaining a qualification or the stages already achieved by a person at a particular time. The VQTS model uses ECVET points as quantitative measurements of specific parts of a training programme or qualification. ECVET points as used in the VQTS model reflect the duration of the competence development process and are based on the 'learner's workload' (one credit point equals about 30 hours of learner's workload). 'The total amount of credit points for a training programme or qualification is divided according to the average time a person in training needs to acquire competences or to reach a step of competence development. The time necessary to reach a step of competence development (the duration of the competence acquisition) can be different within the steps of a competence area as well as between competence areas. Therefore, credit points present the individual "value" of a certain step of competence development within the Competence Profile of a training programme or qualification' (Luomi-Messerer, 2009, p. 52). Thus, when using the VQTS model, weighting can be done by allocating ECVET points to the parts of the qualification mapped to the Competence Matrix (i.e. the steps of competence development covered).

6.2.3. Access and interoperability

There is no link to any international or national standard taxonomies. According to the publication on the VQTS model (Luomi-Messerer, 2009, p. 27), such taxonomies or classifications can be used for developing Competence Matrices: 'As a starting point for determining the scope of the Competence Matrix, the professional classifications from ISCO-88 (International Standard Classification of Skills and Competences) and the corresponding ISCED levels (International Standard Classification of Education) in the selected field could be analysed.'

6.2.4. Validity

Quite many of these VQTS-based Competence Matrices developed in EU-funded projects seem to be little sustainable beyond the lifetime of the projects. The reason for this may be that there is no official 'accreditation' of them and the information about their existence is not sufficiently disseminated. Furthermore, a body would be needed for updating them based on new developments in the work context.

There is not much information available on the use of VQTS-based Competence Matrices beyond the lifetime of the EU-funded projects in which they were developed. However, it can be assumed that up to now there is no public commitment to a long-term development of any of the Competence Matrices.

6.2.5. Scalability

The mapping of qualifications to existing Competence Matrices is quite straightforward; general guidelines are also available (see Luomi-Messerer, 2009). However, for a broader use the development of a database and an IT-based solution would be needed for supporting the mapping.

Transferring the VQTS model to other sectors, occupational fields and countries has also proved to be possible, as the various EU-funded projects using this approach show. However, the development and the maintenance of these Competence Matrices is quite resource intensive. For example, for designing a Competence Matrix and its competence areas, core work tasks need to be derived empirically by using methods that include work process analyses, company surveys, expert interviews, work-related comparison of existing qualification or occupational profiles and moderated workshops with experts from the occupational field. Experts from the respective occupational field (from the world of work as well as from the world of education) from different countries must also be included – for validating competence areas as well as for identifying steps of competence development. Moreover, the mapping of qualifications to a Competence Matrix requires expert knowledge to interpret the competence descriptions and decide on whether a step of competence development is covered by the profile of a qualification or not.

6.3. Results of the mapping exercise

6.3.1. Introduction

The VQTS/HCEU Competence Matrix was developed in cooperation between stakeholders from education and the world of work. It is the only of the four reference points used here that has been developed specifically for comparing qualifications (but it can also be used for other purposes).

Only the VQTS-based Competence Matrix itself was used for the mapping exercise and not the more detailed descriptions for the individual learning domains (knowledge, skills, competence). Although this might to some extent have supported a more complete mapping of national qualifications (as shown in

the section below to discuss the 'weaknesses' of this reference point), the list of items to be mapped would have been too extensive and this task would have become much more complex.

6.3.2. Match between the reference point and the national qualifications descriptions

6.3.2.1. *Comprehensiveness and relevance (scope/coverage)*

With the mapping against the VQTS/HCEU reference point, the aspect of comprehensiveness is more difficult to capture than with the other reference points, as it includes learning outcome statements that express different levels of proficiency (i.e. the steps of competence development). The coverage indicator was thus based on the 34 sub-areas of competence included in the profile, instead of on the individual learning outcomes statements. Individual shares range between 38 per cent for the UK qualification and a median coverage of 100 per cent when mapping the Finnish qualification.

Figure 9. **VQTS/HCEU healthcare assistant – coverage of sub-areas of competence**
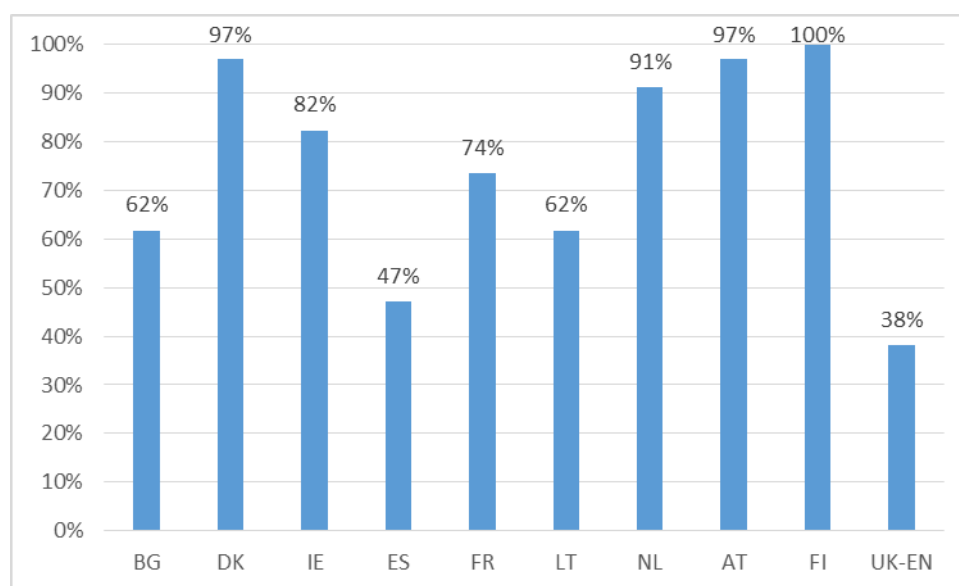
Source: Database.

The HCEU profile stands out from the other reference points in that it has the lowest median share of learning outcomes that are implicitly covered (28 per cent). The share of learning outcomes considered as only implicitly referred to in national qualification descriptions is particularly low for Spain, France, the Netherlands and Austria (all below 20 per cent). Despite the low median share,

with the qualifications from Bulgaria and Lithuania, this share exceeds 80 per cent (83 per cent for Bulgaria, 98 per cent for Lithuania).

The qualitative assessment of the match between qualification descriptions and the VQTS/HCEU Competence Matrix shows, for example, that while it (like all other reference points) fails to describe a 'complete profile' of the Austrian qualification analysed, of the four models, the VQTS/HCEU Competence Matrix was found most compatible/informative in relation to the Danish standards. This might be due to the fact that the matrix was developed within a limited group of countries with a profile and a format (apprenticeship) that is similar to Danish IVET. Also, for mapping the Lithuanian qualifications, the VQTS/HCEU Competence Matrix (as well as the O*NET profile) is better suitable for the mapping of work-process based and holistically described competencies.

Also, the scope of the qualifications from the Netherlands and UK-England was captured quite well but with some limitations:

Box 11.   **Limitations observed in the Netherlands and UK-England**

The VQTS/HCEU Competence Matrix makes it possible to capture the breadth of the **Dutch** qualification. However, it is less able to capture its more transversal aspects.

In general, the learning outcomes (and assessment criteria) included in qualifications from **UK-England** are captured well enough by this reference point (and by all others). A VQTS-based Competence Matrix would be also suitable for the ICT qualification from UK-England as well as the healthcare assistant qualification provided that is was supplemented with a knowledge component. It would have been useful to apply the VQTS model to the ICT qualification (EQF level 5). As this qualification expects more autonomy, problem solving and project management from the qualification holder, a VQTS matrix would probably capture this but be somewhat weaker on detailed activity specification. In terms of distinguishing the higher and lower level abilities and nesting some abilities within others, the VQTS/HCEU profile is best (compared to the other reference points), but it again fails to capture most of the detailed work activities embodied in assessment criteria. A VQTS-based Competence Matrix in particular is good in being able to providing a hierarchical profile which can be superimposed on the qualification structure.

Source: Feedback reports – the Netherlands and UK-England.

In some countries, it was noted that the profile described in the VQTS/HCEU Competence Matrix is at a higher level in terms of skills and competences required as compared to their qualifications and therefore a limited match was assessed (in Bulgaria, France, Ireland and Finland):

Box 12. **VQTS/HCEU Competence Matrix refers to a higher level than qualifications – examples from Ireland and Finland**

Although the transversal elements are well integrated and contextualised in the VQTS/HCEU Competence Matrix, this does not mean that there is a greater likelihood that in a country like **Ireland** where there is some separation of transversal and occupationally specific learning outcomes into different modules, a match with a VQTS/HCEU learning outcome statement can only be achieved through a combination of learning outcomes rather than a straightforward one-on-one match. The interviewed expert from the healthcare sector found the VQTS/HCEU Competence Matrix to be at 'quite a high standard – almost nursing standard level' (in Ireland, care assistants do not generally cover vital signs, taking pulses etc., as this tends to be a protected function of nurses, but in some hospitals it is taught to care assistants, another indicator of the high amount of variation in the country).

The VQTS/HCEU Competence Matrix is the closest approach in describing the qualification requirements but partly fails to capture the comprehensiveness of the **Finnish** practical nurse qualification and partly has elements which are not considered to be part of the work of a practical nurse in Finland. Based on the interviews it seems that the model is not usable in the Finnish context of healthcare professions as it seems to have also requirements higher than what are the requirements for a practical nurse.

Source: Feedback reports – Ireland, Finland.

6.3.2.2. *Categorisations within the reference point – focus on level of proficiency*

Looking at the coverage of learning outcomes based on the different competence areas or sub-areas does not reveal any interesting insights. However, the VQTS/HCEU Competence Matrix with its steps of competence development can be used to compare the levels of proficiency of qualifications. While it does not make sense to calculate the median coverage of steps of competence development, similarities and differences between qualifications can be shown

For example, the Annex shows the similarities and differences of the healthcare assistant qualifications from Denmark and from Ireland mapped to the matrix. Both qualifications are linked to EQF level 4 (based on their classification in the national context). The Danish qualification seems to be broader, since it covers more sub-areas of competence than the Irish one. In those cases where both qualifications cover the same sub-areas (26 cases), the Danish qualification more often also includes one or more higher steps of competence development (in 16 cases). The Irish qualification only includes higher steps than the Danish qualification in three cases. For both qualifications, no additional learning outcomes (i.e. those not covered by the reference point) were identified. Thus, in order to understand why both qualifications are linked to the same EQF level, further information and evidence would need to be collected. When compared to the French qualification (EQF level 3), one can observe that this qualification is

narrower (i.e. it covers only a low number of sub-areas of competences) and usually covers only lower steps of competence development. However, the Dutch qualification (also EQF level 3) shows a profile similar to the Danish qualification. Again, this means that the mapping to the HCEU Competence Matrix does not necessarily clearly indicate differences between qualifications at different EQF levels.

6.3.3. Strengths and weaknesses

6.3.3.1. *Strengths*

The **rationale for structuring the VQTS/HCEU Competence Matrix is clear** and understandable (except maybe for the area 'management' which seems all-embracing). It is the most hierarchically based of these reference points. The VQTS/HCEU Competence Matrix provides a logical and detailed account of the competence areas, sub-areas of competence and more detailed abilities required by the occupation. The structure is helpful for comparative purposes and the sub-structure helps to position the qualifications with greater accuracy, as it provides parameters.

The **descriptions are generally short and clear**. The VQTS/HCEU Competence Matrix even seems to be at an ideal level of detail for some national contexts (the 'Goldilocks' reference point – neither too simplified nor too detailed, as assessed for the Irish qualification).

The VQTS/HCEU Competence Matrix is better suited for comparison of several national qualifications based on the **holistic descriptors of competences** related to **work processes** (for example, it provides a good reflection of the Dutch profile and is the closest approach in terms of the basic idea compared to the way the Finnish qualification for practical nurses is structured). Some of the base level competences are quite loosely framed while others relate more to detailed work activities. Since the description focus on work processes, this gives the feeling that the matrix was created for a specific purpose and for a specific occupational profile (which is less visible in the case of ESCO or WSSS, which create more often the impression that the descriptions are cut and paste from an existing standard used elsewhere and for other purposes).

The reference point includes **specific occupational items but also more transversal ones** by applying a structured approach (it contains both elements of transferable skills but also an element of multiple realisability). The distinctions are clear and transversal KSC are contextualised: Transversal elements are well

integrated in a meaningful way, in other words the concept behind the learning outcome has been applied in a specific context.

Of the four models, VTQS/HCEU reference point is the only one that **tackles the issue of levels of competence** of occupational learning outcomes (levels of complexity or performance levels) in a logical and consistent manner by distinguishing steps of competence development. Thus, it is considered as very good in showing the limitations of the English qualification in terms of the range of higher-level competences.

6.3.3.2. *Weaknesses*

Many **statements** in the VQTS/HCEU Competence Matrix **are described in a rather broad manner,** the level of detail is very low, and the meaning is not always clear. This leaves quite some room for interpretation when mapping learning outcomes of qualifications. For example, the sub-area of competence 'Gathering data' of the VQTS/HCEU Competence Matrix includes the following steps of competence development with quite broad statements:

(a) '1.1.a To be able to assist in conducting professional care assessment;
(b) 1.1.b To be able to conduct professional care assessment;
(c) 1.1.c To be able to guide and supervise the complete professional care assessment'.

In other cases, however, the statements are **very focused on the details** and very – sometimes too – concrete (for example, related to nutrition and excretion).

The VQTS/HCEU Competence Matrix that was used for the testing exercise does not have a **knowledge component** and knowledge requirements remain implicit within the ability descriptors. This could be a serious shortcoming in assessing knowledge requirements for an occupation. For example, were it applied to the English ICT qualification, with greater knowledge requirements than the healthcare assistant qualification, this could be a handicap. However, the steps of competence development of the VQTS/HCEU Competence Matrix are not only described in a rather general way, they are also presented in more detail, structured in competence, skills and knowledge. As already mentioned, only the more general descriptions were used for the test exercise to reduce the amount of text in the reference point. In some cases, however, it turned out to be useful or **sometimes necessary to read the detailed information** to better understand the more general descriptions.

The distinction and differentiation of the steps of competence development is useful, but it also makes the mapping process more **time-consuming** and

requires deeper expertise related to these work processes and also in the development of competences needed in these work processes.

Chapter 7. Suitability of the reference points for different usage contexts

This chapter focuses on a final assessment of the suitability of the selected reference points for the international comparison of VET qualifications and also for other contexts of use. Prior to this, however, challenges are discussed in connection with characteristics of national qualifications and with general characteristics of reference points. These challenges need to be considered as they affect all contexts of use.

7.1.   Challenges for all reference points and usage contexts

7.1.1. Challenges connected to characteristics of national qualifications

The overall assessment of whether certain reference points are suitable for different usage contexts is not only dependent on the characteristics of the reference point. Also, certain characteristics of national qualifications can pose challenges for any of the selected reference points. The main challenges observed are presented in this section, illustrated with examples from the qualifications analysed.

One of these challenges relates to the use of 'optional' parts of qualifications, i.e. the option for learners to select certain parts of a qualification and their learning outcomes or not. While current VET policy documents at European level stress the need to provide flexible and modular learning opportunities in order to provide learners with the occupational skills and transversal competences needed in the labour market and society (e.g. ACVT opinion 2018 - Advisory Committee on Vocational Education and Training, 2018), this flexibility leads to problems in mapping qualifications and their learning outcomes to reference points and, in particular, in comparing qualifications ([146]). Often one or more of these optional units or modules (sometimes called 'electives') have to be chosen by the learner, which means that there is not only

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([146]) The fact that this trend towards more flexibility and individual paths in VET is actually taking place, albeit with a high degree of variability between countries, is also shown by the study 'Changing the nature and role of VET in Europe' (cf. Cedefop, forthcoming-b).

one profile of a qualification, but different profiles depending on the combination of these units. For example, while in Denmark descriptions of initial VET qualifications do not work with 'compulsory' and 'optional' learning outcomes, individual schools can give learners the opportunity to specialise within these (broad) learning outcomes (e.g. by giving learners who acquire the IT support qualification the opportunity to choose between different software certificates). Nevertheless, the learning outcomes in the Ministerial Order, which were mapped to the reference points in this study, are in principle all mandatory. However, this is not the case in Finland (and Ireland), where the use of optional units has proved to be a major challenge for mapping and also for comparing qualifications. The Finnish example is presented in the following box:

Box 13.   **Use of optional units in Finland**

A Finnish VET qualification encompasses a) compulsory units (all persons holding a qualification have the core vocational competence required by the qualification criteria), b) optional units within one and the same qualification (will help in meeting the different, and sometimes highly diverse, orientation and competence needs in working life), c) 'general study units' (they refer to key competences in lifelong learning, and d) 'free choice' study units (such as courses in higher education). Particularly the element of optionality in the provision of VET makes it virtually impossible to map a Finnish VET qualification to the reference points. 'Optionality within one and the same qualification will help in meeting the different, and sometimes very diversified, orientation and competence needs in working life' (Finnish National Board of Education, 2015, p. 11). This means that there are numerous study units defined and offered in the qualification requirements which include, in case of the IT service technician qualification, for example, artificial intelligence, internet of things and locally defined study units. The national qualification requirement in Finland is not to be seen as the one and only content for studying for all, it is a framework which allows a huge amount of flexibility and thus serves the principle of individual learning: 'In addition to the needs of working life, the vocational qualification system must also serve individuals, enabling them to make choices according to their individual needs and to build flexible study pathways. Free choice units, the possibility to complete selected units and the revised structure of common units would enhance the flexibility of qualifications and enable individuals to develop their competences according to their own needs. Flexible study pathways and free choice units would also promote equality in education and reduce the unnecessary overlapping of studies' (Finnish National Board of Education, 2015, p. 12).

Source: Feedback report - Finland.

Another specific feature of Finnish VET qualifications that creates a challenge for mapping, relates to their scope and level of detail: for all four reference points, there are many additional KSC included in the qualifications but it would be a tremendous effort to try to filter them out in the way the reference

points are presenting the KSC. For example, the healthcare assistant qualification has eight different competence areas (specialisations), each of which has some common mandatory requirements, but also very many field-specific requirements. Listing them would take several hundred pages (currently the main part of the qualification description is just under 400 pages). Thus, even though the KSC presented in the reference points can be identified almost completely in the Finnish qualifications, this does not mean that they match perfectly and correspond completely to the Finnish qualifications.

In the Irish case, in addition to the use of optional units, the limited logical consistency in describing and categorising learning outcomes in qualification documents is considered a challenge for mapping learning outcomes to reference points:

Box 14.   **Use of optional units in Ireland**

It is difficult to assess the extent to which these reference points are able to capture the overall scope of national qualifications, as it is difficult to judge the overall scope of the qualifications due to their structure with so many optional modules: The structure of the Irish qualifications makes this type of exercise extremely difficult. The healthcare assistant qualification contains three compulsory modules and 30 other modules from which learners select four. If there are, say, ten learning outcomes per module this makes well over 300 learning outcomes.

In Ireland, transversal learning outcomes are 'concentrated' into four modules in the case of both the healthcare assistant and ICT service technician qualification ('concentrated' means that in the other occupation-specific modules there may also be references to transversal KSC). This is interesting because it means that the learner chooses between doing either customer service or communications or team working or personal effectiveness, although the availability of the modules depends on the provider's specialisations and what they offer, and on perceptions of which of these modules is easiest to do (this is what happens in an educational market). So, there can be great variation between people holding what is ostensibly the same qualification in terms of its content.

Perhaps partly because of this structure, a single learning outcome in the reference point might be covered by a combination of learning outcomes in the qualification or it might be so taken for granted that it does not feature at all.

Source: Feedback report - Ireland.

Moreover, some national qualifications contain specific learning outcomes that are not at all included (at least not in an explicit way) in any of the reference points. This was pointed out, for example, for the Finnish VET qualifications:

Box 15.   **Specific types of learning outcomes – example from Finland**

In Finland, it is stated that the 'objective of vocational upper secondary education and training is to provide students with the learning outcomes and vocational skills required by a vocational qualification, as well as capabilities for entrepreneurship. Furthermore, the mission of education is to support students' growth into good and balanced individuals and members of society, and to provide them with the diverse knowledge and skills needed in further studies, professional development and leisure activities and in the development of their personalities' (Finnish National Board of Education, 2015, p.11). To achieve the latter goals, the key competences for lifelong learning have a very distinct role and they are defined as eleven individual competences in the VET qualifications. Almost all of these are missing from the reference points.

Source: Feedback report - Finland.

