



COMPETENCE MATRIX INTERNATIONAL SERVICE TECHNICIANS



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MAN Diesel & Turbo



Leonardo da Vinci
istituto tecnico industriale



Via Peruzzi, 9 – Carpi (MO)
Tel. +39 059 695241
Fax + 39 059 643028
Cod. Fisc. 81004250361



Lifelong
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How to use the IST Competence Matrix for ECVET Mobilities

Tanja Bacher, Simone Kunz (3s research laboratory)

1. Introduction

For some years now the European Commission has pursued the objective of increasing the mobility rate of young people in Vocational Educational and Training (VET). However, the diversity of VET systems in Europe often makes the comparability of education offers difficult and hardly gives young people the opportunity to spend a period of learning abroad, even a short-term one. Since such a stay can be highly valuable for young people, the European Commission has encouraged the development of transparency instruments to improve the understanding of VET systems in other countries and therefore boost transnational mobility. One such instrument is the ECVET recommendation, the European Credit system for Vocational Education and Training.

2. The VQTS model¹

The VQTS model seeks to overcome such incomparability of qualifications and training programmes in different countries. By focussing on work processes many similarities in workplace tasks across countries can be identified. Thus, such core work tasks are often easier to compare than training programmes in different countries for achieving the required competences. In the VQTS model the core elements are the Competence Matrix and Competence Profiles.

2.1 Competence Matrix

In the Competence Matrix learning outcomes related to an occupational field are presented in a table. The vertical axis of the Competence Matrix contains the competence areas, based on the various core work tasks of the respective professional field. The horizontal axis shows the steps of competence development described in learning outcomes, which indicate the progress of a learner or a graduate of a training programme. The core work tasks of the selected occupational field are derived empirically from the working world. Major changes in the respective occupational field can easily be accommodated in the Competence Matrix.

2.2 Competence Profiles

By using a Competence Matrix, Competence Profiles can describe the stages of competence development to be achieved through a training programme or the stages already achieved by a learner or a graduate of a training programme. The crucial question for this exercise is how well a curriculum or training plan can be mapped on the Competence Matrix. This mapping process is easier where the curriculum or training plan is developed and described in a competence-based or learning-outcomes-based manner.

2.2.1 Organisational Profiles

The Organisational Profile mirrors the width and scope of competence development that can be achieved in a specific VET programme and is usually developed by the authorities responsible for a training programme.

2.2.2 Individual Profiles

Using an Organisational Profile helps to identify the competences acquired so far by a learner or by a graduate of a training programme and thus to produce an Individual Profile.

¹ For further information visit: <http://www.vocationalqualification.net/vqts/>.

3. The IST Competence Matrix

One aim of the Leonardo da Vinci-Project 'International Service Technician' was to develop a training course to equip Service Technicians with the required international skills and competences, including a period of work experience in an international company. Based on a skills audit with companies, and in close cooperation with the participating VET schools, core work tasks of International Service Technicians were derived. Thus, the IST Competence Matrix displays the competence requirements of International Service Technicians in Italy, Netherlands and Norway.

4. How to use the IST Competence Matrix for ECVET mobilities

ECVET describes qualifications in terms of 'units of learning outcomes'. This helps to identify the units of learning outcomes that could be transferred in the course of an ECVET mobility experience. Including the Competence Matrix within a Memorandum of Understanding (MoU), a voluntary agreement determining the conditions of mobility exchanges between institutions involved, would assist in identifying the relevant learning tasks to be undertaken during the mobility period.

The Individual Profile can also be used for ECVET mobilities, by indicating the competences of a mobile learner before and after a mobility period. Hence, the Individual Profile can facilitate the development of a Learning Agreement (LA), which lays down the conditions for the respective mobility period/project.

4.1 Units of Learning Outcomes

The assessment of the units of learning outcomes transferred in a mobility period plays a major role in ECVET. The assessment criteria have to be agreed on before mobility periods for reasons of transparency. They should be clearly described in the Learning Agreement to indicate "if the learner achieves the expected learning outcomes and if these are positively assessed by the "hosting" institution, the "home" institution will validate and recognise them as part of the requirements for a qualification".²

² <http://www.ecvet-team.eu/en/content/get-know-ecvet-better-questions-answers>.

