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Competence Certificate

Proposal for Implementation of an ECVET-Procedure developed within the framework of the VQTS Project *

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1. Introduction

The mutual recognition of qualifications is a basic requirement for increasing the mobility of vocational training and for the development of a European job market. Amongst other things, a system that would make it easier to combine and transfer content of education and training and competences is necessary. This is a central goal of the „Bruges-Copenhagen Process," wherein the EU countries have declared their willingness to strengthen cooperation in vocational education and training (VET). In the course of the process, the intention is to create a system for vocational training similar to the *European Credit Transfer System* (*ECTS*), which for years has been successfully used for student mobility in the higher education area. In 2002, a *Technical Working Group* (*TWG*) was implemented by the European Commission in order to develop a proposal for a European credit transfer system in VET (*ECVET*). Furthermore, projects and initiatives are being promoted that are also working on the exemplary development of this kind of credit transfer system, especially within the framework of the Leonardo da Vinci Programme.

One such procedure is being developed in the „*VQTS*" (*Vocational Qualification Transfer System*) project, a large Leonardo da Vinci project. For the development and testing of the process, a sector-related approach and the vocational field "mechanical engineering" were selected, though the approach can also be used for other sectors.

First, the basic idea, the function and use of the developed approach is described, before the instruments and elements for visualisation and description of the competences are explained in the next step. This document is intended to introduce the approach developed in the VQTS partnership to individual target groups, selected stakeholders as well as to a broader public of experts. The goal is to obtain recommendations for improvement and feedback on feasibility. Please send any suggestions directly to the authors named on the title page, unless otherwise noted in the forwarding of the document.

2. Basic idea of the VQTS approach

One requirement for increasing the mobility in VET is that competences acquired at school or in-company can be applied as a „common currency" throughout Europe. Studying abroad should not necessarily increase the duration of vocational training. Therefore, the goal of the VQTS Project is the creation of a systematic procedure for the international transfer of competences acquired within the framework of VET at secondary level. An instrument for describing competences acquired by apprentices and students lies at the core of the project, which should facilitate the transfer of competences acquired abroad in particular. This instrument is called in the following "Competence Portfolio" (see Ch. 3). The planning and organisational steps necessary for a stay abroad will be described in a „Mobility Procedure" below.

2.1 Mobility Procedure

The mobility procedure is divided into three phases:

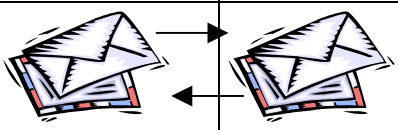
a) Preliminary phase
b) Implementation phase
c) Final phase

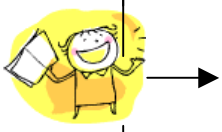
The tasks required of the involved students or apprentices and institutions in the respective phases are described below:

a) Preliminary phase

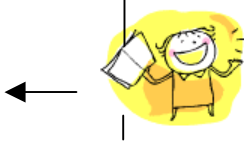
Apprentices or students who would like to study abroad send an informal request to the organisation responsible for their training (school or company), i.e. to the institution that issues the completion certificate for the training, „training institution in the home country“for short. A specific „training institution in a host country“ (school or company) can be named in the request.

Figure 1: Mobility Procedure Steps

Training Institution in the Home Country	**Training Institution in the Host Country**	**Tasks/Activities**
		Look for a suitable training institution or training-company abroad and request information on the training programme(s) offered or work that is being done. National requirements must be observed (e.g. in some countries, the training institution in the host country must be accredited according to national requirements).
		Send a statement of purpose: the aim to take part in the mobility procedure is declared by all participating training institutions or companies in this “Letter of Intent”. E.g. how many apprentices or students can take part could be ascertained.
		Send the Competence Portfolio to the training institution or company in the host country. The Competence Portfolio describes the apprentice or student’s competences acquired. This should allow the training institution in the host country to determine which competences can be built upon, or for which areas or work tasks the person is suitable.
		Analyse the Competence Portfolio of the applicant and, if necessary, obtain additional information from the training institution in the home country. This should ensure that the person is neither unchallenged nor over-challenged during his/her stay abroad.
		Clarify whether the acquisition of certain competences that would be acquired in the home country will be missed during the stay abroad and whether these are essential. If yes, clarify how the deficit can be made up. This clarification should be stated in an annex of the