7.1.2. Challenges connected to general characteristics of all reference points that apply to all usage contexts

7.1.2.1. *Implicitly included learning outcomes*

The question of 'implicit coverage' is a challenge for comparison. The possibility of using this category was introduced because, as a rule, it can be assumed that the wording in the reference points does not perfectly match the qualifications, but it is possible that an item contained in a reference point can be 'read into' the learning outcomes included in a qualification. Thus, instead of individual words, (assumed) underlying concepts were mapped to the KSC statement of the reference point. However, 'implicitly included' can have different meanings and whether an item was explicitly or implicitly included in a national qualification description obviously relies on the experts' interpretation, which introduces an element of uncertainty [147]. For example, if the KSC concepts in the reference points are quite broadly formulated and more detailed concepts used in the national qualifications need to be mapped to them, the category 'implicitly covered' is likely to be selected more frequently. This is particularly the case where a single learning outcome in the reference point could be covered by a combination of learning outcomes in the qualification. 'Implicitly covered' may also have been chosen if the aspect is not explicitly mentioned in the description of the learning outcomes of the qualification, but is a presupposing element of

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[147] This degree of interpretation is a general limitation of the approach used, as we have no evidence of the reliability of the approach. The mapping was done by only one person at a time (supported by sectoral experts) and we have no data to show that the results of mapping the learning outcomes of one and the same qualification to a reference point by different people are consistent.

another learning outcome included in the qualification. Learning outcomes of this kind are not independently specifiable. There may also be an implicit hierarchy in the game, e.g. it may be the case that one has to have acquired certain learning outcomes at a lower level of achievement before learning outcomes can be acquired at a higher level. Another issue is that all descriptions in the reference points are somehow abstractions from a context; challenging the interpretation.

The various reasons that can lead to a high proportion of implicitly included learning outcomes make it difficult to judge whether a qualification fits well with a reference point or not, or to judge which reference point performs better in this respect. The mere comparison of the proportion of implicit learning outcomes does not show any clear findings. For example, it is not possible to clearly indicate whether a high proportion of implicit coverage should be considered unfavourable (e.g. because it indicates that it is difficult to establish a clear link between formulations) or favourable (e.g. because the inclusion of these aspects helps to better reflect the overall scope of a qualification).

7.1.2.2. *Performance level of learning outcomes*

The performance level of learning outcomes is not sufficiently expressed in three of the reference points (as they were used in this study). The VQTS/HCEU Competence Matrix is an exception in this regard. The lack of possibility to reflect different levels hampers the comparison of qualifications, as the example from Denmark shows:

Box 16.   **Link to other qualifications – example from Denmark**

The Danish 'IT-supporter' profile is incorporated into the data and communication programme, which lasts between three and six years. The programme leading to the 'IT-supporter' qualification (NQF/EQF level 4) lasts three years and has a practical focus. This qualification is also integrated as a step in the NQF/EQF level 5 IVET qualification 'Data technician specialising in infrastructure'. Some of the learning outcomes contained in the reference points (both occupational and transversal KSC) are placed in the NQF/EQF level 5 qualification. The difference between the two is hard to capture using the external reference points, since the difference is an issue of level rather than contents.

Source: Feedback report - Denmark.

A similar observation was made in the English case: the treatment of descriptors as all on more or less the same level is a problem as there are clear differences between the abilities required for qualifications linked to different EQF levels and reference points or frameworks should in some way be able to take account of this. This is arguably a problem for all four reference points discussed. EQF does take this into account to some extent but at too high a level of

generality to have the direct applicability that these four reference points aim to have. The expression of performance levels would also benefit the Austrian context where two healthcare assistant qualifications coexist (below the level of a diploma nurse): the 'Diploma nursing assistance - level 1 (*Pflegeassistenz*)' and 'Diploma nursing assistance - level 2 (*Pflegefachassistenz*)' (the latter one was used in this project). The VQTS/HCEU matrix provides competence descriptions at different levels which can be used to compare these two qualifications.

7.1.2.3. *Supporting the identification of essential and less essential learning outcomes (weighting)*

Among the reference points used, only the ESCO profiles used clearly distinguish between 'essential' and 'optional' demands for 'skills/competences' and 'knowledge', and thus give an indication of the varying degrees of importance of learning outcomes (weighting). As discussed earlier (see Chapter 3), the average and median coverage of ESCO essential KSC is significantly higher than that of optional KSC, but there are also some variations across countries and profiles. Such a distinction between 'essential' and 'optional' learning outcomes is, however, usually not made, or made in a different way in the national qualifications (for example, units or modules are labelled as 'mandatory' or 'optional', but not single learning outcomes).

The learning outcomes of the reference points used were also structured into different areas/sections. Usually, the structure already used in the reference point was applied. Only in case of the ESCO profiles, occupational learning outcomes were grouped according to the structure applied in the WSSS. In order to gain insight into the importance of groups of learning outcomes within a qualification, the mapping also included the indication of the weighting of each set of learning outcomes by section or area. Country experts were asked to indicate the weighting in percentages, so that all percentages added up to 100 per cent for the entire qualification (including the set of other/further learning outcomes identified, if applicable). However, in most cases, this kind of weighting was not possible at all (which was confirmed by the consulted sector experts). In most cases, the problem was that qualifications used other forms of grouping learning outcomes and it proved impossible to 'translate' them into the grouping of learning outcomes provided by the reference points ([148]). For example, it was not possible to estimate the weight of the different groups of learning outcomes in the Lithuanian healthcare assistant qualification because a large part of skills and

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([148]) This can also be considered as challenges related to the characteristics of qualifications.

competencies in this profile are of generic character, or cross-cutting through many fields of activity.

In addition, the criteria for weighting or indicating the percentage were not sufficiently clear (e.g. should this be based on the duration of learning time, the importance of content, applicability or value of learning outcomes in the work process, the scope and length of the task?). The handling of implicitly reflected learning outcomes was also unclear (should they be treated in the same way as explicitly reflected learning outcomes?).

Weighting was difficult even in case of the qualifications from UK-England which use credit points. Credit points are assigned to units and not to learning outcomes or to assessment criteria and there are multiple learning outcomes and assessment criteria within each unit. There are also potential overlaps between learning outcomes and assessment criteria in different units in the overall qualification. The weighting of different groups of learning outcomes was considered particularly difficult in contexts where the national qualification description provides a general framework, but which can be implemented at local level individually and in different variations. This is the case, for example, in Denmark:

Box 17. **Example from Denmark**

In the Danish case, weighting is extremely complicated at a general level, since schools and enterprises have the possibility to put different emphases on individual learning outcomes according to the requirements of local labour markets or different types of enterprises (specialisations etc.). Weighting is only possible with a more in-depth knowledge of the systems that are being compared and is nearly impossible on the basis of a comparison of standards (learning outcomes) alone. At a very general level, information on what is covered and what is not covered in a qualification will be an indicator, but in some cases, there are learning outcomes and issues that are implicit and where one has to 'read between the lines' to assess how elements should be weighted.

Source: Feedback report - Denmark.

In the Finnish case, individualisation is also a reason why weighting in the mapping of qualification descriptions to the reference points was not possible; however, other challenges were also identified:

Box 18. **Example from Finland**

The effort to indicate which parts of a qualification are more important than others somehow does not fit to the Finnish concept of designing VET qualifications. The Finnish VET qualification structure has compulsory units for all, optional units, free choice units and requirements for key competences for lifelong learning. Moreover,

the qualification will be realised through an individual competence development plan which is tailor-made for each individual student. Furthermore, the key competences for lifelong learning are both learned and assessed partly as independent units but they are also integrated into the professional/job specific competence requirements which makes the estimation of weighting very difficult and artificial.

Although the scope of the various units is defined with a number of competence points, these are not to be understood as measures for the importance or how essential the unit is in regard to the comprehensive qualification.

Source: Feedback report - Finland.

Also, in the French case, weighting has proven to be difficult for various reasons, but a bit less so for the ICT service technician:

Box 19.   **Example from France**

For the French ICT service technician qualification, weighting was somewhat easier and in particular when mapping it to the ESCO profile, compared to the three other reference points, probably because the ESCO profile mirrors relatively well the key learning outcomes used in the French qualifications. However, language as well as attitudes and values barely appear in the French qualification descriptions. Moreover, not all learning outcomes included in qualifications are thoroughly assessed, even if learners learn them, and this cannot be visualised in the weighting. Also, since the modules in France cover different competences, it is hard to assess the time invested in each of them. The time spent on obtaining a competence may also depend on the learners, and this is also not reflected. The ICT service technician qualification, for example, is modularised and adapted to each individual learner.

Also, in relation to the O*NET profile, with the breakdown into the categories (tasks, knowledge and skills), it is difficult to indicate the percentage for each group of learning outcomes because of the overlap among the tasks, knowledge and skills. Moreover, the different areas used in the WSSS do not mirror the French approach to weighting. And since many of the areas of the VQTS-HCEU Competence Matrix are not covered, it proved difficult to do the weighting.

Source: Feedback report - France.

7.2.   Suitability of the reference points for comparing VET qualifications

This section includes a comparative assessment of the reference points based on the requirements identified ([149]) and the results from the mapping exercise.

([149]) An overview of the analysis of reference points with regard to identified requirements is available in the Annex.

The focus here is on the suitability of these reference points for the international comparison of qualifications.

7.2.1. Scope

As indicated earlier, the international comparison of qualifications requires reference points that are comprehensive in terms of concepts and designations as well as in terms of coverage of different types of learning outcomes (occupational, transversal, general knowledge subjects) and of different languages (ideally, the EU's 24 official and working languages should be covered).

Of the four reference points, ESCO and O*NET are explicitly designed to provide a full coverage of KSC. This is not the case for WSSS which has a limited scope and a specific application, namely competitions, as well as for the VQTS-based Competence Matrices, which are available for selected occupational fields only.

Only the ESCO profiles (as they were used here) and the VQTS-based Competence Matrix HCEU explicitly distinguish occupational and transversal learning outcomes. This distinction is not so clear and only implicitly the case with the other reference points (WSSS and O*NET profiles). However, also in ESCO, the distinction between occupational and transversal KSC is not always clear. Moreover, it is not always considered useful to have them separated (i.e. a list of transversal KSC separated from occupational KSC and without indication of the context in which they can be used). The ESCO list of transversal KSC is also very detailed and it was suggested that it could be simplified by reducing the number of items. This requires a synthesis exercise, hierarchically classifying the competences by groups and establishing degrees of importance or weight in a given profile. It could be further analysed to what extent these KSC items are interdependent and to what extent one assumes another and it would therefore not be necessary to detail them all. It was also suggested introducing a clearer distinction between transversal skills and competences and transferable ones and that transferable skills such as literacy and numeracy should be distinguished from abilities that are necessary for worker autonomy, such as the ability to plan and communicate which can be realised through the application of different skills (always bearing in mind the overall goal of the activity).

Compared to the other reference points, the knowledge component in the VQTS-based Competence Matrix HCEU, which describes competences at different performance levels, was assessed as less visible. However, the mapping only used the general descriptions for the steps of competence

development; there are also more detailed descriptions available which are structured in competence, skills and knowledge.

In terms of language coverage, ESCO is the clear winner. Mapping of learning outcomes to a reference point that uses the same language as the qualification description is favourable for obvious reasons. However, in the mapping exercise conducted as part of this study, only the English versions of the ESCO occupational profiles were used as well as the English versions of the other three reference points.

7.2.2. Categorisation and structure

Related to categorisation and structure, one requirement was assessed as necessary for the international comparison of qualifications: a consistent and transparent construction scheme for OSP. Others, such as explicit performance levels or weighting were assessed as being desirable.

Of the four reference points, only O*NET and WSSS meet this requirement: The O*NET Content Model is systematically used as construction scheme for all occupations included and there are clear rules for designing WSSS (specified in 'Guidance Notes') (WSI, 2013b). In ESCO, however, OSP are based on functional analysis of individual occupations and the publications on the VQTS model only provides general guidelines for the design of competence matrices.

An additional structural organisation of the learning outcomes included in a reference point was assessed as not necessary but desirable. All four reference points show some structural organisation of learning outcomes. This is emphasised here because the grouping of learning outcomes was useful for the mapping exercise as related items were listed together ([150]). This supported the identification of learning outcomes that are to a certain extent related. So, without grouping, the analysis (done 'manually') would have been even more difficult ([151]). However, the grouping of KSC differs from the one applied in the national qualifications and therefore does not support weighting of learning outcomes (a further desirable characteristic of reference points to be used for comparing qualifications). Experience shows that structuring learning outcomes included in a reference point according to work tasks or activities supports the mapping of

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([150]) For the ESCO profiles, that currently do not have a systematic structure, the WSSS structure was used. This helped to navigate through them, but the structure was not always intuitive.
([151]) It was also suggested to include the category 'other' for stating additional KSC from the national qualifications but not included in the reference point under each grouping of KSC.

learning outcomes included in national qualifications. However, the ESCO profiles are not structured in this way.

The expression of explicit performance levels is also a desirable aspect of reference points for the comparison of qualifications since they can, for example, support the visualisation of the differences between qualifications linked to different EQF levels (via their classification at national levels). As discussed above, of the four reference points only the VQTS-based Competence Matrix HCEU meets this requirement since the steps of competence development illustrate the process of progression from the lower to the higher levels.

7.2.3. Access and interoperability

The assessment of requirements per usage context did not identify requirements that are necessary. While O*NET and the VQTS-based Competence Matrix are not linked to any international standard taxonomies, the ESCO occupations are linked to ISCO, WSSS are related to ESCO and to O*NET. Thus, WSSS are only indirectly connected to ISCO via ESCO.

7.2.4. Validity

The following requirements were assessed as necessary for comparing qualifications: regular updates at frequent intervals, traceability of amendments, and public commitment to long-term development of a reference point or system.

Looking at the four reference points, the following observations can be made: O*NET meets all requirements and ESCO has been given a long-term development commitment by the European Commission (regular updates – without a pre-defined timetable but on an ad hoc basis based on stakeholder feedback and needs – including traceability of changes are foreseen for the future). WSSS are updated every second year, following the WorldSkills Competitions (traces of changes are accessible only to members), but there is no clear long-term commitment to develop WSSS into a reference system. The VQTS model does not meet any of these requirements.

7.2.5. Scalability

For all usage contexts, scalability is a key requirement. Scalability is assessed as rather high for O*NET and for occupations and transversal KSC of ESCO. For WSSS, scalability is limited, while it is very low for the VQTS model.

7.2.6. Mapping national qualifications – summary of the assessment with a practical focus

In addition to the more general assessment of the reference points with regard to the identified requirements, this section also includes an assessment of the

suitability of the reference points for the mapping of learning outcomes included in a national qualification based on practical experiences.

The mapping results (see tables in Annex 4) do not show a clear preference for one of the reference points, although the median coverage (corresponding to the share of terms included either explicitly or implicitly in national qualifications) suggests a somewhat lower 'relevance' of the ESCO profiles compared to the other two reference points for which this information is available.

Table 9.   **Reference points used for testing**

Reference point	Median values	
	Healthcare assistant	ICT service technician
ESCO profile	63%	65%
O*NET profile	80%	79%
WSSS	72%	82%
VQTS/HCEU Competence Matrix	n/a	n/a

Source: Database.

The consideration of the comprehensiveness of reference points also does not indicate a clear preference of a reference point: The amount of additional learning outcomes included in qualifications but not in reference points seems to depend more on the specificities of a country than on reference points. The following table shows that the volume of additional learning outcomes for VET qualifications within a country is usually assessed in the same way.

Table 10.   **Volume of additional learning outcomes – overview across profiles**

	Healthcare assistant									
	BG	DK	IE	ES	FR	LT	NL	AT	FI	UK-EN
ESCO	high	low	none	none	low	none	medium	high	high	none
WSSS	high	none	none	none	low	none	medium	high	high	none
O*NET	high	none	none	none	low	none	medium	high	high	none
HCEU	high	none	none	none	low	none	high	high	high	none
	ICT service technician									
	BG	DK	IE	ES	FR	LT	NL	AT	FI	UK-EN
ESCO	high	low	none	none	medium	none	none	high	high	none
WSSS	high	none	none	none	medium	none	low	high	high	none
O*NET	high	none	none	none	medium	none	low	high	high	none

Source: Database.

Also based on the experts' feedback, no clear 'winner' was identified since all four reference points analysed and tested have their strengths and weaknesses.

(a) ESCO is clearly the most comprehensive and relevant reference system of the four, aiming at representing an amalgamation of the occupational profiles of European countries. However, as a reference system, it lacks coherence and the profiles are rather simplistic and limited, with a problematic skill inventory which needs supplementation for particular occupations and lacks a hierarchical structure. The use of the concepts of knowledge and skills/competence or the distinction between occupational and transversal KSC is not always clear, knowledge items are presented as nouns (whereas the learning outcomes statements in many national qualifications are formulated with an action verb) and often without any indication of the context in which they can be applied. There is quite some variation between the learning outcomes in terms of scope and detail (some are considered as too narrow and specific, others as too broad). ESCO also fails to capture the work processes in which required skills and competences are to be used and does not clearly express a level of proficiency.

(b) O*NET is a well-developed and differentiated system but focuses on the U.S. labour market. The profiles are rather short and it is easy to gain an overview, and they include knowledge components. However, the profiles as used in this study lack contextualisation and there is a somewhat unclear division between skills and detailed work activities. Some O*NET statements are very broad and formulated in a more general (less detailed) way, they do not express the level of proficiency of learning outcomes and there is no clear distinction between occupational and cross-sectoral/transversal learning outcomes.

(c) WSSS are clearly described and understandable, they use a clear and logical structure (although it remains to a certain extent unclear how to interpret the role that the areas/headings play), they integrate occupational and transversal skills and are activity oriented (however, they could be expanded by specifying detailed work activities). Critical points include that the division into 'know and understand' and 'be able to' seems to be a bit artificial and it makes the KSC lists rather long and verbose. Some WSSS statements merge KSC that do not necessarily always go hand in hand and transversal aspects are not sufficiently covered. Moreover, WSSS also has an element of hierarchy which is helpful but is too demanding for qualifications of a number of less well-developed VET systems. WSSS would need to be adapted also for lower performance levels.

(d) VQTS-based Competence Matrices are only available for selected occupational fields and they are usually not updated. However, the rationality for structuring the VQTS/HCEU Competence Matrix is generally logical and

understandable, the descriptions are generally short and clear and are based on the holistic descriptors of competences related to work processes. Specific occupational items are included but also more transversal ones. The VQTS/HCEU Competence Matrix is very good in differentiating competence areas and higher and lower level abilities. However, the differentiation of the steps of competence development makes the mapping process more time-consuming and requires deeper expertise related to these work processes. Moreover, some statements are described in a rather broad manner (and in these cases it would be sometimes necessary to read the detailed information also provided in the HCEU Competence Matrix but not used for the mapping in this project) whereas others are too much focused on the details. Also, the lack of knowledge descriptors in the profile used for the mapping exercise is a weakness. However, in the HCEU Competence Matrix, knowledge aspects are actually specified and could be used for mapping.

7.2.7. Comparing qualifications based on reference points – use cases

As shown above, a general assessment of which reference point is more appropriate than others for comparing VET qualifications is a challenge. It is always necessary to indicate the specific purpose of the comparison before such an assessment can be made. Whether a reference point will be used for comparing qualifications generally depends to a certain extent on its perceived relevance in a specific context or for a specific need. Comparisons of the profile and content of VET qualifications can serve different purposes and, depending on the purpose, the methodology applied, the reference points and the sources used as well as the results obtained (including the way they are presented and what is considered as 'meaningful' result) must meet different requirements. In particular the requirements for the depth or level of detail of this comparison depend on the specific interests. In general, however, a comparison, although probably always with limitations, can in most cases at least serve as a starting point for further steps.

Some potential user cases for international comparison of VET qualifications are listed below. The purposes of qualification comparison are also important aspects to be considered in the methodological toolbox. Thus, these user cases will be taken up and further elaborated in WA4.

7.2.7.1. *Supporting the improvement and further development of national qualifications*

A reference point for mapping qualifications and their learning outcomes can provide added value because it allows for a detailed comparison of which concrete occupational and transversal skills and competences have been covered or not by each single qualification. This approach is demonstrated by the 'mapping tables' in Annex 4, showing how the qualifications covered in the study match the concepts included in the ESCO profiles, O*NET profiles and WSSS. The VQTS-based Competence Matrix HCEU with each specific structure (steps of competence development) is less useful for providing such an overview of several qualifications next to each other. The overviews provided by these tables in the Annex provide a direct and detailed comparison of the intentions of national qualification authorities. They do not list any additional learning outcomes included in the qualifications but not in the reference point. However, in order to give an impression of the completeness of the individual reference points in relation to each qualification, they indicate the volume of additional learning outcomes. (which is assessed as 'none', 'low', 'medium' or 'high').

The comparison of VET qualifications mapped to these reference points allows national (within or outside Europe) policy-makers and stakeholders to systematically judge their own priorities and solutions and to gain inspirations from other countries' choices for revising or further developing their own qualifications. The reflection on the mapping results can support mutual learning between countries and can be used as a starting point for improving and further developing qualifications.