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1. Introduction

For some years now the European Commission has pursued the objective of increasing the mobility rate of young people in VET (Vocational Educational and Training). The Bruges Communiqué (European Commission, 2010), for example, calls for the establishment of communication strategies for different stakeholder groups, and focused on implementation and the added value of transparency tools (e.g. ECVET). Besides, there are several other European (transparency) tools and principles³ supporting mobility and lifelong learning and improving the quality and efficiency of education and training (aims that are included in the long-term strategic objectives of the EU education and training policies 'ET 2020').⁴

However, it is still not as common for VET students to have a stay abroad as it is for university students, who mainly take a semester abroad by taking part in the Erasmus programme. This may be due to the following reasons: The age of learners may play a role (they are often younger in VET schools) as well as lacking structures (for example a central mobility coordination office) or language and financial barriers. Furthermore, one important impediment is insufficient understanding of foreign education systems, programmes and contents.

The diversity of VET systems in Europe, which is an expression of the individual countries' different cultures and traditions, makes the comparability of education offers difficult and hardly gives young people the opportunity to spend a period of learning abroad, even a short-term one. However, such a stay can be highly valuable for young people because it contributes to their personal development and also enhances their opportunities in the labour market. It is for these reasons that the European Commission has for some years encouraged the development of transparency instruments to help improve understanding of VET systems in other countries and therefore boost transnational mobility. One such instrument is the ECVET recommendation, the European Credit system for Vocational Education and Training, issued by the Commission and adopted by the European Parliament and the Council in 2009.⁵

The VQTS model is one approach for enhancing the transparency and comparability of training programmes offered in different countries by identifying similarities/differences through core work tasks of a specific occupational field. The IST project followed the VQTS approach and developed an IST Competence Matrix. This paper discusses how the IST Competence Matrix could be used as a starting point for planning and conducting ECVET mobilities.

2. The VQTS model⁶

Comparing training programmes and understanding qualifications from other countries' VET systems is one of the main challenges of ECVET implementation, since there are various national approaches, concepts and traditions for designing and describing qualifications. The VQTS model is one approach to overcome such incomparability of qualifications and training programmes of different countries by

³ Cf. http://ec.europa.eu/education/lifelong-learning-policy/mobility_en.htm.

⁴ Cf. http://ec.europa.eu/education/lifelong-learning-policy/framework_en.htm.

⁵ Cf. ECVET Recommendation: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:155:0011:0018:EN:PDF>

⁶ For further information visit: <http://www.vocationalqualification.net/vqts/>.

focussing on work processes (Luomi-Messerer 2009, p. 10-11).

The model was developed in the European Project 'VQTS' (Vocational Qualification Transfer System) and was further developed in the Lifelong Learning project 'VQTS II'. The VQTS model assumes that although there are differences in national approaches on how training is offered and organised, it is possible to identify many similarities in the tasks of modern work processes. For example, different professions in different countries tend to apply similar material, technologies and processes. Thus, occupational requirements or the core work tasks including the required vocational or professional competences in an occupational field are often easier to compare than training programmes in different countries for achieving the required competences. Hence, "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" (ibid., p. 10-11). The VQTS model follows a 'development logical' differentiation of a competence profile and can thus also be used for describing the acquisition of competences. The core elements of the VQTS model are the Competence Matrix and Competence Profiles.

2.1 Competence Matrix

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 comparing qualifications with one another. In the Competence Matrix learning outcomes related to an occupational field are presented in a table. The vertical axis of the Competence Matrix contains the competence areas, based on the various core work tasks of the respective professional field. The horizontal axis shows the steps of competence development described in learning outcomes, which indicate the progress of competence development of a learner or a graduate of a training programme. The learning outcomes are described as professional competences which provide information about which core tasks a person can carry out in a specific work context (Luomi-Messerer 2009:10f).

When developing a Competence Matrix several considerations should be made: first, the occupational field in which the Competence Matrix is to be developed must be selected and it must be decided, which professional profiles will be included in the matrix. Second, experts should be involved in the development process: on the one hand experts able to provide support in applying the VQTS methodology and who preferably also have expertise in the selected occupational field as well as practitioners from the selected occupational field (from the world of work and the world of education) and from different countries for identifying transnational competence areas (core work processes) and the steps of competence development (ibid., p. 16). Third, the competence areas of the respective profession should be defined. As mentioned above the basis for this are the core work tasks which are comprehensive tasks within the work context of a person working in the respective occupation. Instead of using subjects from traditional subject-based curricula, the core work tasks of the selected occupational field should be derived empirically from the working world (work practice/work place). On the basis of the work tasks a varying number of competence areas are defined, depending on the complexity and range of activities or job opportunities within the respective occupational field (ibid., p. 17). Fourth, the competence development steps for each competence area are described. Competence development steps illustrate the process of progression from the lower to the higher steps, in total between two and six successive competence development steps should be defined, depending on the complexity of the respective competence area (ibid., 19ff).