		mobility contract, as an agreement between the training institution in the home country and the apprentice or student.
		Establish a mobility contract between the training institution in the home country and the training institution in the host country. Two copies of the contract are issued and signed by both institutions. It contains an agreement on the competences to be acquired during the stay abroad, on the training programme offered during this time, the names of the contact persons and the responsibilities of the participants.
		The apprentice or student begins his or her stay abroad.

b) Implementation Phase

		During the stay abroad, the apprentice or student completes the training programme at the training institution or company in the host country, which was agreed upon in the mobility contract.
		If necessary, the training institution in the home country stays in touch with the training institution in the host country (for further enquiries etc.).
		The training institution in the host country is responsible for updating the Competence Portfolio during the stay abroad. At the end of the stay, the augmented Competence Portfolio is sent to the training institution in the home country.
		After the time period designated for the stay abroad, the apprentice or student returns to the training institution in the home country.

c) Final Phase

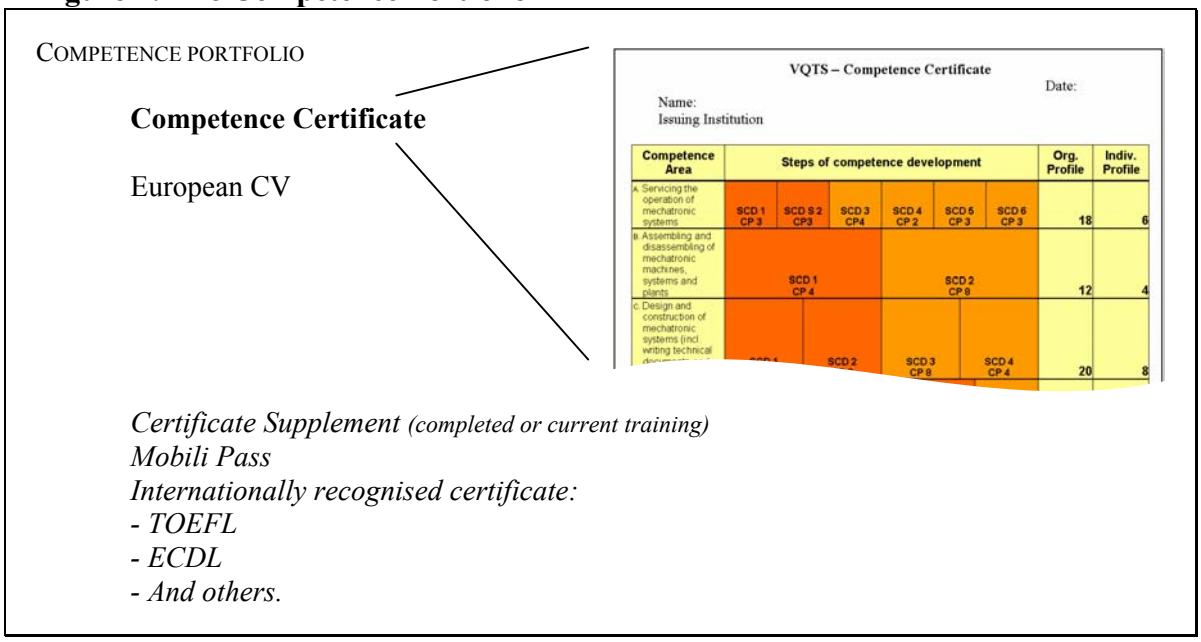
		After completion of the stay abroad, the training institution in the home country verifies whether all formal requirements, as well as the stipulations stated in the mobility contract, have been observed. If acquisition of certain competences must be made up for, this is organised according to the annex of the mobility contract.