7.2.7.2. *Supporting the international cooperation across countries*

The international cooperation across countries (e.g. for the purpose of identifying learning outcomes that can be addressed in mobility phases or in joint programmes) might require the identification of 'core profiles' or 'core learning outcomes' that are included in the national qualifications preparing for the same occupation. Annex 3 shows the profiles that emerge when selecting those learning outcomes from each reference point for the healthcare assistant profile that are covered (either explicitly or implicitly) in at least nine out of the ten qualifications.

7.2.7.3. *Showing differences and similarities of qualifications in the EQF context*

Qualifications from the same occupational field but linked to different EQF levels, for example, can be compared to check whether and how the different performance levels are expressed. This comparison can be supported by a

reference point that allows for identifying different performance levels, such as a VQTS-based Competence Matrix. Such a reference point could also be used for comparing qualifications from different countries with a similar profile and the same EQF level to explore the consistency of levelling decisions ('horizontal comparison' – see IBE, 2016) or just to visualise the similarities and differences of these qualifications. Annex 5 provides an example of the comparison between the Danish and the Irish healthcare assistant qualification (both are linked to EQF level 4) based on the mapping on the VQTS/HCEU Competence Matrix. The mapping shows clear differences between these qualifications. In order to interpret them, however, further information would need to be collected on these qualifications.

7.2.7.4. *Applying for a job or further learning programme in another country with a VET qualification*

A vacancy note or the access requirements for an educational programme might indicate a specific VET qualification as a requirement or prerequisite. In order to establish equivalence between this qualification and one's own qualification, a reference point can be used for the comparison. Identifying similarities and differences can help decide whether it is worth applying for the specific job or education programme. It can also provide arguments as to why one's own qualification can be considered sufficient, or it can provide insights into what additional learning outcomes would be required to meet the requirements. A similar form of checking the content and profile of the applicant's qualification is also possible for the respective employer or the person responsible for the admission procedure to the educational programme.

The 'HealthCareEurope' project ([152]) that developed the VQTS/HCEU Competence Matrix followed this aim: It provides tools and instruments to support recognition praxis of foreign qualifications related to nursing and elderly care across Europe and around the globe. This is supposed to support a smooth recognition of prior expertise migrant workers bring with them when moving to another country. This approach can support professional mobility within Europe, speed up recognition procedures and thus help to reduce the imbalance and skills shortage within Europe. The Competence Matrix developed allows to map both the formal qualifications acquired abroad and the results of non-formal and informal learning, such as practical work experience. The comparison of qualifications makes it clear which differences exist between VET qualifications

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([152]) https://www.project-hceu.eu

across countries and which knowledge, skills and/or competences are 'surplus' or 'lacking'. This is presented in an innovative 3D representation. Thanks to this intuitively understandable cube, it is possible to illustrate both the similarity of occupational content and qualifications and to deduce the training needs resulting from the migration of nurses.

7.2.7.5. *Obtaining a VET qualification in another country based on work experience and non-formal learning*

A reference point that facilitates the mapping of learning outcomes contained in national qualifications and their translation into other languages supports the identification of corresponding learning outcomes achieved through work experience and non-formal learning or in the context of discontinued training in another country. This can improve the information on the chances of participating in validation procedures in the other country by showing the learning outcomes already acquired and those yet to be achieved. In particular, an appropriate reference point can support the identification and documentation of a person's learning outcomes acquired through non-formal and informal learning in another country with a view to obtaining a vocational qualification.

7.3. Suitability of the reference points for automated text processing of qualifications data (WA2: Exploring, gathering and analysing national qualifications data)

7.3.1. Introduction

This study focused on the reference points that are suitable for the comparison of VET qualifications and their learning outcomes. The qualifications themselves were not at the centre of the discussion or only to the extent that challenges were identified in the mapping process associated with specific characteristics of the description or structuring of qualifications or due to the extent of differences in approaches to describing and structuring learning outcomes in reference points and qualifications. However, the results and success of mapping processes also depend on the quality and comprehensiveness of the qualification descriptions or the accessibility of the descriptions. Thus, a closer look is needed at the key sources for data on national qualifications, in particular related to their content and profile. These key data sources will be explored in WA2 which looks at the dimensions or conditions for the suitability of data sources of qualifications (documents as well as qualifications databases or registers) that are important for

the comparison of qualifications. These dimensions will also need to be reflected in the methodological toolbox.

In this study, the analysis of qualifications and the mapping of their learning outcomes to the selected reference points was done manually. This means that each country researcher (supported by sectoral experts) tried to identify the match between the reference points and the qualifications descriptions by looking at each KSC concept included in the reference point and checking whether there is an equivalent statement contained in the qualification. If a match was identified, the cell for 'explicitly covered' or 'implicitly covered' was ticked in the Excel list provided. Thereby, 'explicitly covered' was chosen when the learning outcome statement described in the reference point could clearly be identified in the qualification description because quite identical or similar formulations are used. 'Implicitly covered' was chosen when the learning outcomes described in the reference point are not explicitly mentioned in the qualification description but based on the descriptions, it seemed that there was an indirect reference to it.

Ideally, the learning outcomes identified as explicitly or implicitly covered were also marked in the qualification description. In this way, after checking the coverage for each element of the reference point, it was possible to identify which additional learning outcomes are included in the qualification that are not included in the reference point. While this was possible for qualifications described on a limited number of pages, it proved difficult or impossible for qualifications with very extensive descriptions. Taking into account the scalability requirement, which will also be crucial for the methodological toolbox for qualification comparison, it is clear that manual analysis and mapping of learning outcomes of qualifications – in addition to all the other challenges already mentioned – is far too resource intensive, making it difficult and costly to repeat for other qualifications and countries. More or different solutions need to be found for gathering and analysing national data on qualifications that can help to meet this challenge. WA2 will therefore explore the use of new digital technologies for an 'automated' gathering of data on qualifications.

7.3.2. Suitability assessment

Three of the four analysed reference points or systems, O*NET, the WSSS and VQTS-based Competence Matrices, are assessed as less suitable for this usage context because they do not comply with most of the requirements specified. O*NET nevertheless has one feature which ESCO, the best suited candidate for this usage context, is lacking: OSP which have been compiled according to a consistent construction scheme, using weighting based on empirical evidence. The O*NET OSP facilitate a systematic detection of shared and differing features

across occupations. Although ESCO is the only one of the four analysed reference points or systems qualifying as a potential reference system for automated text processing, it is far from perfect. Major deficits are the currently inadequate structure of most parts of the skills pillar (hampering automated reasoning), the lack of generic skills terms ([153]) (hampering the automated mapping of concepts occurring at different levels of specificity), the fact that OSP have not been compiled according to a uniform construction scheme consistently applied across all sectors (resulting in an imbalanced assignment of transversal and occupational KSC across occupations and sectors) and a weighting of KSC which can be contested, because it is the result of an non-transparent editorial decision, and not of empirical evidence.

The question of the 'implicitly addressed' KSC (see discussion above) must be given special consideration in this usage context. To what extent can digital tools map learning outcomes without direct (explicit) match and to what extent can machine learning be used to improve the mapping of implicitly addressed KSC? And to what extent will human intervention be required to (manually) identify implicitly included learning outcomes or to check and, if necessary, correct identified matches?

In the context of ESCO, another aspect needs to be taken into account: ESCO profiles combine both shorter phrases (KSC concepts) and longer, more detailed descriptions (in a separate data field). The mapping exercise has shown that it is sometimes necessary to read the longer descriptions to understand the meaning of the KSC concept and to determine whether it is included (explicitly or implicitly) in a qualification. It should therefore be considered whether these longer descriptions should be used and what impact this will have on the automated word processing of qualification data. In addition, it has to be decided whether the mapping supported by digital tools should be limited to pre-selected occupational profiles or whether it would be more appropriate to include the whole ESCO skills pillar to analyse the learning outcomes contained in a qualification. In the latter case, it might also be possible to map learning outcomes contained in qualifications that are not included in the specific occupational profiles. However, the resources required must also be taken into account here: How much human effort would be required to verify and correct the identified matches? It could be considered using specific occupational profiles as

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([153]) One of the NLP experts we interviewed in the course of this investigations called ESCO skills 'too verbose': KSC like 'cut trees to clear public access' never or only rarely occur in exactly the same form in vacancies, whilst more general, broader concepts are missing.

a starting point and to use the whole ESCO pillar only for the 'other' learning outcomes. But how then to deal with these other learning outcomes that are mapped to ESCO concepts? Can they also be used to compare qualifications? Or can they possibly be used to identify other occupational profiles addressed by the qualification?

7.4. Suitability of the reference points for exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements (WA3)

7.4.1. Introduction

In this usage context, the reference point will not only be used for mapping intended learning outcomes (learning outcomes included in qualification descriptions) but also for mapping achieved learning outcomes (that have been put into practice by graduates and 'experienced' by employers) and required learning outcomes (that are actually needed at the workplace). It is planned to develop a survey methodology that involves graduates as well as employers in order to gather and analyse data on the relevance of VET qualifications, i.e. the match/mismatch between qualifications and the labour market. Thus, the reference point to be used in this context has to meet some specific requirements: It should not be too detailed (in particular, the reference point has to contain concepts for assessing achieved learning outcomes at a lower level of granularity compared to the usage contexts discussed above), the concepts included need to be understandable for both, graduates as well as employers, and the workload for completing the survey has to be reasonable (i.e. it should probably not take more than 30 minutes to complete it).

7.4.2. Suitability assessment

A reference point that is structured around work tasks that reflect real working life seems to be most suitable for this purpose. WSSS and VQTS-based Competence Matrices already have such a structure; the same grouping of learning outcomes could be applied to ESCO occupational profiles and to O*NET profiles. Regarding the level of detail, the O*NET profile (at least for the nursing assistant) could be the preferred one because it is the reference point with the lowest number of learning outcomes items. The VQTS/HCEU Competence Matrix, however, has the advantage that different performance levels can be indicated. Thus, it could be used to explore commonalities and differences in

terms of performance levels between the intended, achieved and required learning outcomes.

7.5. Suitability for the Skills Panorama

The recommended reference system should also enhance data exchange with other projects, such as the Cedefop Skills Panorama ([154]). Differences in the requirements are mainly the consequence of the focus on structuring information here. Necessary languages for instance can be reduced to English, French and German (although information in more languages is always favourable); and explicit performance levels and weighting are not needed.

ESCO appears to be the best suited reference system for structuring online labour market (LM) information, as it fulfils most of the requirements labelled as 'necessary' for this usage context, such as comprehensiveness, both with regard to concepts and EU languages (though for structuring online LM information English, French and German would suffice), an appropriate organisation format, additional structural organisation and strong public commitment to long-term development. Yet, ESCO shows shortcomings with regard to two 'necessary' requirements, namely vocabulary control and traceability of amendments (the latter is, however, intended).

Of the 'desired' requirements, ESCO has deficiencies in structuring its content ('Finely tiered structure leading from general to more and more detailed concepts'), and it lacks a consistent and transparent construction scheme for OSP, as well as linkage to national European taxonomies. What counts more, however, is the connection with ISCO 08, even if linkage to other standard taxonomies such as ISCED would also be desirable. More details on ESCO's shortcomings in this regard is presented in the following paragraphs.

(a) Vocabulary control (necessary requirement): Terminological rules are mentioned in the ESCO handbook, but are not transparent to users. O*NET in contrast covers this point very well; the standardised procedure of compiling concepts and designations is documented and available.

(b) Traceability of amendments (necessary requirement): Due to its short lifetime so far, this requirement cannot fully be assessed for ESCO. Yet, the ESCO handbook declares that new releases of ESCO will guarantee full backward compatibility, and history notes will document the amendments (see

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([154]) In the future, Europass might integrate the technical side of the Skills Panorama.

European Commission, 2017a, p. 35). O*NET in comparison has already proven traceability of their updates.

(c) Finely tiered structure leading from general to more and more detailed concepts (desired requirement): ESCO already fulfils this requirement for occupations and for transversal and cross-sectoral KSC. Sector- and occupation-specific KSC, however, so far are not structured, although related activities are intended. The other three potential reference points or systems perform better for this requirement, albeit to varying degrees. O*NET shows the most elaborated structuring, while WSSS and the VQTS model only partially meet the requirement.

(d) Consistent and transparent construction scheme for OSP (desired requirement): The OSP in ESCO have been compiled based on functional analysis of individual occupations. No documentation of a general construction scheme is publicly available. O*NET and WSSS provide more favourable results, again with O*NET using the most elaborated approach.

(e) Linked to national European taxonomies of related content (desired requirement): following ESCO's primary intention to facilitate information exchange between people, languages, and Member States, linking its content to national taxonomies in European countries is essential and therefore intended. To date, however, this linkage is not in place. None of the other reference systems provides linkage to such taxonomies, either.

With these considerations it is quite obvious that besides ESCO, O*NET would come next in meeting the requirements for structuring online information systems on LM and VET related topics. O*NET's strong points lie primarily in its well-founded taxonomy work, visible in the requirements of vocabulary control, of structuring and using a consistent construction scheme for OSP. This is also fostered by O*NET's long history, resulting in experience with regular updates and the development of transparent documentation. A strong argument why it should not be chosen as a central reference system, however, is its limitation to the U.S. labour market, and consequently to (American) English as the only language.

Both WSSS and the VQTS model suffer from comparable weaknesses: Their primary intention is not to serve as a comprehensive reference system. Instead, WSSS were developed to foster capacity building and to enhance excellence in VET. Both are limited in terms of occupations and KSC, and also in terms of qualification levels. These features make them less suitable for structuring information systems such as the Cedefop Skills Panorama.

Even if ESCO still shows considerable shortcomings, it has the potential for a suitable reference system for this usage context. There are clear indications for

future development, so that improvements with regard to vocabulary control and traceability of amendments – being the only 'necessary' requirements not covered – can be expected. Last but not least, the European Commission's strong commitment to long-term development of ESCO fosters this assessment.

7.6. Suitability of the reference points for big data analysis from online vacancies / European Skills & Jobs Survey

What has been said already under 'Automated text processing of qualifications data – WA2' also applies to this usage context: ESCO, despite having certain shortcomings (mainly lack of structure in the KSC pillar and an unsuitable alignment with the language of the labour market, again mostly for KSC), it is the only candidate that seems to show at least medium suitability for this usage context.

Chapter 8. Conclusions and recommendations

In section 1.2.1, the key research questions for this study are listed. As indicated, this list is slightly different from the questions posed in the ToR as one question (originally it was Question 3) is now integrated in Question 1. In this section, on the basis of the previous chapters, answers are provided to the two research questions.

8.1. Research question 1. Which are the relative strengths and weaknesses of ESCO (v1), O*NET and WSSS (and other potential reference points) when used as external reference points for comparison of VET qualifications?

Besides ESCO, O*NET and WSSS, the study identified other potential reference points. It looked at the VQTS (Vocational Qualification Transfer System) model which was developed and further applied in a series of EU funded projects ([155]). Furthermore, the Common Training Frameworks ([156]) and the Blueprint for Sectoral Cooperation ([157]) were taken into account. Finally, national competence classification systems were considered: from Austria - *AMS-*

([155]) http://www.vocationalqualification.net; Luomi-Messerer, 2009.

([156]) Directive 2005/36/EC on the recognition of professional qualifications (as amended through Directive 2013/55/EU in November 2013 (http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013L0055) has created the possibility to introduce new routes for automatic recognition through the 'Common Training Principles', which aim to be similar in effect to the automatic recognition based on the harmonisation of the minimum training requirements of the five sectoral professions in the healthcare sector. Common training principles for other professions should take the form of common training frameworks (CTF) or common training tests (CTT) (cf. Articles 49a and 49b of the mentioned Directive).

([157]) This is a rather new initiative, a key action of the New Skills Agenda for Europe (http://ec.europa.eu/social/main.jsp?catId=1415&langId=en). The Blueprint is a framework for strategic cooperation between key stakeholders (e.g. businesses, trade unions, research, education and training institutions, public authorities) in a given economic sector. The aim is to develop concrete actions to satisfy short and medium-term skills needs to support the overall sectoral strategy. The first five Blueprint Alliances started to work in January 2018 and four additional Blueprint Alliances started working early 2019.

Kompetenzenklassifikation ([158]), the Czech Republic – *Centrální databáze kompetencí* ([159]), Italy – *Professioni, occupazione, fabbisogni* ([160]), France – *Répertoire Opérationnel des Métiers et des Emploi*, *ROME* ([161]), and the UK – *National Occupational Standards, NOS* ([162]). All these other potential reference points were used for inspiration, but only the VQTS model was further analysed. The Common Training Frameworks and the Blueprint for Sectoral Cooperation are still at early stages of development and most national classifications are available only in national languages and the chances of using one of these national models at European level are considered rather low. Hence the identification of strengths and weaknesses focused on ESCO, O*NET and WSSS and VQTS.

Strengths and weaknesses relate to the different usage contexts in which the reference points are used. The study looked at the use of reference points for international comparison of VET qualifications (WA1 – the current project), for the automated text processing of qualifications data (WA2), for exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements (WA3), for the Skills Panorama (Cedefop project on intelligence of skill needs) for big data analysis from online vacancies (Cedefop project on vacancy analysis), and for the European Skills & Jobs Survey (survey on skills mismatch). While the second research question relates to all these contexts of use, except for the first one, the focus of this study (and the first research question) was on the international comparison of VET qualifications.

Even within a specific usage context, and more specifically in the context of international comparison of VET qualifications, different purposes determine the strengths and weaknesses of reference points, making the assessment a challenging one. Questions arise, for instance, on what is the purpose of international comparison. What level of detail is required? What level of certainty is needed in comparison? Which learning outcomes need to be taken into account? Which languages need to be covered?

Nonetheless, the study analysed the four reference points, looking at different requirements: scope (which refers to the range of concepts, designations and languages to be covered by the reference point or system), categorisation and structure of the terms and concepts included, access and

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([158]) http://www.ams.at/bis/bis/KompetenzstrukturBaum.php
([159]) http://kompetence.nsp.cz/
([160]) http://professionioccupazione.isfol.it
([161]) https://www.data.gouv.fr/fr/datasets/repertoire-operationnel-des-metiers-et-des-emplois-rome/
([162]) https://www.ukstandards.org.uk

interoperability of the reference point or system, validity of the terms and concepts included, scalability of the reference point or system.

The four reference points were developed in different contexts and for different purposes, which is reflected in the way they are structured and formulated. Of the four reference points used here, only the VQTS-based Competence Matrices are specially designed for qualification comparison. This needs to be taken into consideration when assessing their functionality vis-à-vis national qualification descriptions. They often use rather broad descriptors which lend themselves to contextual interpretations. In fact, all of them require a certain amount of interpretation, which introduces an element of uncertainty. It needs to be acknowledged that the 'words' used may not mean the same in all countries and something might also get lost in translation. Moreover, it has to be considered that the possibility for comparing qualifications (and their labour market relevance) and the quality of the result of this exercise not only depends on the suitability of the reference points. The description of qualifications and the way the information is presented in qualification documents also plays an important role. The worst case would be comparing one set of poorly drafted learning outcomes in the reference points with another set of poorly drafted learning outcomes in qualification descriptions.

Some qualification descriptions might better a better match with a specific reference point than others (e.g. because they share the same logic of development, use similar vocabulary, or use similar structural elements). In these cases, the mapping of learning outcomes included in a qualification is probably easier. For example, qualifications that also distinguish between occupational and transversal learning outcomes or between knowledge and skills, might be a better match with ESCO, O*NET or WSSS. Qualifications that present learning outcomes in close relation to work processes and describe them in a holistic way (i.e. not broken down in knowledge, skills, competences), in turn, might more easily be mapped to a VQTS-based Competence Matrix.

The following table provides an assessment of the strengths and weaknesses of the four reference points in relation to the necessary requirements for international comparison of qualifications (green shade refers to a strength; orange shade refers to a weakness). It also provides an assessment of the general applicability, the necessary amendments needed for providing input to a methodological toolbox for the international comparison of qualifications and finally, the workload associated with making the necessary changes.