The Competence Matrix is a flexible instrument since it allows responses to major changes in the respective occupational field by adding, removing or restructuring the Competence Matrix. It should be considered that titles of the competence areas should be chosen in a way that they promote mutual understanding and are understandable for experts working in the occupational field (ibid.).

2.2 Competence Profiles

By using a Competence Matrix, Competence Profiles can depict the stages of competence development to be achieved through a training programme or the stages already achieved by a learner or a graduate of a training programme. These profiles are formed from particular parts of the matrix and generally just cover a limited spectrum of the competences described in the matrix. The competence profiles are developed by identifying competences part of a specific training programme or qualification (Organisational Profile) or by reflecting the competences already acquired by a person in training or a graduate (Individual Profile). The Competence Profiles can only refer to the competences described in the Competence Matrix (ibid., p. 44).

Developing Competence Profiles requires an interpretation against the background of the specific training and work context. The crucial question for this exercise is how well a curriculum or training plan can be mapped on the Competence Matrix. Since the competences described in the Competence Matrix are strongly linked to the work processes and are not explicitly related to certain subjects of a curriculum or a training plan, the mapping process is easier in those cases where the curriculum or training plan is developed and described in a competence-based or learning-outcomes-based manner.

2.2.1 Organisational Profiles

The Organisational Profile mirrors the width and scope of competence development that can be achieved in a specific VET programme. An Organisational Profile reflects the range and extent of the competence development offered by a specific training programme. Organisational Profiles are formed by indicating the 'relevant' competences of the specific training programme in the Competence Matrix. In this case 'relevant' means that learners (participants of the particular training programme) are prepared for working in the respective competence areas and are developing competences in the respective steps of competence development.

Usually Organisational Profiles are developed by the authorities responsible for a training programme. Those involved in this exercise should have a very good knowledge about the curriculum or training plan as well as about the core work tasks expected of a graduate of the respective training programme. Therefore, one should include people involved in the training process (for example, teaching and training personnel or people with similar functions), representatives from the working world, graduates or persons in training (ibid., p. 44-45).

2.2.2 Individual Profile

Using an Organisational Profile helps identifying the competences acquired so far by a learner or by a graduate of a training programme. For indicating the Individual Profile in the Competence Matrix teaching and training personnel who are well informed about the competence development process during the training programme should be involved. The Individual Profile can be developed at any time during training; this could also be combined with the end of terms, when examinations are conducted, since this might be useful for evaluating the stage of competence development already acquired by a learner.

3. The IST Competence Matrix

The Leonardo da Vinci-Project 'International Service Technician' (IST)⁷ is addressing the lack of specialised training courses for technicians undertaking international assignments and identified the

⁷ For further information visit: <http://www.servicetechnician.eu/>

need to equip these technicians with the skills and competences necessary to work in an international context. Since in a global economy Service Technicians are consistently required to solve technical problems wherever the global acting companies have installed their machines, it becomes necessary that Service Technicians are able to work internationally as International Service Technicians.

One aim of the project is to develop a training course to equip Service Technicians with the required international skills and competences including a period of work experience in an international company (cf. IST Proposal). In the IST project partners from different European Countries tried to overcome the problem of incomparability of training programmes by using the VQTS approach.

Thus, a Competence Matrix for International Service Technicians was developed, displaying the competence requirements of International Service Technicians in the countries Italy, Netherlands and Norway. Based on a skills audit with companies, and in close cooperation with the participating VET schools, core work tasks of International Service Technicians were derived. Since IST are mainly working with mechatronic systems it was decided in the project to use the VQTS Competence Matrix 'Mechatronics' as a basis and further develop the matrix and adapt it, so it fits the working reality of International Service Technicians. Hence, some competence areas of the VQTS Competence Matrix 'Mechatronics' were maintained whereas parts of others were removed or added. In addition to the nine competence areas of the Competence Matrix 'Mechatronics' the IST Competence Matrix identified five additional competence areas for working as an International Service Technician.