In every mobility procedure, making competences transparent plays an especially important part. The Competence Portfolio was mentioned in the description of the mobility procedure. The instruments that are used in the proposed approach, or respectively, have been developed within the framework of the VQTS Project, are described below.

3. Competence Portfolio, Competence Certificate and Competence Profile: Instruments for describing competences and making them visible

Completed training and acquired competences are made visible using a Competence Portfolio (see Figure 2). The Competence Portfolio is a type of folder that contains various documents and certificates that provide information on the completed and current training or training segments of the apprentice or student. It includes at least a European CV. The centrepiece is the Competence Certificate developed in the VQTS project. If available, additional certificates are included (e.g. Certificate Supplement, Mobili Pass, internationally recognised certificates such as ECDL, TOEFL).

Figure 2: The Competence Portfolio



3.1. Competence Certificate

The Competence Certificate is a document for VET comparable to a certificate of employment. It lists the competences acquired within the framework of the training, and gives an impression of what tasks a person is able to do. It gives an overview of the competences acquired during the entire training, using a specified structure and a point system (credit points). Furthermore, the Competence Certificate includes personal data, information on the institution issuing the certification, and the date it was issued.

How are the acquirable or acquired competences displayed in this Competence Certificate? The „Competence Profile of a training programme / qualification", as well as the „Competence Profile of a person in training" is described below.

3.2 Competence Profiles

The competences are structurally described in a table.

The competence areas are listed in the first column. Based on core work tasks, a varying number of competence areas are defined, depending on the complexity, range of activities or job opportunities. We assume that 5-25 competence areas that can be acquired within the framework of training will be defined per occupation or numerous related occupations.

The following exemplary figure for the „mechatronic engineer“ occupation lists the competence areas in the left column of the table:

Figure 3: List of Competence Areas

Competence Areas – Competence to/for...		
A. Servicing the operation of mechatronic systems		
B. Assembling and disassembling of mechatronic machines, systems and plants		
C. Design and construction of mechatronic systems (incl. writing technical documents and user manuals)		
D. Manufacturing mechatronic parts, components and systems		
E. Programming of programmable logic controller (PLC) of mechatronic systems and production plants, CNC-machines and robots.		
F. Installation, configuration and testing of hardware and software components in production plants.		
G. Planning and monitoring of the production process, controlling and assessment of work results (PPS-systems,production planning and control, monitoring of checking devices, computer aided data documentation, quality regulation and management systems)		
H. Commissioning of mechatronic systems (e.g. robots, production islands...) and technical support for customers		
I. Diagnosis and fault repair in control devices of production plants, CNC-machines etc.		
...		

This table merely serves as a rough overview and does not show the acquirable or actual competences available to a person in training. In order to be able to show these, a description of the specifications of the individual competence areas is necessary: therefore, 2-6 steps of the competence development for every competence area are described in the row.

The following table is an example of the description of competence steps for the competence area „D. Manufacturing mechatronic parts, components and systems,“ named in Figure 3. 5 steps of competence development (SCD) are described.

Competence Area D. Manufacturing mechatronic parts, components and systems	Step of competence development 1 SCD 1	Step of competence development 2 SCD 2	Step of competence development 3 SCD 3	Step of competence development 4 SCD 4	Step of competence development 5 SCD 5

SCD 1 He/she can use simple manually operated manufacturing machines (turning lathe, milling machine, power drill), manufacture simple components (e.g. simple prismatic swivels), operating accompanying manufacturing tasks with tools (e.g. cutting and winding thread) and undertaking simple electro-technical and electronic manufacturing tasks (e.g. manufacturing cable connections, soldering).