Table 11. **Assessment of the suitability of the selected reference points for the international comparison of VET qualifications (WA1)**

	ESCO	O*NET	WSSS	VQTS c. m.
Scope				
Comprehensiveness of concepts and designations	Developed for EU countries	Comprehensive coverage (but based on US labour market	Developed for global competitions, less for the labour market	Developed specifically for comparing qualifications in an EU context
	Comprehensive coverage of OSP	Development based on US labour market	No comprehensive coverage of OSP	No comprehensive coverage of OSP
	OSP not always able to cover all LOs in national qualifications	OSP not always able to cover all LOs in national qualifications	OSP not always able to cover all LOs in national qualifications	OSP not always able to cover all LOs in national qualifications
Coverage of different types of LOs (occupational, transversal, general knowledge subjects)	**Yes:** Occupational KSC (knowledge, skills/competences), sector-specific KSC, cross-sectoral KSC, transversal KSC.	**Yes:** Occupation-specific learning outcomes (occupation-specific tasks, work-related attributes), transversal learning outcomes (e.g. problem solving or social skills), general knowledge subjects (specific academic subjects and functional knowledge, e.g., biology, foreign language, mechanical knowledge); worker characteristics (cognitive, psychomotor, physical, sensory abilities; interests; values; and work styles).	**Yes:** Knowledge and understanding, abilities; implicit distinction between technical/occupation specific and transversal skills.	**Yes:** Competences ('abilities') – integrating soft skills in context-related descriptions (the steps of competence development are first described in a rather general way and are then presented in more details, structured in competence, skills and knowledge).
available in EU's 24 official and working languages	**Yes**: Available in a large number of languages	**No**: Only available in English	**No:** Only available in English	**No**: Available in English and a few other languages
Categorisation and structure				
Consistent and transparent construction scheme for OSP	**No** OSP are based on functional analysis of individual occupations Lack of vocabulary control and transparency of terminological rules	**Yes** O*NET Content Model is systematically used as construction scheme for all occupations. Standardised and transparent procedures for compilation and naming of occupations, tasks, tools & technologies etc.	**Yes** Rules for designing Standards Specifications are specified in 'Guidance Notes'	**No** The VQTS model only provides general guidelines, e.g. core work tasks – the basis for competence areas – must be derived empirically No formalised structure for describing learning outcomes
Validity				
Regular updates at frequent intervals	Intended	**Yes**	Every second year, following the WorldSkills Competitions	**No**
Traceability of amendments	Intended	**Yes**	Yes, but accessible only to members	**No**

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Public commitment to long-term development of a reference system	**Yes**	**Yes**	**No**	**No**
Necessary amendments	Need to formalise structures for describing and classifying learning outcomes in OSP	Profiles need adjustment to EU labour market Need to be translated in other languages	More profiles need to be developed Need to be translated in other languages Need to be aligned more with labour market needs Need to formalise structures for describing and classifying learning outcomes	Need to be translated in other languages More profiles need to be developed Need to formalise structures for describing and classifying learning outcomes Need to be updated and maintained
General applicability when necessary amendments are taken into account	**High - medium**	**Medium - low**	**High - medium**	**High**
Assessed relative workload to complete the necessary amendments	**Medium**	**Medium**	**Medium**	**High**

Source: Authors.

All four reference points analysed can be used to compare VET qualifications from European countries (WA1) - although only the VQTS-based competence matrix HCEU was actually designed for this purpose. However, it should be noted that there are some limitations: O*NET refers to the US labour market, WSSS and VQTS-based Competence Matrices are available for a limited number of profiles only and all of them except ESCO are merely available in English (or – as in the case of the VQTS model – have been translated into few other languages only). The downside of ESCO is the lack of consistency in how it defines and describes OSP and KSC (lack of quality and consistency) and the lack of a useable classification of KSC in OSP. This downside refers less to using individual reference points for international comparison of qualifications, but is a more fundamental criticism towards ESCO as a reference system. This criticism becomes even more important in using ESCO in other usage contexts.

In general, all four have the potential for 'up-scaling'. However, this would require quite some resources in the case of VQTS-based Competence Matrices and probably also in the case of WSSS ([163]). Using any of the reference points is

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([163]) Furthermore, the assessment of the requirements that reference points must fulfil in this usage context did not contain any further ranking of these requirements. For example, if the 'scalability' requirement is considered the most important, it is obvious that WSSS and the VQTS model are very limited in their suitability.

possible for international comparison, even though some necessary amendments will have to be taken into account. This then obviously becomes a resource issue as well: While the VQTS model might work best in conducting an individual case of comparing qualifications, applying this approach to all relevant qualifications in Europe requires a far larger workload/investment compared to using ESCO or O*NET.

ESCO has a good starting position to be used as it already includes a high number of KSC and OSP and is available in many languages. The problem with ESCO is however a fundamental one and relates to the design process of ESCO. ESCO followed a sectoral approach without a clear conceptual model for developing OSP and classifying KSC. The result of this approach is that there is a lack of consistency in how the OSP and KSC are developed and what they include and there is overlap between KSC (specifically visible for the transversal KSC). In order to become a suitable reference system for comparing VET qualifications, ESCO must be provided with this foundation: a conceptual model and the revision of the skills pillar and the OSP to ensure a consistent approach. The scaling-up ESCO may be resource intense in conceptual work (more than O*NET, VQTS or WSSS), but less resource intense in covering all sectors and languages.

> **Conclusion 1: All four analysed reference points that showed potential to be generally applicable as reference point and system have strengths and weaknesses related to this general applicability for the international comparison of qualifications. While ESCO is currently best positioned for this purpose in terms of sectoral and linguistic coverage, ESCO would require the development of a conceptual model underlying the approach to ensure consistency in the description of KSC and the design of OSP. Any reference system needs a firm conceptual basis to interpret the outcomes of a comparison of qualifications. The other reference points also provide opportunities in different contexts in which comparison of VET qualifications is involved and particularly the use of VQTS-based Competence Matrices or WSSS can be further explored in cross-country cooperation activities within Europe (such as in Erasmus+ projects, Sector Sills Alliances, Centres of Vocational Excellence).**

In the sections below, the four sub-research questions are discussed. Before this, the following sub-section discusses another emerging issue for the international comparison of VET qualifications: the restriction to learning outcomes.

8.1.1. Note on the focus on learning outcomes

The use of reference points in this study focuses on learning outcomes. However, not all information relevant for the comparison of VET qualifications is expressed by learning outcomes alone. Different types of additional information also have a significant influence on the content, labour market value, national reputation and international perception of a VET qualification, for example:

(a) national VET governance (e.g. a VET qualification might be closer aligned with the needs of the labour market if social partners are involved in their design);

(b) formal aspects of organisation (duration, entry requirements);

(c) ratio between work-based and school-based learning/training;

(d) assessment methods applied;

(e) professionalism of teachers/trainers;

(f) quality monitoring applied in the particular VET programme (as one of the preconditions for trust) ([164]);

(g) currency for further learning, such as access to the next level of education;

(h) currency in the labour market, such as intended position in the national labour market (demarcation to closely related occupations, position within national occupational taxonomy);

(i) currency for the society, such as social status associated with a qualification.

A previous study (Cedefop, forthcoming-a) raised the question of how much and what kind of information is needed to compare qualifications. The comparative analysis revealed the specific aspects – 'key comparability criteria' – distinguishing IVET qualifications from each other: the distribution of types of learning outcomes (general knowledge subjects, transversal learning outcomes and occupational learning outcomes); the purpose and currencies of qualifications and the extent to which qualifications provide access to further learning and (conditional/limited) access to higher education.

Thus, if one wants to arrive at a more thoroughly informed transnational comparison of VET qualifications, these additional influencing factors would also have to be analysed, ideally also relating the intended learning outcomes described in qualification documents to those actually achieved by school leavers or graduates. Such a comprehensive approach would not only improve the accuracy of a comparison of VET qualifications, it would also facilitate the alignment between the supply and the demand side of the labour market.

([164]) 'Measures for quality assurance have a direct impact on outcomes of VET. Therefore, quality assurance must be incorporated as background variable in the project design for a future VET-LSA' (Baethge et al., 2008/9, p. 40).

VET qualifications in EU Member States (the 'supply side') are expressed in different languages and styles, at different levels of detail, coming from a broad range of occupational areas. On the demand side – e.g. as expressed in occupational standards or in job vacancies – requirements are not limited to learning outcomes (in terms of knowledge, skills, competence – KSC) but also refer to characteristics which are not necessarily explicitly addressed in qualification descriptions, such as physical abilities, personal characteristics, occupational interests or attitudes and values. These job requirements display a comparable range of linguistic variation. They also occur in some countries' OSP but are not readily picked up in the reference points analysed in this study.

Moreover, the restriction to learning outcomes may potentially miss important conceptual differences in reference points. For example, it can be questioned whether 'full occupational capacity' is expressed as learning outcome.

Conclusion 2: The sole focus on learning outcomes constitutes a certain restriction for the international comparison of qualifications. Nevertheless, a reference point (based on learning outcomes) can serve as translation hub between VET qualifications, between the supply and the demand side, in different usage contexts.

8.1.2. Research question 1.1 To what extent are these reference points sufficiently detailed to capture the intended learning outcomes addressed by national qualifications?

Each reference point has its own way of describing learning outcomes: ESCO provides both short and longer descriptions, VQTS-based Competence Matrices provide different levels of proficiency, WSSS focuses on work tasks and O*NET has a uniform structure for clustering learning outcomes across OSP. In general, all reference points have a sufficient level of detail to capture the intended learning outcomes addressed by national qualifications, yet all face challenges.

In general, challenges relate to what is considered as explicitly and implicitly addressed by a reference point. Concerning the latter, in most instances, there is not a one-to-one match between the concepts included in a reference point and the learning outcomes contained in a national qualification. Even if an explicit match has been found (as assessed by experts), there is always some degree of interpretation (e.g. regarding the identification of similar words and synonyms or the reference to the same context). In any case, this degree of interpretation is higher when an implicit match is established. This can refer to the inclusion of a learning outcome in more abstract descriptions (for instance 'helping elderly' is

considered as implicitly included in 'helping clients at all age-groups') or it can refer to pre-assumed presence of learning outcomes in reference to others (for instance 'conducting mathematical calculations' is considered as implicitly included in 'administer right doses of drugs'). In addition, each reference point has its own challenges concerning the level of detail that hamper the mapping:

(a) **ESCO:** There is an imbalance and inconsistency on how transversal KSC are taken into account. The list of transversal KSC is long and very detailed. In addition, sometimes transversal KSC are already integrated in occupational KSC leading to duplication and lack of clarity on how to balance the transversal and occupational KSC. Furthermore, in terms of providing sufficient level of detail, the ESCO assessment revealed that use of the concepts of knowledge and skills/competence is not always clear and that there is quite some variation between the learning outcomes in terms of scope and detail.

(b) **O*NET**: Some statements are very broad and formulated in a more general (less detailed) way which creates challenges in comparing them with learning outcomes included in national qualifications, leaving more room for interpretation.

(c) **WSSS**: WSSS statements are rather broad leaving room for different interpretations.

(d) **VQTS/HCEU**: There is a large variation in the level of detail in statements and the knowledge components remain implicit within the ability descriptors (they are only made explicit in the more detailed descriptions that were not used in the mapping exercise).

However, it should also be mentioned that national qualifications differ in their level of detail. This difference can be seen between countries, within countries, between OSP and even between statements within an OSP.

Conclusion 3: All reference points generally strike a balance between being detailed enough to capture the content of what is included in national qualifications and being concise enough to be applicable. Some reference points (WSSS and O*NET) are more consistent in how learning outcomes are described (at what level) and clustered. ESCO has the disadvantage of not having a strictly applied approach to clustering and integrating (transversal) learning outcomes, leading to duplications, to variations across sectors and in the level of detail applied and to a lack of consistency.

8.1.3. Research question 1.2 To what extent are these reference points able to capture the overall scope of national qualifications (broad vs. narrow)?

An underlying question here concerns the thinking behind the function of a reference point. Is it intended to provide a realistic description of what a person in a particular occupation must have in terms of learning outcomes in order to be a professional? Is it intended to provide a comprehensive list of all possible learning outcomes that may be relevant to the profession in different contexts?

Another related issue concerns the function of national qualification descriptions. Again, one might wonder whether they are complete lists of learning outcomes required for a particular occupation; or whether they are specific groups of learning outcomes for a particular task. Since a qualification may have different purposes, the description may also include learning outcomes related to preparation for further education or higher education, in addition to learning outcomes preparing for access to the labour market.

In any case, for the international comparison of qualifications, the reference point needs to be able, on the one hand, to capture as many of the learning outcomes contained in national qualification descriptions as possible (comprehensiveness). On the other hand, it should not include too many learning outcome statements not reflected in national qualification descriptions (relevance). However, the purpose of the comparison (as well as the target group and users of the results) determines the extent to which these requirements must be met in each case.

The following figure gives an overview of the comparison of the comprehensiveness and relevance of reference points between countries and qualifications based on the mapping. It clearly shows that the indication of the coverage percentage alone is misleading if one wants to judge whether a reference point can cover the entire scope of a qualification. It is important to consider the volume of additional learning outcomes as well (which is assessed as 'none', 'low', 'medium' or 'high'). For example, the Spanish qualification of the ICT service technician shows high coverage when mapped to the O*NET profile (97 per cent), which seems to be a good match as no other learning outcomes are indicated. The same percentage of coverage is given for the Finnish healthcare assistance profile mapped to the VQTS/HCEU Competence Matrix. However, the scope of the qualification is not so well captured here as a high number of other learning outcomes are included in the Finnish qualification which are not captured by the reference point.

Figure 10. **Comprehensiveness and relevance of reference points – overview across countries and qualifications**

Source: Database.

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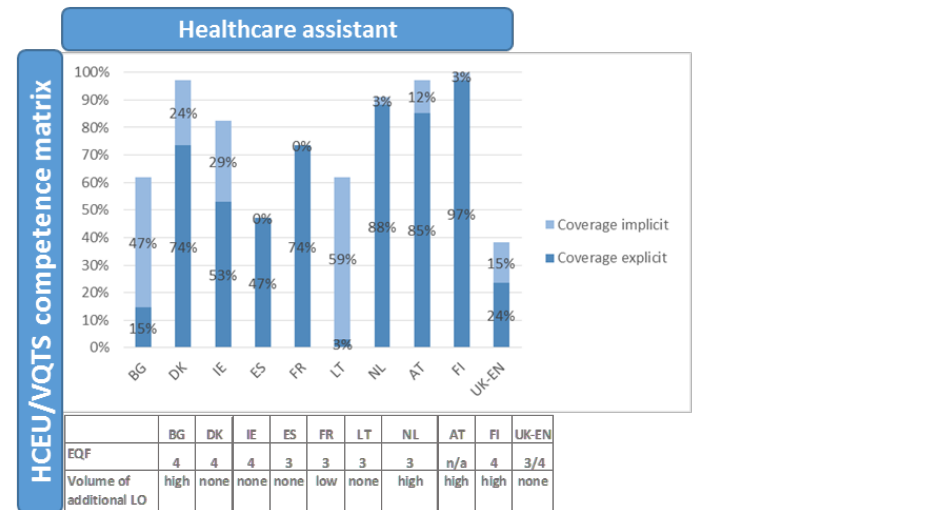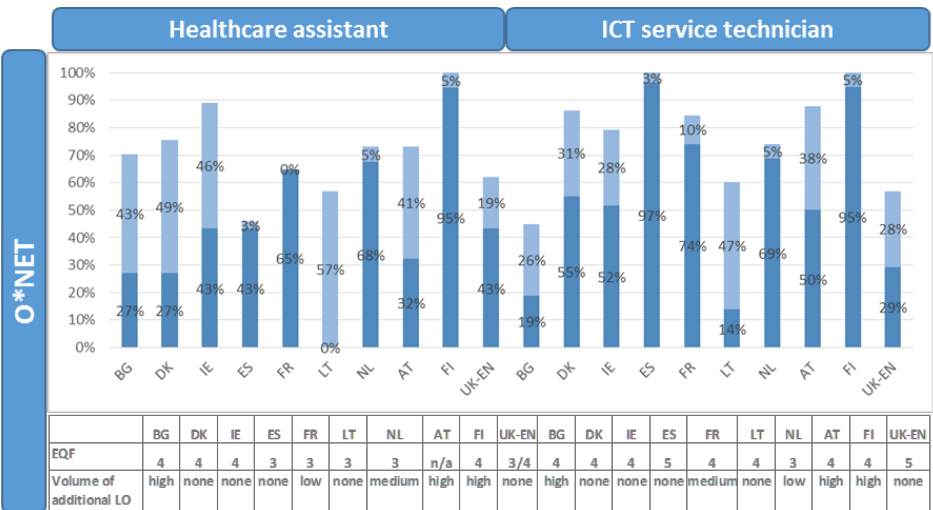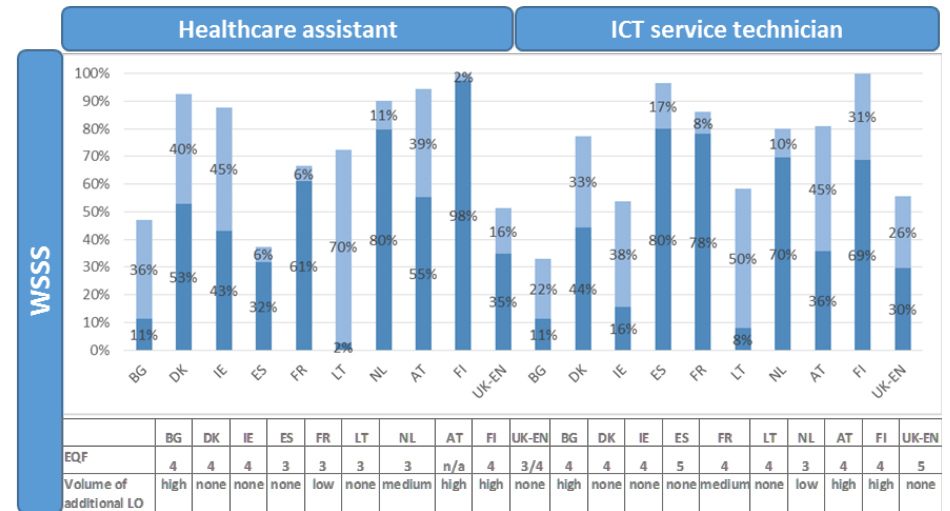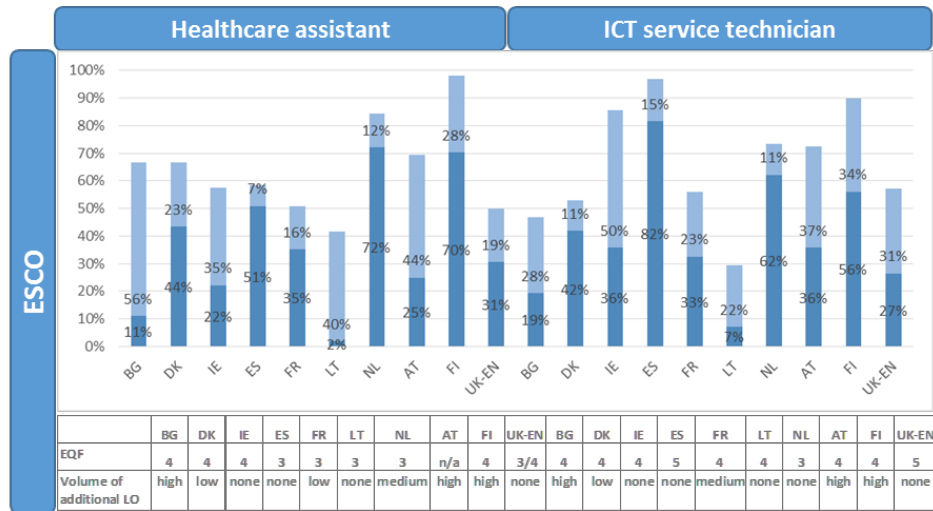
Conclusion 4: All reference points can be used to capture the scope of the national qualifications to a certain extent. However, all reference points face challenges in terms of comprehensiveness and relevance in relation to different country contexts. The comparison of qualifications with each other based on the reference points is therefore only of limited informative value, as there are learning outcomes in some national qualifications that are not reflected in the reference points.

8.1.4. Research question 1.3 To what extent are these reference points able to support a weighting of the different learning outcomes covered by the qualification, thus providing an insight into what are considered to be essential and less essential learning outcomes?

The approaches used for weighting differs across these reference points: ESCO occupational profiles distinguish between 'essential' and 'optional' demands for 'skills' and 'knowledge'; O*NET uses 'importance' (e.g. of certain tasks, knowledge, skills, abilities, work activities), 'frequency' (e.g. of tasks), 'extent' (e.g. of work values), specific rating scale for work context (e.g. 'every day', 'never' etc.) and in WSSS, percentages are indicated per section, showing the relative importance of a group of skills within the respective 'Skill'. However, the weighting approaches used in O*NET and WSSS were not visualised in the reference points tested in this project. The VQTS/HCEU Competence Matrix itself does not include any weighting, but weighting is possible when developing Competence Profiles, i.e. mapping qualifications on a Competence Matrix. In this case, ECVET points can be allocated based on the workload necessary for achieving a step of competence development within the context of the specific qualification.

However, the weighting was not possible in most cases. Applying weighting approaches in international comparison of qualifications appears extremely challenging. The key concern is on what basis the weighting of different learning outcomes in national qualification descriptions should be based. In most cases, the grouping of learning outcomes in reference points appears artificial and not applicable to national contexts. National qualifications tend to have other forms of grouping that do not coincide with the ones in the reference points. Thus, even if there is a distinction between essential and optional units in qualifications, an indication of the weighting of individual learning outcomes included in units is not possible.

Conclusion 5: Weighting of learning outcomes of national qualification descriptions mapped to the learning outcomes included in reference points appears challenging and the reference points do not provide sufficient ground to apply weighting approaches in national contexts.