Once the IST Competence Matrix was available the Organisational Profiles of the VET programmes of the participating VET schools in Italy, the Netherlands and Norway were indicated in the Competence Matrix. Although the three participating VET schools in the IST project are not explicitly operating with learning-outcome descriptions, all of them were able to indicate their course profiles for 'Mechanics, Mechatronics and Energy' (Italy), 'Automation' and 'Industrial Mechanic' (Norway) and 'Middle-ranking Engineering Outflow Differentiation Technician'⁸ (Netherlands) in the developed Competence Matrix, although these programmes might also include additional training content (for example specialised training content on energy as it might apply to the training programme in Italy) not relevant for working as an International Service Technician.

4. How to use the IST Competence Matrix for ECVET mobilities

According to the 'Copenhagen Process', it should be possible to utilize 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. The added value of ECVET is that it builds on a structured description of qualifications in terms of 'units of learning outcomes' and therefore facilitates the identification of possible units of learning outcomes that could be transferred in the course of an ECVET mobility (Luomi-Messerer/Tritscher-Archan 2011, p. 5-6).

A Competence Matrix can facilitate such mobility periods: The indication of Organisational Profiles in the Competence Matrix can facilitate the establishment of transparency and mutual trust between the competent institutions, when planning mobility periods, since overlapping training content as well as differences in the respective training programmes become visible. In the ECVET approach the establishment of mutual trust is laid down in the Memorandum of Understanding (MoU), which is a

⁸ The original name of the programme in Dutch is „Middenkader Engineering Uitstroombdifferentiatie Technicus.”

voluntary agreement determining the conditions of mobility exchanges between institutions involved. In this agreement the organisations accept each other's status as competent institutions and accept each other's quality assurance, assessment, validation and recognition criteria. Therefore it is recommended to include the Competence Matrix in the MoU for indicating the relevant parts for the mobility period.

The Individual Profile can also be used for ECVET mobilities, by indicating the individual profile of a mobile learner before and after a mobility period, which should be agreed on by both the 'sending' and the 'hosting' institution. Hence, the Individual Profile can facilitate the development of a Learning Agreement (LA), which lays down the conditions for the respective mobility period/project. The Learning Agreement is concluded by the VET providers in the country of origin and in the host country and the respective mobile learner. It comprises inter alia personal information about the mobile learner, the duration of the stay abroad as well as the knowledge, skills and competence to be acquired in the mobility period/project. It also clarifies the responsibilities of the stakeholders involved. In particular, it clarifies that, if the expected learning outcomes have been achieved or the specified competences have been developed by the mobile learner and positively assessed according to agreed criteria by the hosting institution, the home institution validates and recognises them as part of the requirements of a qualification.

Through the Individual Profile sufficient information is provided about the competences already acquired by the person in training (ibid., p. 46-47). This ensures that the mobile learner is given tasks and responsibilities that correspond with his/her level of competence development and that his/her competence development will be updated after the mobility period.

4.1 Units of Learning Outcomes

ECVET makes it easier to compare qualifications, since it provides a transparent and structured description in terms of learning outcomes. These learning outcomes are structured into units. Units of learning outcomes are components of a qualification and consist of coherent learning outcomes ('sets of learning outcomes'). This 'unit structure' is an advantage during training particularly for periods of mobility as they are related to only one part of a qualification.

The ECVET Recommendation suggests that the description of a unit should include the following information:

- the title of the unit;
- the title of the qualification to which the unit relates;
- the reference of the qualification according to the European Qualifications Framework (EQF) level and, where appropriate, the national qualifications framework;
- if applicable, the ECVET points associated with the unit;
- the learning outcomes contained in the unit;
- the procedures and criteria for assessment of these learning outcomes;
- the validity in time of the unit, where relevant.

The IST project used the Competence Matrix as a basis for identifying units of learning that could be transferred in a four week mobility period between the VET schools in Italy, the Netherlands and Norway. Through indicating the Organisational Profiles in the Matrix overlapping training areas could be identified and it could be ensured that the competences that will be acquired in a partner school in one of the partner countries in a concrete mobility period will be recognised and validated by the 'home' institution.

The IST project partnership agreed on two units of learning outcomes that could be transferred in a concrete mobility period – one technical and one non-technical unit. When forming units it needs to be

considered that it should be possible to assess the learning outcomes associated with the respective unit. In IST case both units should be assessable independently from each other.