SCD 2 He/she can manufacture more complex components on conventional manufacturing machines, can apply basic CNC technology, undertake fitting and assembly (e.g. maintain fitting) and carry out simple circuit board manufacture and mounting (with a given print). He/she can integrate simple pneumatic and hydraulic components.

SCD 3 He/she can operate and program Standard-CNC-Machines (amongst others, turning lathes and milling machines) for manufacture of more complex manufacturing machines, including elements of hydraulics, pneumatics and electronics (e.g. hydraulic cylinders, voltage sensors), as well as develop simple circuits and prints.

SCD 4 He/she can master special manufacturing processes and machines (e.g. laser cutting technology, erosion) for manufacture of complex machinery and can integrate standard pneumatic and hydraulic elements as well as complex electronic circuits into the component assembly.

SCD 5 He/she can manufacture miniaturised and high-precision components and component assemblies (integrated components) and can carry out series production taking economic efficiency calculation into consideration (with optimised CNC Programmes).

3.3 Credit Points

In order to be able to get a quantification that goes beyond the description of the competences, a certain number of credit points is given and entered into the table for the acquisition of each of these competence steps.

In our proposal, we assume that there will be a maximum of 60 credit points that can be received in a year of typical training. We consider the „main tracks“ of training „typical“; specialised programmes (e.g. for people with special needs) must be quantified specifically. This means that, e.g., in a three-year training programme, a maximum number of 180 credit points can be issued, 240 for a four-year programme etc.

The total number of credit points for training is divided into the competence areas and steps of the competence development. The credit points are divided according to the average time it takes for an apprentice or student to acquire a competence or to reach a step of competence development. This means that the allocation of credit points is based on the student workload required to acquire competences (student workload includes all learning and training time: attendance as well as time spent studying or working outside of the training

institution or training company). To determine credit points, one could allot a syllabus or class schedule to the competence profile and use the time an apprentice or student spends on individual units for percentual distribution.

The time it takes 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 competence area or of a step of competence development within the competence profile of a training programme. These should not be viewed independently of competence descriptions. It is irrelevant whether the competences were acquired in an school or in-company environment. This means that the duration, that is at the basis of the credit points, are valued independently of the place of learning (company or school).

The allocation of credit points is undertaken by the institution that offers the training programme and issues the certificate of completion („training institution in the home country“) or by any super ordinate institution.

The Competence Profile of a training programme, meaning the acquirable steps of competence developments (*organisational competence profile*), the Competence Profile of a person in training, meaning the already acquired steps of competence development (*individual competence profile*), as well as the corresponding number of credit points (CP), can now be entered into the Competence Profile table.

The following table shows a fictional example of a Competence Profile of a 4-year training programme in the field of mechatronic engineering from country X, as well as the Competence Profile of a person in training:

Figure 4: Section of the Competence Profile of a fictional Competence Certificate

Competence Area	Steps of competence development	Org. Profile	Indiv. Profile
A. Servicing the operation of mechatronic systems	SCD 1 CP 3 | SCD S 2 CP3 | SCD 3 CP4 | SCD 4 CP 2 | SCD 5 CP 3 | SCD 6 CP 3	18	6
B. Assembling and disassembling of mechatronic machines, systems and plants	SCD 1 CP 4 | SCD 2 CP 8	12	4
C. Design and construction of mechatronic systems (incl. writing technical documents and user manuals)	SCD 1 CP 5 | SCD 2 CP 3 | SCD 3 CP 8 | SCD 4 CP 4	20	8
D. Manufacturing mechatronic parts, components and systems	SCD 1 CP 4 | SCD 2 CP 5 | SCD 3 CP 7 | SCD 4 CP 3 | SCD 5 5	24	19
E. ...		8	4
F. ...		30	10
G. ...		12	8
H. ...		22	22
L. ...		...	...
	Total	240	112

Legend:

	Competence Profile of a person in training in the second year
	Competence Profile of the entire 4 year training programme
	These steps of competences are part of the whole „Competence Matrix“ for the field of mechatronic engineering, however, the acquisition of these competences is not offered within the framework of this training programme—see also Ch. 4!