8.1.5. Research question 1.4 To what extent are these reference points able to distinguish between (what ESCO refers to as) occupation-specific and cross-sectoral/transversal knowledge, skills and competences?

The only reference point that makes an explicit distinction between occupation-specific and transversal knowledge, skills and competences is ESCO. In the other reference points, the transversal learning outcomes are more integrated within other statements (O*NET, VQTS) or generally less covered (WSSS). This being said, ESCO is not unproblematic in making this distinction, as it is conceptually not well elaborated how the transversal and occupation-specific KSC interrelate, interact or integrate. This leads to confusion in comparison, overlap of descriptions and unnecessary long lists of KSC statements. Moreover, a distinction between 'transversal' and 'transferable' learning outcomes should be considered.

Conclusion 6: Only ESCO makes an explicit distinction between transversal and occupation-specific KSC. This distinction however is conceptually not well developed leading to conceptual and operational challenges in international comparison of qualifications. The distinction between transversal and occupation-specific KSC often has a political dimension whereby specific emphasis is placed in VET on specific (sets of) key competences, 21st century skills and alike.

8.2. Research question 2. To what extent can these reference points complement each other, and for which purposes?

8.2.1. Assessment of the suitability of reference points for other usage contexts

The previous research question (research question 1) focused on the use of the reference points for the international comparison of qualifications. The study identified also other usage contexts: Automated text processing of qualifications data (WA2), exploring, gathering and analysing data on the match/mismatch between qualifications and labour market requirements (WA3), Skills Panorama (Cedefop project on intelligence of skill needs), big data analysis from online vacancies (Cedefop project on vacancy analysis), and the European Skills & Jobs Survey (survey on skills mismatch).

When comparing the differences with regard to the necessary requirements for the usage context international comparison of VET qualifications with those of the other contexts, the only necessary requirement in addition to those identified for international comparison is, within the category 'categorisation and structure', the requirement 'finely tiered structure, from general to increasingly detailed concepts'. The following table provides an assessment of the strengths and weaknesses of the reference points in relation to the different usage contexts (taking into account the necessary requirements per usage context). It also assesses the general applicability of the reference points and identifies what needs to be amended and what would be the relative workload/investment for these changes.

Table 12. **Suitability of the reference points analysed for different usage contexts (besides international comparison)**

	ESCO	O*NET	WSSS	VQTS c. m.
Additional necessary requirement on top of those identified for international comparison (see Table 11): **Finely tiered structure leading from general to increasingly detailed concepts**	Yes (transversal & cross-sectoral KSC, occupations); No (sector- & occupations-specific KSC). No approach to cluster learning outcomes in a conceptual model applicable across OSP	Yes (occupations, O*NET Content Model variables; tools & technologies; (detailed) work activities).	5 tiers: Heading (domain) – 'Skill' (occupational profile) – section (KSC) – type of KSC (knowledge and. abilities) – learning outcomes	Partly (competence areas form the vertical axis of a Competence Matrix; on the horizontal axis – i.e. for each competence area – between two and six successive steps of the competence development process within certain core work tasks are described; in the HCEU Competence Matrix, these steps are further described in terms of competence, skills and knowledge).
Automated collection/analysis of national qualifications data (WA2)				
Necessary amendments	Need for a more structured approach to clustering LOs	Amend to EU labour market Translate into all EU languages	Expand to more transversal LOs Expand to more OSP Translate into all EU languages	Expand to more OSP Translate into all EU languages Need for systematic approach to updating and maintenance
General applicability when necessary amendments are taken into account	Medium	Low /not at all	Low/not at all	Low/not at all
Assessed relative workload to complete the necessary amendments	Conceptual work: High Work concerning improving the scope: Low	Conceptual work: Medium Work concerning improving the scope: High	Conceptual work: Medium Work concerning improving the scope: High	Conceptual work: Medium Work concerning improving the scope: High
Data collection/survey on (mis)match between qualifications and LM requirements (WA3)				
Necessary amendments	Need for a more structured approach to clustering LOs	Amend to EU labour market Translate into all EU languages	Expand to more transversal LOs Expand to more OSP Translate into all EU languages	Expand to more OSP Translate into all EU languages Need for systematic approach to updating and maintenance
General applicability when necessary amendments are taken into account	Medium	Medium – low	In general: low; beyond that, only for a limited section of the LM, and for a limited number of qualifications	Medium

Assessed relative workload to complete the necessary amendments	Conceptual work: High Work concerning improving the scope: Low	Conceptual work: Low Work concerning improving the scope: High	Conceptual work: Medium Work concerning improving the scope: High	Conceptual work: Low Work concerning improving the scope: High
Structure online information systems on LM/VET related topics (e.g. Cedefop Skills Panorama)				
Necessary amendments	Need for a more structured approach to clustering LOs	Amend to EU labour market Translate into all EU languages Need to link to EU LM instruments	Expand to more transversal LOs Expand to more OSP Translate into all EU languages Need to link to EU LM instruments	Expand to more OSP Translate into all EU languages Need for systematic approach to updating and maintenance
General applicability when necessary amendments are taken into account	High for occupations; Not at all for KSC	Medium – high for occupations Medium for KSC	Low	Low
Assessed relative workload to complete the necessary amendments	Conceptual work: High Work concerning improving the scope: Low	Conceptual work: Low Work concerning improving the scope: Medium	Conceptual work: Medium Work concerning improving the scope: High	Conceptual work: Low Work concerning improving the scope: High
(Automated) collection/analysis of national vacancy data (e.g. Cedefop RTLMI project, Skills & Jobs surveys)				
Necessary amendments	Need for a more structured approach to clustering LOs	Amend to EU labour market Translate into all EU languages Need to link to EU LM instruments	Expand to more transversal LOs Expand to more OSP Translate into all EU languages Need to link to EU LM instruments	Expand to more OSP Translate into all EU languages Need for systematic approach to updating and maintenance
General applicability when necessary amendments are taken into account	Medium	Low	Low	Low
Assessed relative workload to complete the necessary amendments	Conceptual work: High Work concerning improving the scope: Low	Conceptual work: Medium Work concerning improving the scope: High	Conceptual work: Medium Work concerning improving the scope: High	Conceptual work: Medium Work concerning improving the scope: High

Source: Authors.

Besides the presented weaknesses and necessary amendments, all reference points face common challenges:

(a) Concerning **automated collection/analysis of national qualifications data (WA2)**, the reference points face challenges related to whether learning outcomes of qualifications are assessed as explicitly or implicitly covered by a reference point. While explicit coverage is complex, it can be tracked

through automated workflows, but identifying implicit coverage is impossible to do cost-effectively.

(b) Concerning **data collection/survey on (mis)match between qualifications and LM requirements (WA3)**, the KSC lists used in all reference points are probably too long to be applicable in surveys.

(c) Concerning the **structure of online information systems on LM/VET related topics (e.g. Cedefop Skills Panorama)**, the learning outcomes need to be clearly categorised to present data online.

(d) Concerning **(automated) collection/analysis of national vacancy data (e.g. Cedefop RTLMI project, Skills & Jobs surveys)**, the overarching challenge is again how to deal with implicit coverage. Another challenge for all reference points concerns how to deal with contextualised job descriptions and the non-contextualised descriptors: a skill might mean something completely different in different job contexts.

Conclusion 7: ESCO appears to be the most relevant reference system compared to the other three for the other usage contexts: automated collection/analysis of national qualifications data (WA2); data collection/survey on (mis)match between qualifications and LM requirements (WA3); structuring online information systems on LM/VET related topics (e.g. Cedefop Skills Panorama); (automated) collection/analysis of national vacancy data (e.g. Cedefop RTLMI project, Skills & Jobs surveys). This relevance mainly relies on the far greater coverage of ESCO in terms of sectors and languages and the reference to labour markets in EU countries. The relevance of ESCO for other usage contexts is however seriously hampered by the lack of a conceptual model underlying the approach that can be used to cluster, classify and organise KSC and for designing OSP. While the workload for making ESCO relevant for all sectors and languages is limited; the workload for the conceptual further development of the ESCO skills pillar (and the implications for revising the OSP) is considerable high.

8.2.2. Looking forward: what lessons can be taken on board from other reference points in view of improving ESCO?

The analysis in the previous sections shows that none of the reference points is perfectly suitable for all usage contexts. Although some are better suited to the usage contexts within this project (WA1-3), some also have the potential to be used beyond this project. In general, of course, there is a clear difference

between the reference systems ESCO and O*NET and the reference points WSSS and VQTS-based Competence Matrices related to the scalability requirement. This aspect is of crucial importance when considering the overall objective of this Framework Contract: to prepare methodologies allowing for systematic comparison of the purposes, content, and profile of VET qualifications on a cross-border basis.

As concluded, ESCO could work as reference point (and system) in the different usage contexts. It should however see some major adjustments that contribute to the transparency of ESCO as a reference point. These adjustments to ESCO can be inspired by the other reference points:

(a) Adjustment 1: ESCO needs to have a stronger **conceptual basis for describing learning outcomes.** ESCO is based on an empirically driven sectoral approach and lacks a theoretical foundation how to define and describe different learning outcomes. This causes a lack of consistence in the quality of how learning outcomes are described and – how learning outcomes in different OSP can relate to each other. This conceptual basis is more developed in other reference points such as O*NET and WSSS. The most elaborate conceptual basis can be found in the O*NET Content Model, the conceptual foundation of O*NET. The Content Model provides a framework that identifies the most important types of information about work and integrates them into a theoretically and empirically based system ([165]).

(b) Adjustment 2: **ESCO needs to have a systematic approach to clustering learning outcomes**. Learning outcomes need to be thematically clustered (for instance in work tasks) to be reported on at a higher abstraction level. Also here, WSSS and O*NET classifications could be taken as inspiration.

(c) Adjustment 3: ESCO needs to better **embed the transversal learning outcomes and the occupational learning outcomes** in a systematic manner. This also involves a deeper discussion and explanation of what transversal actually means and to what extend transversal learning outcomes differ in relation to the context (contextualisation). Currently, inspiration could be taken from the O*NET or the VQTS approach, where transversal learning outcomes are integrated in the occupation-specific learning outcomes.

(d) Adjustment 4: ESCO could introduce **levels of proficiency** into its OSP to be better able to differentiate between qualifications at different levels. Inspiration could be taken from the VQTS approach.

([165]) https://www.onetcenter.org/content.html

Conclusion 8: ESCO needs to undergo a number of fundamental amendments to serve as reference point in all usage contexts. These adjustments relate to providing the conceptual foundation for ESCO (quality of learning outcome descriptions; clustering of learning outcomes; integrating transversal and occupation specific learning outcomes; and levels of proficiency). Besides other sources, inspiration could be taken from WSSS (clustering learning outcomes), O*NET (conceptual model) and the VQTS model (embedding transversal and occupational learning outcomes) and again the VQTS model (levels of proficiency).

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List of abbreviations

AI	Artificial Intelligence
ECVET	European Credit system for Vocational Education and Training
EQF	European Qualifications Framework
ESCO	European Skills, Competences, Qualifications and Occupations
EU	European Union
EUSP	EU Skills Panorama
HE	Higher education
HCEU	HealthCareEurope - Fostering transparency and recognition of prior learning within geographical mobility of professionals in the healthcare sector
ICT	Information and Communications Technologies
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
IVET	Initial vocational education and training
KSC	Knowledge, skills, competence
LM	Labour market
NACE	*Nomenclature statistique des activités économiques dans la Communauté européenne* – Statistical Classification of Economic Activities in the European Community
NLP	Natural Language Processing
NQF	National Qualifications Framework
O*NET	Occupational Information Network
OSP	Occupational skills profile
PES	Public Employment Service
RTLMI	Real-time labour market information
SOC	Standard Occupational Classification
UNSPSC	United Nations Standard Products and Services Code
USDOL/ETA	US Department of Labor/Employment and Training Administration
VET	Vocational education and training
VQTS	Vocational Qualification Transfer System
WSC	WorldSkills Competition
WSI	WorldSkills International
WSSS	World Skills Standard Specifications
BG	Bulgaria
CY	Cyprus
DK	Denmark

EL	Greece
IE	Ireland
ES	Spain
FR	France
HU	Hungary
LT	Lithuania
NL	Netherlands
AT	Austria
FI	Finland
SE	Sweden
UK-EN	United Kingdom – England
U.S.	United States

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Annex 1. National competence classification systems

The following national competence classification systems were considered and the results of this analysis also inspired the identification of requirements:

(a) Austria (*AMS-Kompetenzenklassifikation*): This classification system for vocational requirements is part of the Occupational Information System of the Austrian PES. It currently contains 17.500+ concepts and their definitions, 29.000+ terms, and is structured hierarchically as well as semantically. Since its establishment in 1999/2000 it is continuously being updated. *AMS-Kompetenzenklassifikation* ([166]) is used to describe occupational requirements for all professions relevant on the Austrian labour market (via linking relevant KSC concepts with occupations of the national occupational taxonomy). The resulting occupational profiles are displayed in the Austrian PES' labour market information systems (*AMS-Berufsinformationssystem* ([167]), *AMS Qualifikations-Barometer* ([168]), used as reference point in research (e.g. for vacancy analysis and enterprise surveys) and as matrix for matching supply and demand.

(b) Czech Republic (*Centrální databáze kompetencí*, *CDK*): This database is a competence classification relevant for occupational profiles of all sectors and skill levels relevant for the Czech labour market as well as (vocational) education and training ([169]).

(c) Italy (*Professioni, occupazione, fabbisogni*): In this database, the 800 professions relevant for the Italian labour market are linked with required skills, knowledge and abilities. This model is based on O*NET (see further below) ([170]).

(d) France (*Répertoire Opérationnel des Métiers et des Emploi*, *ROME*): ROME is the French national classification of occupations and aims to provide a common language to all employment stakeholders and job advisers in their daily activities, and to cover branches/sectors, occupations, competences and activities. ROME groups occupational profiles in the so-called ROME *fiches* (sheets), an occupational profile or cluster that includes several job

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([166]) http://www.ams.at/bis/bis/KompetenzstrukturBaum.php
([167]) Occupational information system – see http://www.ams.at/bis/
([168]) Skills Barometer – see http://bis.ams.or.at/qualibarometer/
([169]) http://kompetence.nsp.cz/
([170]) http://professionioccupazione.isfol.it

titles. The ROME sheets/*fiches* are organised in professional fields and offer a detailed description of the occupations (definition, conditions of access, competences and activities) (¹⁷¹).

(e) UK (National Occupational Standards, NOS): They are statements of the standards of performance individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding. NOS are developed for employers by employers through the relevant Sector Skills Council or Standards Setting Organisation (¹⁷²).

The table below includes an overview of the main features of these national systems and indicates lessons to learn for requirements of reference points and particularly for further developing ESCO. These national systems were only used for inspiration but not further analysed in this study because most of them are available only in national languages and the option of using one of these national models at European level is considered as rather low. However, they were also analysed in the context of the development of ESCO (see Ziegler et al., 2012) and have partly influenced the current structure of ESCO.

(¹⁷¹) https://www.data.gouv.fr/fr/datasets/repertoire-operationnel-des-metiers-et-des-emplois-rome/
(¹⁷²) https://www.ukstandards.org.uk

Table 13. **Overview of main features of some national systems considered for identifying requirements reference points should meet**

	AMS-Kompetenzen-klassifikation	Centrální databáze kompetencí (CDK)	Italian System	ROME	UK National Occupational Standards (NOS)
Context of development					
URL	http://www.ams.at/bis/bis/KompetenzstrukturBaum.php	http://kompetence.nsp.cz/	http://professionioccupazione.isfol.it	https://www.data.gouv.fr/fr/datasets/repertoire-operationnel-des-metiers-et-des-emplois-rome/	https://www.ukstandards.org.uk/Pages/index.aspx
Country	AT	CZ	IT	FR	UK
Responsible organisation	Austrian PES	Consortium financed by ESF and national funds / Ministry of Labour	ISFOL/INAPP/Ministry of Labour/ISTAT	Pôle emploi	Collective duty of industry led steering groups and government offices in all four nations across the UK
Scope/context	KSC, work experiences, attitudes, certificates and other occupational requirements relevant for occupational profiles of all sectors and skill levels relevant for Austrian labour market as well as (vocational) education and training ((knowledge, competencies, aptitudes, cognitive skills, physical requirements, work experiences, work tasks, attitudes and values, certificates etc.)	KSC relevant for occupational profiles of all sectors and skill levels relevant for Czech labour market as well as (vocational) education and training.	Occupational profiles of all sectors and skill levels relevant for the Italian labour market (specific tasks and activities, knowledge, skills, attitudes, generalised work activities, working conditions, work styles, professional values, characteristics of personality)	Occupational profiles of all sectors and skill levels relevant for the French labour market (competences, activities)	Statements of the standards of performance individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding; NOS only developed in areas needed by employers (Knowledge and understanding, specific tasks and activities - 'you must be able to')
Languages	German	Czech	Italian	French	English
Access and interoperability					
KSC accessible independent of occupations	Yes	Yes	No	Yes (but not publicly available)	Yes
KSC linked to occupations	Yes	Yes	Yes	Yes	Yes
Occupational profiles linked to ISCO	Yes	Yes	not ascertainable	not ascertainable	not ascertainable
Occupational profiles linked to NACE	No	Yes	not ascertainable	not ascertainable	not ascertainable
Categorisation and structure					
Structural organisation of KSC	Classificatory structure, Thesaurus structure	Classificatory structure	Classificatory structure (O*NET content model)	Classificatory structure	Classificatory structure

Learning domains (explicit reference?)	professional competences, transversal professional competences, knowledge ('Kenntnisse', 'Fachwissen')	professional skills and competences (theoretical knowledge and practical skills), general skills (set of general requirements needed to perform a job that is entirely unrelated to a particular profession), soft competencies (complex abilities of a person)	knowledge, skills	competences	Knowledge and understanding, competences
Distinction between 'occupational' and 'transversal' KSC	Yes (professional skills, transversal professional skills)	Yes (soft skills, general skills – transversal; hard skills - occupational)	No	No (core competences and activities, specific competences and activities)	No
Explicit performance levels	Only for required language competences (uses CEFRL scale)	Yes (different scales are used for soft skills, hard skills, general skills; a level is allocated to each individual skill)	Yes (knowledge, skills, attitudes, general work activities etc. are rated with respect to 'complessità' – i.e. complexity)	No	No (individual KSC carry a detailed description of performance criteria, but no explicit levelling; whereas the overall occupational profiles in which NOS are used have a specific 'role level' assigned)
Weighting (e.g. distinction between 'essential' and 'optional' requirements – based on judgement)	No (but core competences are singled out as 'Berufliche Basiskompetenzen')	No	Yes (competences and specific activities are rated with respect to 'importanza' – ie importance)	Yes (core competences 'compétance de base' are kept distinct from 'compétance spécifiques')	No (by definition all KSC linked to an occupational standard are essential)
Accentuation of 'frequently demanded KSC' (based on external factors)	Yes (occupational skills profiles single out competencies frequently demanded in vacancies)	No	Yes (specific work activities and work conditions are rated with respect to 'frequenza' – i.e. frequency)	No	No
Connection to qualifications					

Interlinkage between occupational / KSC system and qualifications	No	Yes	No	Yes	Yes
	(but occupational profiles show structured information on typical (further) education and training in general terms; regulated occupations contain list of required certificates and vocational training qualifications (from controlled vocabulary), all other occupations list potentially demanded qualification requirements)	(Central Database of Competences ('CDK'), National Occupations Framework ('NSP') and National Qualification Framework ('NSK' – which has a limited scope and does not include qualifications from the formal system) are interlinked – see http://www.nsp.cz/)	(but occupational profiles have EQF levels assigned)	(interlinked with national register of recognised qualifications which is managed by CNCP)	(NOS serve as the basis for all relevant vocational qualifications in the NQF)
Lessons to learn for requirements of reference points and particularly for further developing ESCO					
	KSC pillar with highly elaborated thesaurus structure	Interlinkage between occupations, KSC and qualifications; Occupational skills profiles and LO descriptions of qualifications are assembled with the help of sector councils	Based on O*NET; Elaborate rating system (complexity, importance, frequency);	'Interlinkage between occupations, KSC and qualifications; Designed to support mobility between occupations ('core competences and activities' make centrepiece of every occupation transparent)	Interlinkage between occupations, KSC and qualifications; Occupational skills profiles and LO descriptions of qualifications are assembled with the help of sector councils

Source: Authors – the following study was used as starting point, supplemented by own research (desk research only): Ziegler, P. et al. (2012). Skills/competences classifications in the EU-27. Project report under Framework Contract DG EAC Lot 1 - No EAC 02/10

Annex 2. Overview of the analysis and assessment

The table below provides an overview of the analysis of the selected reference points related to the requirements for the different usage scenarios.