The technical unit forms part of the specific training programmes of the VET-schools involved. In Italy parts of the IST Competence Matrix are included in the 5-year programme 'Mechanics, Mechatronics and Energy', in the Netherlands this is the case for the 3-year programme 'Middle-ranking Engineering Outflow Differentiation Technician' and in Norway for 'Automation' and 'Industrial Mechanic'. Also parts of the non-technical unit are part of these programmes (especially foreign language skills in Technical English). Other skills like travel and intercultural skills will be achieved in the form of 'learning by doing' through planning and conducting the trip to the country of the mobility period.

Unit 1 – Testing hardware and software components

(Competence area 7, competence development step 2)

- He/She can master the selection of hardware and software for mechatronic systems (sensors, actuators, interfaces, communication procedures) and can provide and test simple programmable logic control programs (PLC) according to production process requirements.

Unit 2 – Travel and foreign language skills

(Competence areas 12 and 13, competence development steps 2)

- He/She can make simple travel plans on his/her own, can deal with local currency and buy tickets and services (e.g. how to manage when medical assistance is needed, hiring a car and managing heavy traffic in a big city, solve insurance problems in car accidents).

- He/She can understand English in the main points of clear standard input on familiar matters regularly encountered in work, school, leisure etc. He/She can deal with most situations likely to arise whilst travelling in an area where the language is spoken.

Assessment of the units of learning outcomes transferred in a mobility period plays a major role in ECVET and the assessment criteria has to be agreed on before mobility periods for reasons of transparency. The IST project partners have already developed some ideas regarding the assessment of the two units. For unit 1 (technical unit) it was proposed by the involved VET schools that this unit could be assessed by using assessment procedures (e.g. theoretical and/or practical tests) available and used in the VET schools for assessing the contents defined in the unit. This applies also for parts of unit 2 (non-technical unit) e.g. the technical language skills, but for intercultural and travel skills other ways of assessment have to be found. One approach could be presentations of the stay abroad, dealing with experiences made, challenges faced and solutions found.

The assessment criteria should be laid down in the Learning Agreement before a mobility period and it should indicate that "if the learner achieves the expected learning outcomes and if these are positively assessed by the "hosting" institution, the "home" institution will validate and recognise them as part of the requirements for a qualification".⁹ The Learning Agreement should also include the Competence Matrix and a detailed description of the respective units of learning outcomes.

It was agreed that for the Memorandum of Understanding and the Learning Agreement the templates available on ECVET-Toolbox¹⁰ could be used and adapted by the VET schools in Italy, the Netherlands and Norway. In ECVET the assessment conducted must be documented in detail; this document is termed Personal Transcript. After the period abroad this document has to be sent by the 'hosting institution' to the 'home institution' for validation (Luomi-Messerer/Tritscher-Archan 2011, p. 11). For

⁹ <http://www.ecvet-team.eu/en/content/get-know-ecvet-better-questions-answers>.

¹⁰ <http://www.ecvet-projects.eu/toolbox/Default.aspx>.

systematically documenting the stay abroad, including the knowledge and skills acquired abroad Europass Mobility, an online tool for documentation could be used.

5. Conclusions and Outlook

This paper should on the one hand facilitate the further cooperation between the VET schools in Italy, the Netherlands and Norway and mobility periods at a later stage. And on the other hand it can serve other VET schools in the same or other countries as a basis for conducting mobility periods for students aspiring to a career as International Service Technician.

Although there was no time left to test the units of learning outcomes in international mobility periods, the units were partially tested within an international work placement by students from the VET school in Norway and on a national basis by the VET schools.

For further advancement the defined units of learning outcomes could be used as a basis for developing training modules to be conducted in the mobility periods for ensuring that the agreed units of learning outcomes will be acquired by a learner during a mobility period and that they can be recognised after the mobility by the 'home' institution. The IST Competence Matrix establishes a good starting point for further developing the approach of providing Service Technicians with the required international, intercultural and language skills.

Finally, the Competence Matrix as developed in the IST project can be used for several other purposes: (a) the transfer and recognition of competences acquired within the official VET system as well as competences achieved through non-formal or informal learning; (b) the development of qualifications; (c) the composition of job profiles as well as personnel (human resources) planning; and (d) to reference qualifications to qualifications frameworks (Luomi-Messerer 2009, p. 30).

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