In the previous sections, the function of the Competence Certificate as well as the individual elements of the table was described. But how are the contents for representing the Competence Profile in the Competence Certificate developed?

4. Competence Matrix

4.1. Development of a Competence Matrix

We define a **Competence Matrix** as a table with an „open“ list of competence areas related to core work tasks and the according steps of competence development for an occupation or a group of related occupations. We consider the list „open“ because in changing work climates, competence areas will be added, removed or restructured.

Therefore, the Competence Matrix is more encompassing than the Competence Profile of a training programme. It contains all identifiable competence areas and all the differentiated steps of competence development of the competence areas. It therefore describes the „greatest common denominator“ of competences of one occupation or a group of related occupations (in one or more countries). On the other hand, the Competence Profile of a certain training programme, which is formed from individual parts of this Competence Matrix, generally only covers a limited spectrum of competence areas and steps of competence development.

Within the framework of the project, two variations were left open for the development of the Competence Matrix. Development can take place either a) on a European or b) on a national level. In both cases, certain common principles are the basis of the development.

a) European level:

The Competence Matrix is developed through cooperation between countries, based on certain principles for composition of competence areas and for the description of the steps of competence development (see 4.2), e.g. in a moderated workshop with experts from the respective sector. Competence Profiles of national training offers are developed from this joint Competence Matrix.

The goal of a common development of a Competence Matrix is not to harmonise the training offers. However, the transparency of Competence Profiles and the comparability of training / qualification offers should be increased. In this case, the designation of competence areas and the descriptions of steps of competence development for one area of occupations are identical in all countries.

b) National Level:

A national Competence Matrix is developed in the respective country, based on certain principles for composition of competence areas and for the description of the steps of competence development (see 4.2). In this case, the wording of Competence Areas and of the descriptions of steps of competence development is similar, but not identical, in international comparison.

The wording of principles for the development of the Competence Matrix, for the description of the competence areas and the steps of competence development is especially relevant if the Competence Matrix is developed on a national level, in order to ensure that it is understood internationally. These principles are described in the following.

4.2 Principles for Creating of the Competence Matrix

One **competence area** comprises various forms of competences necessary for completing work tasks in a certain profession (e.g. mechatronics). Speaking of "competence” we follow a

broad understanding of the term: we mean cognitive competences (knowledge), functional competences (skills) as well as social competences. “Competence” can therefore be understood as the ability to apply and demonstrate knowledge, skills and social competences in a work context.

Context relatedness

The description of the competences on the various steps of competence development takes place in a context related manner, i.e. it is put into the relation with the mastery and the execution of core work tasks or with the solution of a certain given problem in the work context of a certain occupation. The descriptions of the competences that can be gained in the framework of a VET programme are designed to form a clear picture what they can be applied for in the work context. This is why in the descriptions the term "is able to" is used: Actions are described that can be carried out or problems that can be solved (e.g. "He/She is able to install, adjust and repair mechatronic aggregates and components in production facilities"). The descriptions moreover include – wherever reasonable for the respective competence area or the step of competence development – work-related categories as context characteristics:

- Objects of work: meaning the contents or processes of skilled work (e.g.” assembling compete mechatronic equipment");
- Tools (e.g. "wrenching, drilling or milling machines"), methods (e.g. "test and adjustment methods") and organisation of skilled work
- Requirements for skilled work and technology in form of rules, norms and laws (e.g. "security requirements")

Degree of Specification

The various competence areas must not be specified in too general a manner (e.g. "building machines") nor must they be too detailed (e.g. "soldering cables"). They must be formulated exactly enough in order to suffice for the mutual understanding between skilled workers and practitioners in the respective professional field.