Table 14.   **Analysis of reference points with regard to identified requirements**

Reference points → Requirements ↓	ESCO	O*NET	WSSS	VQTS Competence Matrix
Scope				
Comprehensiveness of concepts and designations	Occupational profiles of all sectors and skill levels relevant for EU labour market as well as (vocational) education and training.	Occupational profiles of all sectors and skill levels relevant for the U.S. labour market.	Not comprehensive; 50 Skills in 6 domains, all linked to intermediate level (EQF / ISCED 3-4).	Not comprehensive; Competence Matrices available for a number of occupational fields: mechatronics, electronics/electrical engineering, tourism (receptionist, cook, catering), healthcare (nursing, professional care, elderly care), foreign trade, cleaning sector, event engineering, bakery, hairdressing, joinery / cabinet making, floristry; mainly focussing on EQF levels 3-6.

Coverage of different types of LOs (occupational, transversal, general knowledge subjects)	Occupational KSC (knowledge, skills/competences), sector-specific KSC, cross-sectoral KSC, transversal KSC.	Occupation-specific learning outcomes (occupation-specific tasks, work-related attributes), transversal learning outcomes (e.g. problem solving or social skills), general knowledge subjects (specific academic subjects and functional knowledge, e.g., biology, foreign language, mechanical knowledge); worker characteristics (cognitive, psychomotor, physical, sensory abilities; interests; values; and work styles).	Knowledge and understanding, abilities; implicit distinction between technical/occupation specific and transversal skills.	Competences ('abilties') – integrating soft skills in context-related descriptions (the steps of competence development are first described in a rather general way and are then presented in more details, structured in competence, skills and knowledge).
Languages	Available in EU's 24 official and working languages, Icelandic, Norwegian, Arabic.	Available in American English. ([173])	Available in English; occasional national language versions exist, but without approval.	Usually available in English; depending on the specific project partnership also available in some other languages.
Categorisation and structure				
Organisation / presentation format	Occupations: Taxonomy & thesaurus. KSC: mostly thesaurus structure only (only transversal KSC have hierarchical structure as well).	Occupations: 4-level hierarchical structure (O*NET-SOC 2010 Taxonomy), alternate names for occupations. Variables characterising various occupational requirements (also knowledge, skills, abilities): Taxonomy structure only.	None of the four formats described; a Term List is the organisation form that comes closest. 'Skills' are listed under 6 headings.	None of the four formats described apply; Competence Matrix is structured in competence areas (based on core work tasks) and steps of competence development.

([173]) Although O*NET provides Spanish translations of some aspects (see under https://www.miproximopaso.org/) and a few more language versions of sub-sections of O*NET exist as European adaptations of the system (e.g. the Italian information system of occupations – see http://fabbisogni.isfol.it/), O*NET is still mostly an American reference system.

Vocabulary control	ESCO handbook refers to terminological rules, but these are not being made transparent to users.	Standardised and transparent procedures for compilation and naming of occupations, tasks, tools & technologies etc.	No normalised vocabulary used in the strict sense; editing rules are specified in 'Guidance Notes' ([174]).	No (the VQTS model only provides general guidelines).
Additional structural organisation	Occupations: ISCO KSC: _'functional collections' (transversal KSC, languages, digital KSC); _'skill type' (knowledge, skill/competence'); _'skill reusability level' (transversal, cross-sectoral, sector-specific KSC)	Variables characterising various occupational requirements are grouped under worker- as well as job-oriented characteristics (amongst those also distinction of learning domains into abilities, knowledge, skills). Tools and Technologies: classified with United Nations Standard Products and Services Code (UNSPSC) Work activities are used to group detailed work activities Detailed work activities are used to group tasks.	Implicit distinction between technical/occupation specific (related to work tasks) and transversal skills: within sections, transversal KSC and occupation specific KSC are listed separately; 'knowledge and understanding' is separated from abilities.	Competence areas (based on core work tasks) and steps of competence development are the main structural element; soft skills and key competences are not presented separately, they are integrated in the context-related descriptions.

[174] Cf. WSI, 2013b – WorldSkills Standards Specifications: Guidance notes for designing, drafting and editing a standards specification for each skill competition

Finely tiered structure leading from general to more and more detailed concepts	Yes (transversal & cross-sectoral KSC, occupations); No (sector- & occupations-specific KSC).	Yes (occupations, O*NET Content Model variables; tools & technologies; (detailed) work activities).	5 tiers: Heading (domain) – 'Skill' (occupational profile) – section (KSC) – type of KSC (knowledge and. abilities) – learning outcomes	Partly (competence areas form the vertical axis of a Competence Matrix; on the horizontal axis – i.e. for each competence area – between two and six successive steps of the competence development process within certain core work tasks are described; in the HCEU Competence Matrix, these steps are further described in terms of competence, skills and knowledge).
Consistent and transparent construction scheme for OSP	No (OSP are based on functional analysis of individual occupations)	Yes (O*NET Content Model is systematically used as construction scheme for all occupations).	Yes (rules for designing Standards Specifications are specified in 'Guidance Notes') ([175])	No (the VQTS model only provides general guidelines, e.g. core work tasks – the basis for competence areas – must be derived empirically).
Explicit performance levels	No (ESCO does not provide any explicit rating of skills performance levels in systematic manner; use of action verbs for indicating level of proficiency).	No (O*NET does not provide any explicit rating of skills performance levels in systematic manner; (detailed) work activities contain action verbs indicating level of proficiency).	No (No explicit indication; general focus is on excellence in VET students).	Yes (the steps of competence development illustrate the process of progression from the lower to the higher steps).
Weighting	Distinction between 'essential' and 'optional' demands for 'skills' and 'knowledge'.	'Importance' (e.g. of certain tasks, knowledge, skills, abilities, work activities) 'frequency' (e.g. of tasks)	For use in competitions, percentages are indicated per section, showing the relative importance of a group of skills / LO within the respective 'Skill'	No – but weighting is possible when developing Competence Profiles, i.e. mapping qualifications on a Competence Matrix; in this case, ECVET points can be allocated.
Access and Interoperability				
Linked to international standard taxonomies of related content (e.g. ISCO, ISCED, NACE)	Occupations: linked to ISCO	No ([176])	WSSS are related to ESCO and to O*Net; only indirectly connected to ISCO via ESCO and O*Net	No

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([175]) WSI, 2013b.

([176]) The only external taxonomy O*NET uses as an additional structuring device is the United Nations Standard Products and Service Code (UNSPSC), a common language for global business that allows for cross-occupational comparisons and analysis, which is used to group O*NET's Tools & Technology taxonomy.

Linked to national European taxonomies of related content	Intended	No	No	No
Validity				
Regular updates at frequent intervals	Intended	Yes	Every second year, following the WorldSkills Competitions	No
Traceability of amendments	Intended	Yes	Yes, but accessible only to members	No
Public commitment to long-term development of a reference system	Yes	Yes	No	No
Scalability				
	High for occupations and transversal KSC; Not at all for sector-specific KSC	High	Limited	Low

Source: Authors

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Annex 3. Core learning outcomes resulting from the mapping

The tables below show the profiles that emerge when selecting those learning outcomes from each reference point that are covered (either explicitly or implicitly) in at least nine out of the ten qualifications.

Table 15. **Core learning outcomes resulting from the mapping**

ESCO		WSSS	
WSSS/ESCO section	**ESCO**	**WSSS section**	**WSSS**
Assessing needs and planning client care	disability types (optional Knowledge) identify abnormalities (essential skill/competence) monitor basic patients signs (essential skill/competence) attend to hygiene (transversal skills and comp.)	Assessing needs and planning client care	Carefully assess the client's environment and situation to accurately determine care needs, recognizing boundaries of role Ethics and law with respect to rights, discrimination, and abuse Refer to medical professionals as appropriate
Communication and interpersonal skills	communicate with nursing staff (essential skill/competence) empathise with the healthcare user (essential skill/competence) interact with healthcare users (essential skill/competence) listen actively (essential skill/competence) work in multidisciplinary health teams (essential skill/competence)	Communication and interpersonal skills	Active listening, questioning techniques, interpretation of non-verbal signals, and appropriate educational techniques Communicate in a professional way with clients who have disabilities in communication and understanding Manage a professional and effective communication with the client's family in the appropriate manner ensuring the needs of the client are central Manage consistently effective verbal and written communications with colleagues Open and closed communication with client in the appropriate style, establishing a rapport Professional interaction between practitioner and client and also practitioner with other health personnel
Health and safety	follow hygienic work practices (transversal skills and comp.) follow safety precautions in work practices (transversal skills and comp.)		Respect client as an individual with autonomy and right to accept or refuse care, always be honest to the client Rules and regulations for confidentiality and privacy related to the delivery of care
Managing and delivering client care	disability care (optional Knowledge) provide basic support to patients (essential skill/competence) support individuals to adjust to physical disability (optional skill/competence) support nurses (essential skill/competence) work under supervision in care (essential skill/competence) work with nursing staff (essential skill/competence)		Techniques and ways to communicate with clients who have disabilities in communication, e.g. dementia and hearing problems Techniques for resolving miss-understandings and conflicts The importance of building and maintaining productive working relationships Work sensitively with clients
		Managing and delivering client care	Anatomy and pathology, illnesses, and treatment according to the level of education Assist with hygiene needs as required and respect the client's need for intimacy
Social interaction	give advice to others (transversal skills and comp.) interact with others (transversal skills and comp.)		Consistently observe client and quickly identify any new problems that need attention or medical referral, e.g. pressure ulcer Monitor different health parameters e.g. blood pressure, pulse, temperature, blood sugar, pain, and weight and give information about them

	report facts (transversal skills and comp.) use body language (transversal skills and comp.) work in teams (transversal skills and comp.)		Perform medical tasks within the scope of practice e.g. first aid, wound care, breathing exercises Potential safety hazards Promote and assist with physical, social, and psychological well-being, support of growth and development, caring and rehabilitation
Values	follow ethical code of conduct (transversal skills and comp.)		Standard normal values of health parameters (e.g. normal blood pressure)
Work organization and management	adhere to organisational guidelines (essential skill/competence) apply organisational techniques (essential skill/competence) comply with legislation related to health care (essential skill/competence) comply with quality standards related to healthcare practice (essential skill/competence) ensure safety of healthcare users (essential skill/competence) sterilization techniques (optional Knowledge)		Take precautions for risks which are common in clients which are sick, e.g. pressure ulcers, pneumonia, and contractions Techniques for encouraging clients to learn 'new' skills building confidence and independence Techniques for promoting mobility and knowledge about safe use of mobility devices The circumstances when immediate medical assistance should be sought
		Problem solving, innovation, and creativity	Recognize the boundaries of own expertise/authority in dealing with client's problem(s) and refer to colleagues and professionals as appropriate
		Work organization and management	Ensure safe and ergonomic working practices Follow health, safety, and hygiene standards, rules, and regulations Health, safety, environmental and hygiene legislation, obligations, regulations, and documentation Identify and use the appropriate uniform/personal protective clothing including safe footwear Infection hazards for clients Plan, schedule, and re-prioritize work as the need arises Take appropriate hygiene precautions for infection prevention The importance of working together with other practitioners or/and other persons The purpose, safe use, care, and storage of materials Work together in an efficient way with other practitioners and any person

HCEU (VQTS)			O*NET	
Competence area	Sub-area of competence	HCEU	ONET category	ONET
Communication and collaboration with patients/clients	Communication with patients/clients and relevant others	6.1.a To be able to build, maintain and end verbal and non-verbal communication through empathy and appreciation.	Detailed work activities	Adjust positions of patients on beds or tables.
Creating and maintaining a healthy and safe environment	Handling onsite disasters	4.4.a To be able to react according to guidelines in emergencies and disasters.		Administer basic health care or medical treatments.
	Hygiene	4.1.a To be able to apply relevant (legal and employer-specific) hygienic procedures and guidelines regarding personnel hygiene, working environments, medical equipment, medical waste.		Administer therapy treatments to patients using hands or physical treatment aids.
Management	Ethical competence	B.1.a To be able to apply professional care based on ethical principles and concepts, recognise and manage ethical challenges in professional care and react appropriately.		Assist patients with daily activities.
	Legal framework	B.3.a To be able to act professionally in accordance to legislation on health care (e.g. act according to standards of nursing practice and to existing laws)		Give medications or immunizations.
	Monitoring and evaluating of patient's/client's condition	A.1.a To be able to recognise changes in the patient's/client's condition and react appropriately.		Prepare medical instruments or equipment for use.
Nursing Care	Basic care and personal hygiene	2.1.a To be able to support the patient/client to perform basic care.	Skills	Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
	Mobility, movement, positioning	2.3.a To be able to assist in mobility measures including patient/client activation according to patient's/client's treatment plan and individual condition.		Monitoring — Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
Nursing intervention	Participating in medical and diagnostic procedures	3.1.a To be able to prepare and support patient's/client's for medical treatments and diagnostic tests according to prescription; assist in preparing of medical devices and materials; collect and assist in collecting patient's/client's specimens for treatments.		Speaking — Talking to others to convey information effectively.

Figure 11. **Mapping table for healthcare assistant – ESCO**

	BG	DK	IE	ES	FR	LT	NL	AT	FI	UK-EN	
EQF level	4	4	4	3	3	3	3	n/a	4	3&4	
Volume of additional LO	high	low	none	none	low	none	medium	high	high	none	
monitor basic patients signs	■	■	■	■	■	■	■	■	■	■	10
communicate with nursing staff	■	■	■	■	■	■	■	■	■	■	10
empathise with the healthcare user	■	■	■	■	■	■	■	■	■	■	10
interact with healthcare users	■	■	■	■	■	■	■	■	■	■	10
provide basic support to patients	■	■	■	■	■	■	■	■	■	■	10
disability care	■	■	■	■	■	■	■	■	■	■	10
comply with legislation related to health care	■	■	■	■	■	■	■	■	■	■	10
comply with quality standards related to healthcare practice	■	■	■	■	■	■	■	■	■	■	10
follow hygienic work practices	■	■	■	■	■	■	■	■	■	■	10
follow safety precautions in work practices	■	■	■	■	■	■	■	■	■	■	10
interact with others	■	■	■	■	■	■	■	■	■	■	10
report facts	■	■	■	■	■	■	■	■	■	■	10
identify abnormalities	■	■	■	■	■	■	■	■	■		9
disability types	■	■	■	■	■	■	■	■	■		9
listen actively		■	■	■	■	■	■	■	■	■	9
work in multidisciplinary health teams	■	■	■	■	■		■	■	■	■	9
support nurses	■	■	■	■	■		■	■	■	■	9
work under supervision in care	■	■	■	■	■		■	■	■	■	9
work with nursing staff	■	■	■	■	■		■	■	■	■	9
support individuals to adjust to physical disability	■	■	■	■		■	■	■	■	■	9
adhere to organisational guidelines	■	■		■	■	■	■	■	■	■	9
apply organisational techniques	■	■	■	■	■	■	■	■		■	9
ensure safety of healthcare users	■	■	■	■		■	■	■	■	■	9
sterilization techniques	■	■	■	■		■	■	■	■	■	9
attend to hygiene	■	■	■	■		■	■	■	■	■	9
follow ethical code of conduct	■	■	■	■		■	■	■	■	■	9
give advice to others		■	■	■	■	■	■	■	■	■	9
use body language	■		■	■	■	■	■	■	■	■	9
work in teams	■	■	■	■	■		■	■	■	■	9
convey medical routine information	■	■	■		■	■	■	■	■		8
manage healthcare users' data	■	■	■	■	■	■	■	■			8
evaluate older adults' ability to take care of themselves	■	■	■	■		■	■	■		■	8
older adults' needs	■	■	■	■		■	■	■		■	8
conduct cleaning tasks	■	■	■	■	■			■	■	■	8
follow clinical guidelines	■	■		■	■	■	■	■	■		8
apply quality standards	■	■		■	■	■	■	■	■		8
adapt to change	■	■		■	■	■	■	■	■		8
demonstrate consideration	■		■	■	■	■	■	■	■		8
demonstrate good manners	■		■	■	■	■	■	■	■		8
demonstrate intercultural competence	■		■	■	■	■	■	■	■		8
geriatrics		■	■	■	■	■	■		■		7
develop a collaborative therapeutic relationship	■	■	■			■	■	■	■		7
promote inclusion	■		■	■	■	■	■	■	■		7
work in a multicultural environment in health care			■	■	■	■	■	■	■		7
deal with emergency care situations	■			■	■		■	■	■		7
assist in the administration of medication to elderly	■	■		■	■		■		■		7
distribute meals to patients	■	■	■	■		■		■	■		7
accept own accountability	■	■		■	■	■	■	■			7
apply health sciences	■	■	■	■	■		■	■			7
respond to changing situations in health care	■	■	■			■	■	■	■		7
digital communication and collaboration	■	■	■	■		■		■			7
carry out work-related measurements	■	■		■	■		■	■	■		7

Skill	Value
manage quantitative data	7
manage quality	7
manage frustration	7
mother tongue	7
instruct others	7
use questioning techniques	7
evaluate information	7
make decisions	7
advise on healthcare users' informed consent	6
educate on the prevention of illness	6
have computer literacy	6
provide health education	6
cope with pressure	6
negotiate compromise	6
manage time	6
contribute to continuity of health care	5
digital data processing	5
carry out work-related calculations	5
communicate mathematical information	5
support company plan	5
support cultural diversity	5
attend to detail	5
demonstrate willingness to learn	5
work efficiently	5
work independently	5
address an audience	5
persuade others	5
support colleagues	5
develop strategy to solve problems	5
process qualitative information	5
use e-health and mobile health technologies	4
follow environmentally-sustainable work practices	4
digital content creation	4
deal with uncertainty	4
make an effort	4
meet commitments	4
persist	4
accept constructive criticism	4
motivate others	4
identify opportunities	4
think creatively	4
use learning strategies	4
inform policy makers on health-related challenges	3
ICT safety	3
problem-solving with digital tools	3
use mathematical tools and equipment	3
employ foreign languages in care	2
work with shape and space	2
support gender equality	2
demonstrate curiosity	2
foreign language	2
lead others	2
memorise information	2
communicate in foreign languages with health service providers	1
employ foreign languages for health-related research	1
demonstrate enthusiasm	1

Figure 12. **Mapping table for healthcare assistant – WSSS**

	BG	DK	IE	ES	FR	LT	NL	AT	FI	UK-EN	
EQF level	4	4	4	3	3	3	3	n/a	4	3&4	
Volume of additional LO	high	none	none	none	low	none	medium	high	high	none	
Health, safety, environmental and hygiene legislation, obligations, regulations, and documentation	■	■	■	■	■	■	■	■	■	■	10
Infection hazards for clients	■	■	■	■	■	■	■	■	■	■	10
Follow health, safety, and hygiene standards, rules, and regulations	■	■	■	■	■	■	■	■	■	■	10
Take appropriate hygiene precautions for infection prevention	■	■	■	■	■	■	■	■	■	■	10
Ensure safe and ergonomic working practices	■	■	■	■	■	■	■	■	■	■	10
Techniques and ways to communicate with clients who have disabilities in communication, e.g. dementia and hearing problems	■	■	■	■	■	■	■	■	■	■	10
Manage a professional and effective communication with the client's family in the appropriate manner ensuring the needs of the client are central	■	■	■	■	■	■	■	■	■	■	10
Promote and assist with physical, social, and psychological well-being, support of growth and development, caring and rehabilitation	■	■	■	■	■	■	■	■	■	■	10
Assist with hygiene needs as required and respect the client's need for intimacy	■	■	■	■	■	■	■	■	■	■	10
The purpose, safe use, care, and storage of materials	■	■	■	■	■	■		■	■	■	9
The importance of working together with other practitioners or/and other persons	■	■	■	■	■		■	■	■	■	9
Identify and use the appropriate uniform/personal protective clothing including safe footwear		■	■	■	■	■	■	■	■	■	9
Plan, schedule, and re-prioritize work as the need arises	■	■	■	■	■	■	■	■	■	■	9
Work together in an efficient way with other practitioners and any person	■	■	■	■	■	■		■	■	■	9
Rules and regulations for confidentiality and privacy related to the delivery of care	■	■	■	■	■	■		■	■	■	9
Techniques for resolving miss-understandings and conflicts	■	■	■	■		■	■	■	■	■	9
Professional interaction between practitioner and client and also practitioner with other health personnel		■	■	■	■	■	■	■	■	■	9
The importance of building and maintaining productive working relationships	■	■	■	■	■		■	■	■	■	9
Work sensitively with clients	■	■	■	■	■	■	■	■	■	■	9
Open and closed communication with client in the appropriate style, establishing a rapport	■	■	■		■	■	■	■	■	■	9
Respect client as an individual with autonomy and right to accept or refuse care, always be honest to the client	■	■	■	■	■	■	■	■	■	■	9
Active listening, questioning techniques, interpretation of non-verbal signals, and appropriate educational techniques	■	■	■	■	■	■	■	■	■	■	9
Communicate in a professional way with clients who have disabilities in communication and understanding	■	■	■	■		■	■	■	■	■	9
Manage consistently effective verbal and written communications with colleagues	■	■	■	■	■		■	■	■	■	9
Recognize the boundaries of own expertise/authority in dealing with client's problem(s) and refer to colleagues and professionals as appropriate	■	■	■		■	■	■	■	■	■	9
Ethics and law with respect to rights, discrimination, and abuse	■	■	■	■	■	■	■	■	■	■	9
Carefully assess the client's environment and situation to accurately determine care needs, recognizing boundaries of role	■	■	■	■	■	■	■	■		■	9
Refer to medical professionals as appropriate	■	■	■	■	■	■	■	■	■	■	9
Techniques for encouraging clients to learn 'new' skills building confidence and independence		■	■	■	■	■	■	■	■	■	9
Anatomy and pathology, illnesses, and treatment according to the level of education	■	■	■		■	■	■	■	■	■	9
Standard normal values of health parameters (e.g. normal blood pressure)	■	■	■	■	■	■	■	■		■	9
Potential safety hazards	■	■	■	■	■	■	■	■	■	■	9
Techniques for promoting mobility and knowledge about safe use of mobility devices		■	■	■	■	■	■	■	■	■	9
The circumstances when immediate medical assistance should be sought	■	■	■	■	■	■	■	■		■	9
Perform medical tasks within the scope of practice e.g. first aid, wound care, breathing exercises	■	■	■	■		■	■	■	■	■	9

Item	Score
Monitor different health parameters e.g. blood pressure, pulse, temperature, blood sugar, pain, and weight and give information about them	9
Take precautions for risks which are common in clients which are sick, e.g. pressure ulcers, pneumonia, and contractions	9
Consistently observe client and quickly identify any new problems that need attention or medical referral, e.g. pressure ulcer	9
The importance of establishing and maintaining client confidence	8
The importance of accurately recording information	8
The roles, competences, and requirements of colleagues and professionals involved in the care of the client	8
Respect client's culture and religious beliefs	8
Record client information/records in the appropriate format e.g. 'Communication Book' or patient's record (hospital). Discuss and represent individual client cases in professional settings	8
The common types of situations which can occur within health and social care work	8
The difference between symptoms and causes of problems	8
Determine the root cause(s) of client's problem(s) through careful and structured discussion/questioning/observation	8
Techniques for working with clients and their families to accurately determine the care needs of the client	8
The role of nutrition and special diets	8
Plan how the client-centred care will be delivered	8
The holistic needs of clients and inclusion of capabilities	8
Patterns of client behaviour and what drives it	8
History of the client's situation	8
The risk factors for the clients which are weak and not able to move too much	8
The significance of knowing when to refer clients to colleagues and other medical professionals and the roles of related professionals	8
Respect the client and the principles of law and ethics in the delivery of care	8
Include patient`s capabilities in the delivery of care	8
Accurately judge when immediate medical attention or support may be required and start with first aid measures	8
Promote mobility by using the client's resources and respecting the clients' needs by the use of adequate mobilization techniques	8
The importance of reviewing care at regular intervals and gaining feedback from all parties including the client	8
Reflect on feedback and evaluate own working practices	8
Regulations regarding the safety and security of medication	7
Techniques of time management	7
The value of managing own continuing professional development	7
Keep up-to-date with new practices and regulations e.g. safe moving and health and safety	7
Use coaching techniques to enable client to learn new 'life skills'	7
Negotiate with colleagues, medical professionals, the client, and their family to ensure the right type and level of care is provided and that the client's autonomy and needs are met	7
The value of 'working with' clients and respecting their wishes in resolving problems	7
The importance of observing clients closely and consistently to identify any concerns they may not be aware of	7
Value the individual, take a strong interest and gain a deep understanding of their character	7
Gain the confidence of the client to discuss their problem(s)	7
Pro-actively re-prioritize client's problem(s) as the situation demands	7
Create, develop, and negotiate 'new safe ways of working' to improve the daily life of the client and their happiness, e.g. use of aids to support mobility	7
The range of illnesses and the relevant treatments	7
Health, social care, and rehabilitation of clients holistically across the lifespan in a variety of daily life situations	7
Secure required resources to facilitate the client care plan	7
Plan how to support client rehabilitation	7
Obtain consent before the delivery of care	7
The importance of flexibility when working with different clients and their families	7
Create a positive environment for the client and deliver safe care	7
Implement measures that promote client's independence within any limitations	7
Organize educational and rehabilitative activities to meet the needs of adult clients of different adult age groups	7
Use resources effectively and efficiently	7
The possibilities for the care to be changed/improved e.g. resources available	7

Description	Score
Understand the client's perspective through careful discussion with them	7
Gain inputs from the client's family, colleagues and related professionals	7
Recognize what makes a client happy and what they consider to be 'well-being'	7
Listen carefully and respond positively to any problems endeavouring to develop solutions	7
Judge the extent to which the care plan is helping the client	7
Agree any changes to the care plan with the client, their family, colleagues, and related professionals	7
Record outcomes of the evaluation	7
Report and record any concerns to the relevant parties	7
The purpose of a uniform/personal protective clothing	6
Select, use effectively/efficiently, and store materials safely	6
Negotiation methods within the scope of health promotion	6
Maintain excellent professional conduct including appearance	6
Why individuals may be not willing to discuss problems e.g. client and family members and techniques for addressing	6
Latest trends and developments in health and social care to ensure the client is provided with best possible support	6
Recognize problems swiftly and follow a self-managed process for resolving	6
Recognize opportunities and pro-actively contribute ideas to improve client care, e.g. through a new way to use the client's environment effectively, through discussions with the client at the right time	6
Techniques to assess the capabilities of the patient and the family	6
Assess the client's capabilities and the capabilities of the family	6
Identify nutritional status and requirements	6
General topics of a healthy lifestyle and how to promote them in a positive way	6
Perform culturally appropriate measures	6
Recommend and administer appropriate measures to support nutritional well-being within the scope of practice and regulations	6
Educate the client in the promotion of a healthy lifestyle, e.g. do exercise regularly, stop smoking	6
Support client in the administration and storage of their medication within the scope of practice and regulations	6
The expected level of client quality of life in relation to their circumstances	6
The principles of ergonomics	5
Maintain safe and secure storage of medication in accordance with regulations	5
Discard waste ecologically	5
Coaching styles and techniques to support client recovery, growth, and development and health education	5
Techniques for developing creative solutions to improve the quality of life of the client and their happiness e.g. providing support and aids for a client to remain in their own home	5
Principles of growth and development across the lifespan	5
The purpose and potential side effects of client's medication	5
Plan and adapt schedule to ensure each client receives the time they need, ensuring individuals are not rushed	5
Latest developments in products and services	5
Develop an action plan taking into consideration resources available	5
The importance of sustainability	4
The significance of sustainability and environmentally friendly work practices	3
How to gain an outcome and assess that	3
Financial implications e.g. budgetary constraints	2
Advise client on common drug groups and their side effects within the scope of practice and regulations, e.g. antihypertensive and analgesics	2

Figure 13. **Mapping table for healthcare assistant– O*NET**

	BG	DK	IE	ES	FR	LT	NL	AT	FI	UK-EN	
EQF level	4	4	4	3	3	3	3	n/a	4	3&4	
Volume of additional LO	high	none	none	none	low	none	medium	high	high	none	
Assist patients with daily activities.	■	■	■	■	■	■	■	■	■	■	10
Speaking — Talking to others to convey information effectively.	■	■	■	■	■	■	■	■	■	■	10
Adjust positions of patients on beds or tables.	■	■	■	■	■	■		■	■	■	9
Administer therapy treatments to patients using hands or physical treatment aids.		■	■	■	■	■	■	■	■	■	9
Administer basic health care or medical treatments.	■	■	■		■	■	■	■	■	■	9
Give medications or immunizations.	■	■		■	■	■	■	■	■	■	9
Prepare medical instruments or equipment for use.	■	■	■	■	■		■	■	■	■	9
Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.		■	■	■	■	■	■	■	■	■	9
Monitoring — Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.		■	■	■	■	■	■	■	■	■	9
Record vital statistics or other health information.	■		■	■	■		■	■	■	■	8
Monitor patients to detect health problems.	■	■	■		■		■	■	■	■	8
Feed patients.	■	■	■	■	■	■		■		■	8
Apply bandages, dressings, or splints.	■	■	■	■	■	■	■		■		8
Hold patients to ensure proper positioning or safety.	■	■	■	■	■	■		■	■		8
Clean patient rooms or patient treatment rooms.	■	■	■	■	■	■			■	■	8
Reading Comprehension — Understanding written sentences and paragraphs in work related documents.		■	■	■	■		■	■	■	■	8
Coordination — Adjusting actions in relation to others' actions.	■	■	■		■	■	■	■		■	8
Assess physical conditions of patients to aid in diagnosis or treatment.		■	■	■	■		■	■	■		7
Explain technical medical information to patients.	■	■	■		■	■	■		■		7
Assist practitioners to perform medical procedures.	■	■	■	■	■		■		■		7
Operate medical equipment.		■	■	■	■		■	■	■		7
Collect biological specimens from patients.	■	■	■	■	■		■		■		7
Move patients to or from treatment areas.	■	■	■	■	■	■	■				7
Dispose of biomedical waste in accordance with standards.	■	■	■	■	■	■		■			7
Psychology — Knowledge of human behavior and performance; individual differences in ability, personality, and interests; learning and motivation; psychological research methods; and the assessment and treatment of behavioral and affective disorders.	■		■	■	■	■	■	■			7
Medicine and Dentistry — Knowledge of the information and techniques needed to diagnose and treat human injuries, diseases, and deformities. This includes symptoms, treatment alternatives, drug properties and interactions, and preventive health-care measures.	■	■		■	■	■	■	■			7
Social Perceptiveness — Being aware of others' reactions and understanding why they react as they do.	■	■	■		■	■	■		■		7
Interview patients to gather medical information.		■	■	■	■	■	■				6
Customer and Personal Service — Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.		■	■	■	■		■	■			6
Service Orientation — Actively looking for ways to help people.	■	■	■		■	■		■			6
Transport biological or other medical materials.	■		■	■			■		■		5
Therapy and Counseling — Knowledge of principles, methods, and procedures for diagnosis, treatment, and rehabilitation of physical and mental dysfunctions, and for career counseling and guidance.			■			■	■	■	■		5
Public Safety and Security — Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.	■	■		■				■	■		5
Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.			■	■		■		■	■		5
Stock medical or patient care supplies.				■				■	■	■	4
English Language — Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.	■								■		2
Education and Training — Knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and groups, and the measurement of training effects.							■		■		2

Figure 14. **Mapping table for ICT service technician - ESCO**

	BG	DK	IE	ES	FR	LT	NL	AT	FI	UK-EN	
EQF level	4	4	4	5	4	4	3	4	4	5	
Volume of additional LO	high	low	none	none	medium	none	none	high	high	none	
keep up to date on product knowledge	■	■	■	■	■	■	■	■	■	■	10
provide technical documentation	■	■	■	■	■	■	■	■	■	■	10
perform ICT troubleshooting	■	■	■	■	■	■	■	■	■	■	10
use repair manuals	■	■	■	■	■	■	■	■	■	■	10
configure ICT system	■	■	■	■	■	■	■	■	■	■	10
ICT networking hardware	■	■	■	■	■	■	■	■	■	■	10
carry out work-related calculations	■	■	■	■	■	■	■	■	■	■	10
apply quality standards	■	■	■	■	■	■	■	■	■	■	10
interact with others	■	■	■	■	■	■	■	■	■	■	10
evaluate information	■	■	■	■	■	■	■	■	■	■	10
make decisions	■	■	■	■	■	■	■	■	■	■	10
use different communication channels	■	■	■	■	■		■	■	■	■	9
create solutions to problems	■	■	■	■		■	■	■	■	■	9
ICT debugging tools		■	■	■	■	■	■	■	■	■	9
administer ICT system	■	■	■	■		■	■	■	■	■	9
maintain ICT server		■	■	■	■	■	■	■	■	■	9
maintain ICT system	■	■	■	■	■		■	■	■	■	9
perform backups		■	■	■	■	■	■	■	■	■	9
ICT network cable limitations	■	■	■	■	■	■	■	■	■		9
repair ICT devices	■	■	■	■	■	■	■	■	■		9
ICT communications protocols	■	■	■	■	■		■	■	■	■	9
follow safety precautions in work practices	■	■	■	■	■		■	■	■	■	9
ICT safety	■	■	■	■	■		■	■	■	■	9
work independently	■	■	■	■	■		■	■	■	■	9
report facts	■		■	■	■	■	■	■	■	■	9
work in teams	■	■	■	■	■		■	■	■	■	9
implement ICT recovery system		■	■	■	■	■		■	■	■	8
manage ICT legacy implication			■	■	■	■	■	■	■	■	8
use precision tools	■	■	■	■	■	■	■		■		8
problem-solving with digital tools		■	■	■	■		■	■	■	■	8
communicate mathematical information	■	■	■		■		■	■	■	■	8
mother tongue	■	■	■		■		■	■	■	■	8
instruct others	■	■	■	■			■	■	■	■	8
develop strategy to solve problems	■	■	■	■			■	■	■	■	8
think creatively	■	■	■	■	■	■			■	■	8
systems thinking		■	■	■	■	■	■	■	■		7
define firewall rules		■	■	■	■	■	■	■	■		7
distributed directory information services	■	■		■	■	■	■	■			7
ICT system user requirements	■		■	■	■	■		■	■	■	7
ICT network routing		■	■	■	■	■	■	■	■		7
follow environmentally-sustainable work practices	■	■		■		■	■	■	■		7
digital communication and collaboration	■	■	■	■			■	■	■		7
digital data processing	■	■	■	■			■	■	■		7
carry out work-related measurements	■	■	■	■		■	■	■			7
attend to hygiene	■		■	■	■		■	■	■		7

Skill	Count
manage quality	7
demonstrate willingness to learn	7
meet commitments	7
work efficiently	7
foreign language	7
address an audience	7
give advice to others	7
process qualitative information	7
manage schedule of tasks	6
ICT system programming	6
use access control software	6
computer programming	6
follow hygienic work practices	6
use mathematical tools and equipment	6
work with shape and space	6
support company plan	6
use questioning techniques	6
manage time	6
use learning strategies	6
ICT market	5
service-oriented modelling	5
manage email hosting service	5
ICT encryption	5
manage quantitative data	5
adapt to change	5
attend to detail	5
deal with uncertainty	5
demonstrate consideration	5
accept constructive criticism	5
lead others	5
motivate others	5
persuade others	5
support colleagues	5
operate private branch exchange	4
procurement of ICT network equipment	4
support cultural diversity	4
support gender equality	4
cope with pressure	4
make an effort	4
demonstrate good manners	4
follow ethical code of conduct	4
demonstrate intercultural competence	4
negotiate compromise	4
use body language	4
identify opportunities	4
memorise information	4
digital content creation	3
demonstrate curiosity	3
demonstrate enthusiasm	3
manage frustration	3
R (statistical analysis system software)	2
persist	2
Microsoft Visual C++ (integrated development environment software)	1

Figure 15. **Mapping table for ICT service technician – WSSS**

	BG	DK	IE	ES	FR	LT	NL	AT	FI	UK-EN	
EQF level	4	4	4	5	4	4	3	4	4	5	
Volume of additional LO	high	none	none	none	medium	none	low	high	high	none	
Health and safety legislation, obligations, regulations, and documentation	■	■	■	■	■	■	■	■	■	■	10
The features of a defined range of IT systems to enable a good breadth of support	■	■	■	■	■	■	■	■	■	■	10
The common types of hardware/software errors which can occur	■	■	■	■	■	■	■	■	■	■	10
Select and use diagnostic software and tools to identify problems	■	■	■	■	■	■	■	■	■	■	10
Accurately record problem and provide resolution report	■	■	■	■	■	■	■	■	■	■	10
Network environments and topologies	■	■	■	■	■	■	■	■	■	■	10
The types and location requirements of active network devices e.g. routers and switchers	■	■	■	■	■	■	■	■	■	■	10
Security options and their impact	■	■	■	■	■	■	■	■	■	■	10
Configuration documentation required e.g. installation instructions	■	■	■	■	■	■	■	■	■	■	10
The basic functions of the hardware and the process for setting-up	■	■	■	■	■	■	■	■	■	■	10
Test and rectify any problems and re-test as appropriate	■	■	■	■	■	■	■	■	■	■	10
Networking protocols e.g. IPv6	■	■	■	■	■	■	■	■	■	■	10
Work with other team members and follow required procedures to achieve successful configuration	■	■	■	■	■	■	■	■	■	■	10
The importance of integrity and security when dealing with user equipment and information		■	■	■	■	■	■	■	■	■	9
Follow health and safety standards, rules, and regulations	■	■	■	■	■		■	■	■	■	9
Maintain a safe working environment	■	■	■	■	■		■	■	■	■	9
Work effectively as a member of a project team	■	■	■	■	■		■	■	■	■	9
The roles and requirements of colleagues and the most effective methods of communication	■	■	■	■	■		■	■	■	■	9
Accurately determine user requirements and effectively manage expectations	■	■		■	■	■	■	■	■	■	9
Diagnostic and analytical approaches to problem solving	■	■	■	■	■	■	■		■	■	9
Recognize and understand problems swiftly and follow a self-reliant and managed process for resolving		■	■	■	■	■	■	■	■	■	9
Thoroughly investigate and analyse complex problems/situations and apply fault finding processes		■	■	■	■	■	■	■	■	■	9
Logical and functional diagrams	■	■	■	■	■	■	■	■	■	■	9
The process for selecting the appropriate driver for different kinds of hardware	■	■	■	■	■	■	■	■		■	9
Networking environments	■	■	■	■	■	■	■	■		■	9
Implement networking services as required by customer		■	■	■	■	■	■	■	■	■	9
The process for building a network and how network devices can be configured to enable efficient communication	■	■	■	■	■	■	■	■		■	9
The techniques of planning, scheduling, and prioritizing	■	■	■	■		■	■	■	■	■	8
The significance of accuracy, checking, and attention to detail in all working practices	■	■		■	■	■	■	■		■	8
The importance of methodical working practices	■	■		■	■	■	■	■	■	■	8
Collaboration and research methods and techniques	■	■	■	■	■		■	■	■	■	8
The value of managing own continuing professional development	■		■	■	■	■	■	■	■	■	8
The speed of IT systems change and the need to maintain currency	■		■	■	■	■	■	■	■	■	8
Select, use, clean, maintain, and store tools and equipment safely and securely	■	■	■	■	■	■	■		■	■	8
Work efficiently and check progress and outcomes regularly	■	■	■		■	■	■	■	■	■	8
Collaborate with work colleagues effectively to maximize efficiency and learning	■	■	■	■	■		■	■	■	■	8
The importance of listening as part of effective communication	■	■	■	■	■	■	■	■	■	■	8
Manage consistently effective verbal and written communications with colleagues	■	■	■	■	■		■	■	■	■	8
Planning and scheduling techniques to facilitate a consistently high level of service, to meet the needs of the user and the organization	■	■	■	■		■	■	■	■	■	8
Different demonstration and presentation techniques to support the development of users' skills and knowledge		■	■	■	■	■	■	■	■	■	8
Trends and developments in the industry and types of improvement which could be introduced to the user		■	■	■	■		■	■	■	■	8

Description	Count
Pro-actively maintain currency of IT systems knowledge	8
Provide accurate up-to-date advice on up-grading and sourcing new IT products and services to support decision-making	8
Translate needs, making recommendations which meet requirements e.g. budgets	8
Support users in resolving problems through advice, guidance, and instruction	8
Address schemes	8
Discuss the technical design requirements for operating systems and networking devices at the appropriate level of responsibility and accountability within the client organization	8
The range of operating systems and their abilities to match particular user requirements, given the user budget requirements	8
The precautions that need to be actioned before an installation or an upgrade	8
The range of network devices e.g. routers, VoIP, IP devices e.g. security cameras, printers, wireless access points, and inter-networking connectivity	8
Precautions which need to be taken to avoid issues arising from changing network configuration on operational equipment	8
Select appropriate services to meet customer requirements	8
Apply all types of different configurations, including software and hardware upgrades, on all kinds of networking devices that can appear in a network environment to include: Routing protocols, Network Security, Wi-Fi, VoIP, etc.	8
Design and implement disaster recovery procedures	8
Discuss the proposed solution for role/feature and agree with relevant parties e.g. users, colleagues and managers	8
The situations when personal protective equipment (PPE) must be used, e.g. for ESD (electrostatic discharge)	7
Identify and use the appropriate Personal Protective Equipment for ESD	7
Plan the work area to maximize efficiency and maintain the discipline of regular tidying	7
Techniques for effective team work	7
Techniques for resolving misunderstandings and conflicting demands	7
Respond appropriately within target time-scales, to users within an organization and those based remotely, in order to provide the appropriate level of IT support	7
Plan, schedule, prioritize and regularly re-prioritize requests for IT support in order to meet and balance the needs of the individual and the organization	7
Produce a cost and time estimate for work to be completed	7
Successfully coach individuals 'face-to-face' and remotely to resolve IT problems, introduce new products and develop their skills and knowledge	7
Demonstrate resilience and persistence when dealing with problems	7
Give knowledgeable/best advice and possible solutions to customer to meet technical and security requirements	7
Prepare configuration documentation	7
The purpose of documenting the completion of the installation or up-grade	7
Closely listen, translate, and accurately identify user needs to ensure expectations are met	7
Accurately identify the hardware and appropriate software driver required to match user/manufacturer specifications	7
Consistently check manufacturers guidance for up-grading regarding 'work flow'	7
Select the roles and/or features of the operating/server system e.g. Active Directory Domain Services (role) and Window Server Back-up (feature)	7
Discuss the proposed solution for role/feature and agree with relevant parties e.g. users, colleagues and managers	7
Configure the appropriate role/feature following manufacturer's instructions or best practice within the organization	7
Gain user acceptance and record	7
The importance of documenting the (rational for as well as all) final configuration settings	7
Maintain configuration records	7
The ability to seek assistance from peers when lacking in experience or knowledge in a particular area	6
The importance of safe disposal of waste for re-cycling	6