Transferability or Learnability

In delimiting competence areas the possibilities for applicability and learnability have to be taken into consideration, which means that it has to be deliberated, whether competences related to a certain work task are easily transferred or acquired in order to effectuate another work task. If this is not the case, a new competence area is defined.

Examples

As understanding between experts from one skilled work area according to experience works well by way of examples, descriptions are complemented - where possible - by examples. These examples relate to the mentioned categories. If we are dealing with an example serving for illustration purposes, it is mentioned by adding "e.g.": If for example an example is given for the "production of simple parts", it is to be added in parentheses "(e.g. simple prismatic swivels)".

Textform

For the description of the competences on the various steps of competence development **whole sentences** are to be used (e.g. "He/She is able to perform basic maintenance tasks on mechatronic appliances and equipments in the production") and not only catch phrases (e.g. "maintenance tasks").

Number of Steps of Competence Development

For each competence area **2-6 steps of the competence development** process are to be described. It depends on the nature of the competence area, if it makes sense to differentiate more or less steps of competence development. Therefore no concrete number of steps of differentiation are pre-determined or given. As a consequence this means that the steps make sense within one competence area (horizontally), but that the steps of different competence areas are not comparable to each other.

This "flexibilisation" of the steps makes it also possible to integrate existing descriptions of steps of the competence development (e.g. Common European Framework for Languages).

Dimensions of the Competence Step Descriptions

To describe competences is not an easy matter, because they depend on a variety of characteristics and may be localized in different dimensions (e.g. in the degree of independence or the measure of the complexity of a task). Nevertheless the descriptions must on the various steps clearly express the differences between the steps of the competence development of a competence area. No specific determinants for differentiating the steps are given in advance, but - if reasonable - certain dimensions are included as reference points for the description of the competence development in addition to the context characteristics (tools, etc.). These dimensions are thought of as continua. The extent or the degree with which they are being reached, characterizes the various steps or enables the differentiation between steps. These are no competences in the stricter sense and also no meta- or key competences, but only dimension belonging to the respective competence. Below, some dimensions are mentioned as examples. This enumeration is not complete; however, more dimensions suitable for the differentiation of the steps of the competence development can be included.

- Ability to perform independent work tasks: marks the degree of necessary support or instruction,
- Ability to deal with complex situations: e.g. ”production of simple work pieces " - for example "simple prismatic wrenching parts" is less complex than the "production of work pieces under the inclusion of elements of hydraulics, pneumatics and electronics";
- Ability to deal with quality standard demands: marks the degree to which demands and standards can be taken into consideration in fulfilling of work tasks;
- Ability to deal with dynamic situations: are for example the initial parameters of a problem/system changing or are they constant;
- Ability to deal with intransparency: measures the ability to deal with messy situations or with action situations, the variables of which are not visible from the outset.[1]

[1] See also the criteria for describing complex action situation of the *Kuratorium der Deutschen Wirtschaft für Berufsbildung* (Berufliche Bildung für Europa. Europäischer Qualifikationsrahmen [EQF] und Leistungspunktesystem [ECVET]. Bonn, March 2005)

By considering all these principles, it becomes evident, how difficult it is, to draw up a "good" competence description. Even the examples we have developed in the area mechatronics do not yet live completely up to these demands. It is also clear that - in particular with a view to the last set of dimensions described - not always all aspects can be considered in a competence description. Rather pragmatic paths will have to be taken and it will only show in practice, how comprehensive these descriptions have to be. Also, specific expert knowledge is needed, in particular methodical know-how, that has to be developed in order to moderate processes for the drawing up of competence descriptions.

4. Questions for Feedback

In order to identify areas of adaptation and improvement we would like to get feedback to the following questions:

- Is the model proposed (in particular the Competence Certificate and the mobility procedure) useful for the target group? Are the needs of different stakeholder met?
- Are the national needs met?
- Is the model proposed implementable in the partner country?
- Which institutions/actors in the accreditation process will be able to implement the model, which will not?
- How is the acceptability and usability assessed (also in terms of bureaucratic effort)?
- What kind of advantages and disadvantages are expected?
- What changes are necessary or advisable?