Description	Value
Keep up-to-date with 'license to practice' requirements and maintain currency	6
Demonstrate thorough and efficient research methods to support knowledge growth	6
The importance of building and maintaining productive working relationships with colleagues and managers	6
Demonstrate strong listening and questioning skills to deepen understanding of complex situations	6
Pro-actively contribute to the development of a strong and effective team	6
Select appropriate demonstration techniques to suit different levels of experience/capability	6
Effectively demonstrate IT systems to individuals and teams to enable them to grow their skills and knowledge	6
Recognize opportunities to contribute ideas to improve the product and overall level of user satisfaction	6
Approach a problem with the appropriate level of confidence to calm the user as necessary	6
Challenge incorrect information to prevent/minimize problems	6
Check user satisfaction level after a problem has been addressed	6
Undertake pre-acceptance testing of the concept	6
Select the operating system: proprietary/open source, total cost of ownership in relation to customer resources	6
Regularly schedule, re-schedule, and multi-task according to changing priorities	5
Undergo various certification requirements, such as: Cisco, Microsoft, and Linux, specializing in at least one specific area	5
The process for managing tension and anger to resolve difficult situations	5
Effectively manage tension/anger and give individuals confidence that their problems can be resolved	5
Different methods of assessing user's abilities in order to support immediate needs and encourage personal development	5
The importance of a calm and focused approach in solving a problem	5
The significance of IT systems and the dependency of individuals and organizations on its constant availability	5
Boundaries of own knowledge/skills/authority and sources of support/escalation procedures	5
Standard resolution times for common problems	5
Check work regularly to prevent/minimize problems at a later stage	5
Seek support when further expertise is necessary and avoid temptation to 'be consumed' by the challenge of the problem	5
Match budget/resource restraints with best possible client solutions	5
Accurately transfer the customer wishes to a logical diagram	5
Prepare a document and get sign off	5
The importance of following instructions and the consequences/costs of not adhering to them	5
Prepare a technical document reflecting the solution in detail for agreement and sign-off	5
Demonstrate enthusiasm to try new methods, systems, and embrace change	4
Recognize and adapt to the changing needs of colleagues	4
Coaching techniques to meet individual learning styles	4
Negotiation techniques for different situations e.g. a project tender	4
Interpret user demands and design requirements to industry certification requirements	4
Share knowledge and expertise with colleagues and develop a supportive learning culture	3
Contribute to bids and tenders for projects	3

Figure 16. **Mapping table for ICT service technician – O*NET**

	BG	DK	IE	ES	FR	LT	NL	AT	FI	UK-EN	
EQF level	4	4	4	5	4	4	3	4	4	5	
Volume of additional LO	high	none	none	none	medium	none	low	high	high	none	
Resolve computer network problems.	■	■	■	■	■	■	■	■	■	■	10
Test computer hardware performance.	■	■	■	■	■	■	■	■	■	■	10
Troubleshoot issues with computer applications or systems.	■	■	■	■	■	■	■	■	■	■	10
Customer and Personal Service — Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.	■	■	■	■	■	■	■	■	■	■	10
Speaking — Talking to others to convey information effectively.	■	■	■	■	■	■	■	■	■	■	10
Troubleshooting — Determining causes of operating errors and deciding what to do about it.	■	■	■	■	■	■	■	■	■	■	10
Writing — Communicating effectively in writing as appropriate for the needs of the audience.	■	■	■	■	■	■	■	■	■	■	10
Collaborate with others to resolve information technology issues.	■	■	■	■	■	■		■	■	■	9
Document operational activities.	■	■		■	■	■	■	■	■	■	9
Implement security measures for computer or information systems.	■	■	■	■	■	■		■	■	■	9
Install computer hardware.	■		■	■	■	■	■	■	■	■	9
Maintain computer networks to enhance performance and user access.		■	■	■	■	■	■	■	■	■	9
Provide technical support for computer network issues.		■	■	■	■	■	■	■	■	■	9
Resolve computer software problems.	■	■	■	■	■	■	■	■		■	9
Test software performance.	■	■	■	■	■	■	■	■		■	9
Computers and Electronics — Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.	■	■	■	■	■	■	■	■		■	9
Coordination — Adjusting actions in relation to others' actions.	■	■	■	■	■	■	■	■	■	■	9
Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.		■	■	■	■	■	■	■	■	■	9
Operation and Control — Controlling operations of equipment or systems.		■	■	■	■	■	■	■	■	■	9
Operation Monitoring — Watching gauges, dials, or other indicators to make sure a machine is working properly.	■	■	■	■	■	■	■	■		■	9
Quality Control Analysis — Conducting tests and inspections of products, services, or processes to evaluate quality or performance.	■	■	■	■	■	■	■	■		■	9
Reading Comprehension — Understanding written sentences and paragraphs in work related documents.	■	■	■	■	■	■	■	■		■	9
Repairing — Repairing machines or systems using the needed tools.	■	■	■	■	■	■	■	■	■	■	9
Analyze data to identify or resolve operational problems.	■	■	■	■	■	■	■		■	■	8
Collect data about customer needs.		■	■	■	■	■	■	■	■	■	8
Create electronic data backup to prevent loss of information.		■	■	■	■	■		■	■	■	8
Monitor the performance of computer networks.		■	■	■	■	■	■	■		■	8
Recommend changes to improve computer or information systems.		■	■	■	■	■	■	■	■	■	8
Update knowledge about emerging industry or technology trends.	■	■	■	■	■		■	■		■	8
Mathematics — Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.	■	■	■	■	■			■	■	■	8
Telecommunications — Knowledge of transmission, broadcasting, switching, control, and operation of telecommunications systems.		■	■	■	■		■	■	■	■	8
Complex Problem Solving — Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.		■	■	■	■	■	■	■	■	■	8
Mathematics — Using mathematics to solve problems.	■	■	■	■	■			■	■	■	8
Service Orientation — Actively looking for ways to help people.	■	■	■	■	■	■	■	■	■	■	8
Systems Analysis — Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.		■	■	■	■	■	■		■	■	8
Systems Evaluation — Identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.		■	■	■	■		■	■	■	■	8

Description	Value
Develop computer or information security policies or procedures.	7
English Language — Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.	7
Active Learning — Understanding the implications of new information for both current and future problem-solving and decision-making.	7
Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.	7
Equipment Maintenance — Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.	7
Judgment and Decision Making — Considering the relative costs and benefits of potential actions to choose the most appropriate one.	7
Programming — Writing computer programs for various purposes.	7
Time Management — Managing one's own time and the time of others.	7
Analyze project data to determine specifications or requirements.	6
Conduct research to gain information about products or processes.	6
Coordinate resource procurement activities.	6
Identify information technology project resource requirements.	6
Clerical — Knowledge of administrative and clerical procedures and systems such as word processing, managing files and records, stenography and transcription, designing forms, and other office procedures and terminology.	6
Monitoring — Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.	6
Operations Analysis — Analyzing needs and product requirements to create a design.	6
Document network-related activities or tasks.	5
Maintain the inventory of equipment.	5
Train others in computer interface or software use.	5
Engineering and Technology — Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.	5
Social Perceptiveness — Being aware of others' reactions and understanding why they react as they do.	5
Design integrated computer systems.	4
Management of Personnel Resources — Motivating, developing, and directing people as they work, identifying the best people for the job.	4

Annex 5.HCEU/VQTS Competence Matrix

Figure 17. **Using the VQTS/HCEU matrix for comparing qualifications**

Competence area	Sub-area of competence	DK (blue) vs. IE (orange)			
Assessment, diagnosis, planning professional care	Gathering data	1.1.a To be able to assist in conducting professional care assessment.	1.1.b To be able to conduct professional care assessment.	1.1.c To be able to guide and supervise the complete professional care assessment.	
	Nursing diagnosis	1.2.a To be able to assist in developing the nursing diagnoses based on collected data.	1.2.b To be able to develop and revise nursing diagnoses based on collected data.	1.2.c To be able to guide and supervise others in developing and revision of nursing diagnoses	
	Planning professional care	1.3.a To be able to assist in developing, revision and adaption of the professional care plan.	1.3.b To be able to develop, revise and adapt the professional care plan.	1.3.c To be able to (a) apply and develop special care plans (b) guide and supervise the development, revision and adaption of the professional care plan.	
Nursing Care	Basic care and personal hygiene	2.1.a To be able to support the patient/client to perform basic care.	2.1.b To be able to perform basic care in all care cases.	2.1.c To be able to guide and supervise others in performing basic care in all care cases.	
	Nutrition	2.2.a To be able to order and distribute meals and, if necessary, support patients/clients without specific dietary restrictions or functional limitations according to nutrition plans.	2.2.b To be able to assist in preparing and adapting a nutrition plan according to patients's/clients' individual condition and functional limitations, handle enteral nutrition and to place and handle feeding tubes.	2.2.c To be able to independently prepare and adapt a nutrition plan according to patient's/client's individual condition and functional limitations; place and handle feeding tubes.	2.2.d To be able to guide and supervise the handling of enteral nutrition and placing and handling of feeding tubes.
	Mobility, movement, positioning	2.3.a To be able to assist in mobility measures including patient/client activation according to patient's/client's treatment plan and ndividual condition.	2.3.b To be able to implement mobility measures including patient/client activation according to patient's/client's treatment plan and ndividual condition.	2.3.c To be able to guide and supervise the implementation of mobility measures.	
	Excretion	2.4.a To be able to support patients/clients in excretion.	2.4.b To be able to assist in placing and caring of catheters, placing and handling enemas and bowel catheter systems	2.4.c To be able to place and care for urinary catheters, place and handle enemas and bowel catheter systems.	2.4.d To be able to guide and supervise all measures related to exretion.
Nursing intervention	Participating in medical and diagnostic procedures	3.1.a To be able to prepare and support patient's/client's for medical treatments and diagnostic tests according to prescription; assist in preparing of medical devices and materials; collect and assist in collecting patient's/client's specimens for treatments.	3.1.b To be able to prepare and support patient's/client's for medical treatments and diagnostic tests according to prescription; collect all kinds of patient's/client's biological specimens for treatments; assist other professionals in medical and laboratory treatments.	3.1.c To be able to guide and supervise others in the participating in treatments and diagnostic procedures.	
	Preparing and administering medication	3.2.a To be able to administer oral and subcutaneous medication according to prescription.	3.2.b To be able to prepare and administer all medication (apart from intra-arterial and intra thecal applications) according to prescription.	3.2.c To be able to guide and supervise the medication process.	
	Wound management	3.3.a To be able to take care of wounds; prevent wounds; assist in wound care.	3.3.b To be able to assess wounds; apply and to change wound dressings according to prescription.	3.3.c To be able to guide and supervise others in wound care.	
	Stoma Management	3.4.a To be able to assist in assessing and taking care of stomas according to prescription.	3.4.b To be able to assess and take care of stomas according to prescription.	3.4.c To be able to guide and supervise others in assessing and taking care of stomas according to prescription.	
	Dealing with medical devices	3.5.a To be able to assist in managing and if applicable placing medical devices according to medical products and guidelines.	3.5.b To be able to manage and if applicable place medical devices according to medical products and guidelines.	3.5.c To be able to assist in and to perform related medical procedures.	3.5.d To be able to guide and supervise others in the use and maintenance of medical devices and related procedures.
	Basic and Advanced life support (BLS/ALS)	3.6.a To be able to provide BLS according to resuscitation guidelines.	3.6.b To be able to assist in applying ALS according to resuscitation guidelines and in cooperation with authorised edical personnel.	3.6.c To be able to apply ALS according to resuscitation guidelines and in cooperation with authorised medical personnel.	3.6.d To be able to guide and supervise others in providing BLS and ALS according to resuscitation guidelines
Creating and maintaining a healthy and safe environment	Hygiene	4.1.a To be able to apply relevant (legal and employer-specific) hygienic procedures and guidelines regarding personnel hygiene, working environments, medical equipment, medical waste.	4.1.b To be able to guide and supervise the correct application of hygiene regulations.	4.1.c To be able to contribute to the evaluation and revision of hygienic procedures and guidelines, execute tests regarding hygiene.	
	Sterilisation	4.2.a To be able to clean, disinfect, sterilise and store medical instruments according to sterility rules.		4.2.b To be able to guide and supervise the complete sterilisation process and to apply document of quality control indicators and protocols.	
	Occupational health and safety	4.3.a To be able to promote a health promoting and safe environment and to implement related measures.	4.3.b To be able to detect safety risks and to increase safety by implementing preventive measures.	4.3.c To be able to develop assessment tools to prevent safety risks and to monitor the maintenance of a safer environment.	
	Handling onsite disasters	4.4.a To be able to react according to guidelines in emergencies and disasters.	4.4.b To be able to coordinate emergencies and disasters as well as care about victims.	4.4.c To be able to prepare guidelines and strategies for emergencies and disasters and to develop and execute appropriate trainings.	

Competence area	Sub-area of competence	DK (blue) vs. IE (orange)			
Communication and collaboration with other professionals	Train and manage other professional caregivers in work activities	5.1.a To be able to contribute to informing and monitoring other professional caregivers regarding daily working routines. (e.g. show others acts in daily routine in absence of the practical instructor)	5.1.b To be able to inform and monitor other professional caregivers concerning daily working routines and individual tasks, make decisions in absence of the person in charge. (e.g. take over management of the ward in absence of the ward manager)	5.1.c To be able to guide and supervise tasks and activities performed by other professional caregivers according to pedagogical and subject related principles, (e.g. educate others as a practical instructor) contribute to the development of new care standards, instruction guidelines and protocols.	
	Professional communication	5.2.a. To be able to communicate within the multidisciplinary team and with other staff, apply professional language.	5.2.b To be able to collaborate with other health care professionals in working processes, network within the multidisciplinary team and with other professionals, advocate for the patients/clients. (e.g. represent the interests of patient's/client's who are unable to do so themselves to physicians)	5.2.c To be able to participate in developing, implementing and evaluating mechanisms for optimising the processes of multidisciplinary collaboration.	
	Integrated care	5.3.a. To be able to apply to the requirements of patient/client management. (e.g. discharge, intake, occupancy management)	5.3.b To be able to apply disease management, contribute to case management.	5.3.c To be able to implement disease and case management in the facility, cooperate with internal and external partners in order to implement integrated care.	5.3.d To be able to implement and further develop integrated care within the facility, network with external partners in order to improve integrated care.
Communication and collaboration with patients/clients	Communication with patients/clients and relevant others	6.1.a To be able to build, maintain and end verbal and non-verbal communication through empathy and appreciation.		6.1.b To be able to assess the patient's/client's capability of cognitive/emotional response and behaviour using professional techniques/tools, use professional communication models/tools. (e.g. RTR measurement, assessment of facial expressions, gestures)	
	Education and empowerment	6.2.a To be able to explain treatment and care related information to the patient/client and relevant others.	6.2.b To be able to train, counsel and empower patient's/client's and relevant others regarding self-care.	6.2.c To be able to identify learning needs of patient's/client's and relevant others.	6.2.d To be able to efficiently use professional methods of interpersonal communication in challenging situations. (e.g. lip-read, Watzlawick)
	Health promotion and prevention	6.3.a To be aware of developments on health promotion and prevention and to be able to provide, motivate and support preventive measures in the care process. (e.g. care advice, family health care, public health care)	6.3.b To be able to implement care processes facilitating health promotion and prevention and the independency of the patient/client, coordinate the collaboration with the multidisciplinary team in order to motivate and support the patient's/client's health promotion and health prevention activities. (e.g. teaching patient's/client's about diabetes while connect the needs to the schedule of the day, organise and offer sports activities for patient's/client's with restrictions on self-care)	6.3.c To be able to contribute to the development and the implementation of health promotion/prevention within the health system.	
	Fostering social life and a stimulating environment	6.4.a To be able to foster health promotion with the patient/client by using creative elements, social activities and the living environment. (e.g. integration into musical activities)		6.4.b To be able to plan and carry out complex activities of daily life and to participate in arranging/ furnishing living environments. (e.g. arrange celebrations)	
	Organising daily life and daily life activities	6.5.a To be able to support the patient/client in organising his/her daily life. (e.g. accompany when shopping)		6.5.b To be able to act on behalf of the patient/client in aspects of their daily life. (e.g. work with the social security office to receive support money)	
Management	Monitoring and evaluating of patient's/client's condition	A.1.a To be able to recognise changes in the patient's/client's condition and react appropriately.	A.1.b To be able to recognise changes in the patient's/client's condition using scoring tools and react appropriately, interrelate the patient's/client's condition to disease pattern.	A.1.c To be able to guide and supervise others in monitoring and evaluating the patient's/client's condition	
	Documentation	A.2.a To be able to independently document all required data of the patient/client.		A.2.b To be able to guide and supervise the documentation.	
	Promoting quality assurance measures	A.3.a To be able to ensure nursing care while considering quality aspects.	A.3.b To be able to convey the meaning of evidence-based care into daily work and to use existing quality systems.	A.3.c To be able to perform quality assurance tasks and to guide and supervise others in delivering quality care.	A.3.d To be able to establish, implement and develop quality management and quality management systems.
	Ethical competence	B.1.a To be able to apply professional care based on ethical principles and concepts, recognise and manage ethical challenges in professional care and react appropriately.		B.1.b To be able to critically reflect ethical issues and support and guide others in ethical decision making	
	Intercultural competence	B.2.a To be able to recognise and show understanding for potential needs and challenges of patient's/client's according to cultural differences and similarities and to react appropriately.	B.2.b To be able to manage intercultural challenges with conflict potential and develop solution strategies. (e.g applying culture-sensitive care)	B.2.c To be able to mediate intercultural challenges, guide other staff members and patient's/client's.	B.2.d To be able to initiate and moderate meetings on ethical issues, participate in ethics commissions.
	Legal framework	B.3.a To be able to act professionally in accordance to legislation on health care (e.g. act according to standards of nursing practice and to existing laws)		B.3.b To be able to ensure compliance with laws and company regulations. (e.g. working law, law regarding to medical products)	
	Identifying and addressing professional training needs	C.1.a To be able to critically reflect one's own competences and to identify training needs.	C.1.b To be able to implement life-long learning in the professional care environment.	C.1.c To be able to identify and select appropriate continuous education opportunities in order to follow them.	C.1.d To be able to identify training needs of other caregivers and support them in their professional development.
	Development of the profession	C.2.a To be able to differentiate between professional care and other health care professions	C.2.b To be able to critically reflect one's profession and position within health care, the social system and society.	C.2.c To be able to identify trends and developments within the health care and social system and their impacts on care professions.	
	Professional care research	C.3.a To be able to understand scientific publications in the field of nursing care.	C.3.b To be able to critically interpret and evaluate research findings and to incorporate relevant findings in the daily practice	C.3.c To be able to support others in research projects and to participate in research in the field of professional care.	

Annex 6. The research team

The following table provides a list of the research team who contributed to the study.

Name	Role
Karin Luomi-Messerer	Team leader
	Country expert – Austria
Simon Broek	Core team
	Country expert - Netherlands
Monika Auzinger	Core team
	Country expert – Austria
Maria Kargl	Core team
Andrew McCoshan	Core team
	Country expert – Ireland
Claudia Plaimauer	Core team
Christopher Winch	Core team
	Country expert – UK-England
Mariya Dzhengozova	Country expert – Bulgaria
Søren Kristensen	Country expert – Denmark
Jouko Luomi	Country expert - Finland
Patrick Werquin	Country expert – France
Vidmantas Tutlys	Country expert – Lithuania
Oriol Homs	Country expert – Spain

# Annex 7.   List of persons interviewed

(not included here due to GPRS)

Annex 8.   Research tools

The research tools provided to country researchers are embedded as files below.

Guidance note for country researchers:

📄 ComparingQ_guida
nce note_20181207.(

Reporting template on feedback to the reference points:

📄 Feedback_reference
_points_20181206.d(

Mapping tables ICT service technician:

📊 ComparingQual_W
A1_ICT_20181206.xls

Mapping tables healthcare assistant:

📊 ComparingQual_W
A1_Health_2018120(