We would appreciate to get detailed feedback to the model proposed. If possible, please answer the questions listed in the Annex!

Annex 1:

1. Mobility procedure

Looking at the mobility procedure as described in the paper "Competence Certificate":

1.1 Feasibility

- Is the description of the mobility procedure applicable for the sending and the hosting institutions (schools, training centres, enterprises) and/or the students/apprentices?
- Are the needs and requirements of (national) accreditation bodies met? If not, why not and what should be changed?
- Is the description of the mobility procedure complete? What are missing elements if any?
- Is it realistic that all the steps described will be implemented by all the institutions and persons involved? If no – who will not implement what elements?

1.2 Usability and acceptability

- Is the description helpful for the sending and the hosting institutions (schools, training centres, enterprises) and/or the students/apprentices? How?
  - Is there an added value to the procedures already in place? Which?
  - Are there elements which are helpful and others which are necessary? Why are they helpful and/or necessary?
- Are there weak points? If yes, what are they? (e.g. bureaucracy involved, duration of preparation of mobility, acceptability by sending/hosting institutions, students/apprentices etc.)
- Would you consider using this procedure? If not, why not?
- Are there elements which should be changed? How should they be changed and why? Which changes are necessary, which changes are advisable?

2. Competence Matrix/Profile

Looking at the principles for the development of a Competence Matrix/Profile as described in the Paper "Competence Certificate":

2.1 General feedback

The Competence Matrix will be developed by experts. It will hold good for a group of similar occupations and serve as the basis for competence profile of individual educational programmes.

- From your point of view, does it make sense to create such a competence matrix? If yes, what will be the added value? If no, why not?

2.2 Feasibility

- Is it feasible to develop a list with areas of competences following the principles, i.e. context-related, degree of detail, differentiation between areas of competences, provision of useful examples, description in whole sentences? If not, what is not feasible and why?
- Is it feasible to develop steps of competences following the principles, i.e. the suggested number of steps, flexibility, dimensions for differentiation between the steps. If not, what is not feasible and why?
- Will the individual institutions involved in mobility be able to create a competence profile from a competence matrix? If yes, who should be responsible for this task and how long will it take? If no, what are the impediments?
- In the competence profiles, credit points will also be calculated. Is the procedure described feasible? Does it make sense for your national educational programmes? What are shortcomings and why? What are suggestions for changes, if any?
- Who should be responsible for creating the Competence Matrix? Should the development take place on a transnational level, on the national level, on a regional, local or sectoral level? Who should work together? Please make concrete suggestions if possible and give reasons for your suggestions.

2.3 Usability and acceptance

- Will the institutions and persons involved in mobility (sending/hosting institution; students/apprentices) be able to use the competence matrix or the competence profile respectively? Is it understandable? For whom not? If not, what should be changed?
- Would you consider using this matrix/profile as drafted in the Paper "Competence Certificate"? If no, why not? If yes, what is the added value?

3. Competence Portfolio / Competence Certificate

Looking at the competence portfolio as described in the Paper "Competence Certificate":

- According to your experience: Will the European CV and the Competence Certificate suffice to accurately describe the competences of a mobile person? If not, describe the specific situation and argue why not. If not, what other documents should be mandatory?
- Is the competence portfolio a relevant document for the sending/hosting institutions and the mobile person? If not, why not? What would be needed?
- Will the sending/hosting institutions be able to identify the individual profile of a person in training and fill out the competence certificate? If not, why not and what changes are suggested?
- Compared to the documents used in mobility currently (which are they?), will the competence portfolio provide an added value to sending/hosting institutions and the student/apprentice?
- Would you consider using the competence portfolio?
- Are there elements which should be changed? How should they be changed and why?