

**Transfer of new methods to identify competence based on the example of two professions, i.e. the mechatronics engineer and a lathe operator**

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Final Report



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## 1 Overview of the results

Competence is essential for each and every company. This explains the enormous interest expressed by the experts interviewed on the topic of competence and on tools for the structured recording and comparability of competences. For practitioners, the focus is on the possibilities for in-house application of competence grids. The competence grids developed within the scope of the COMMET project for work performed by mechatronics engineers and lathe operators are very clearly structured according to competence dimensions, spheres and phases of activity. The experts interviewed (primarily training, HR, operations and production managers) see different options for using the competence grids in business practice, e.g. as standardised support for staff assessment. This can then be used to derive in a second step demand for personnel development. Both of these refer to the competence grids as a tool for comparing target and as-is profiles or requirements and ability profiles.

Contrary to the educational and political discussion, the "competence" topic is more or less an integral part of the "remuneration" topic for HR staff in companies. Whilst this is often ignored in educational research, it must be included in considerations for practical application.

Particular attention was paid in the COMMET project to the definition and examination of the "international business processes" sphere of activity. The competences required for business processes – especially in international business – have a special role to play in conjunction with different competence levels. On the whole, this sphere of activity is very demanding. This calls, for instance, for special work experience and qualifications when clarifying customer orders with a view to international business practice and cultural standards.

Another aspect of the COMMET project is the reference of the competence grids to Europass. The two most important documents here are Europass Mobility and Europass Certificate Supplement. In some of the partner countries, the certificate supplements have already been defined for selected professions. It is possible to use the competence grids as a basis for certificate supplements that have not yet been drawn up. The competence grids can also be used as additional information to document learning experience in more detail. Furthermore, parts of the competence grids can also be used in the description of skills and competences for the Europass Mobility document.

## 2 The competence grids

The competence grids were developed basically using the framework curricula applied in the respective countries for the mechatronics engineer and the lathe operator. In as far as separate vocational training and in-company training exist as is the case with dual vocational training, like, for instance, in Denmark and Germany, these were merged.

These parts were then compressed to form logical spheres of activity of a characterising nature. The specialist and methodological competences as well as the social and personal competences in the version proposed by bbw Bildungswerk der Wirtschaft in Berlin und

Brandenburg e.V. were selected as competence dimensions. The spheres of activity identified were also broken down into the phases of a complete activity (analysis, planning, performance, control, documentation, evaluation). The individual knowledge and skills were then integrated into the resultant matrix comprising activity phases and competence dimensions.

The project partners have adapted their competence grid models as far as necessary to meet with national requirements. In France (CEFORALP), for instance, the spheres of activities for professions were compressed more (in each case, 5 spheres of activity compared to Germany's 10 for a mechatronics engineer and 7 for a lathe operator). 5 spheres of activity were also identified in Italy (SIAV). The model proposed was compared to the national, main qualification systems which, however, proved to be unsuitable when it comes to describing the two professions. The main data in the Italian model is from national and regional curricula as well as from empirical results. The Italian concept considers key actions, types of action, specialist and/or strategic competence whilst knowledge and skills are seen to be "technical" or "transverse". In Spain (UPM), the competence profiles published by the Ministry of Education were used as a basis. Each profile contains a brief description of general competences as well as detailed information about the individual fields of competence. Each field of competence is described with tasks or actions which must be mastered once vocational training has been completed. Another part of the Spanish competence profile are key competences which are transverse and behaviour-related skills. In Denmark (SDE), the competence grid structure has been adopted. The model used by the Hungarian project partner (KOPERNIKUSZ) has a much deeper structure and considers categories such as flexibility and autonomy. This model also shows the huge range of competence terms which are also contained in the glossary developed in the project.

## 2.1 Mechatronics engineer

A characteristic aspect of the work of a mechatronics engineer throughout all the countries is the combination of mechanical and electrical methods. These include specialist knowledge and skills that enable them to work with mechatronics (sub) systems with electric, pneumatic and hydraulic controllers. Tasks range from installation and/or assembly to commissioning, maintenance and service, right through to dismantling mechatronics systems. One important field that is also expressed in the competence grids is quality control or quality assurance, respectively. Big companies, especially, often have a special quality control officer or a separate department for quality assurance. However, this task also forms at least part of the area of responsibility of the mechatronics engineer due to the relatively high level of training.

## 2.2 Lathe operator

The profession of a lathe operator is marked by working with conventional and, above all, numerically controlled machine tools and metal-working processes (e.g. cutting, separating, reforming). This also includes to different degrees the planning and organisation of workflows. Control (measuring) is also important here, especially when handling cost-

intensive materials and machines. In modern production facilities, the importance of programming CNC machine tools and the ability to operate different controllers continues to increase.

### 3 Opinions expressed by practitioners: interviews conducted at companies in the metals and electrical industries

Within the scope of the COMMET project, 30 expert interviews were conducted in total in the participating European countries in order to assess the quality of the instruments developed by the European project partners to present competence and in order to gather proposals for improvements and/or enhancements. The talks with those in charge of HR and vocational training, with production and facility managers from regional companies, and with education experts, were held on the basis of the competence grids for the mechatronics engineer and the lathe operator in order to integrate expert knowledge and know-how from practitioners into the project results. It was interesting to see how the interview partners assessed the contents, structure and practical applicability of the current drafts for the activity-related competence grids. This was supplemented by ideas regarding various options for application in HR, especially as a support for work references / certificates (for instance, Europass). Key instruments and tasks in the field of personnel management were also discussed, such as job description, personnel recruitment and selection, personnel assessment, remuneration and personnel development.

With a view to the competence grids developed for the mechatronics engineer and the lathe operator, the following key questions were discussed with the dialogue partners:

- Have the spheres of activity (taken and compiled from the vocational education framework plans and the framework curricula for vocational training and education) been correctly drawn up and demarcated?
- Have the process phases (parts of the complete activity) been correctly described?
- Are the competence dimensions (specialist competence, methodological competence, social competence, personal competence) plausible?
- Are the competence grids suitable, for instance, as certificate supplements for Europass?
- Are there other fields of HR management where the competence grids can be used?

The results of the interviews are listed below, first according to country, and then with a view to the companies interviewed as well as content and structure features (spheres of activity, process phases, competence dimensions).

The strengths, weaknesses, opportunities and threats of the methodology and the instrument developed are then compiled in a SWOT analysis. The possibilities for using the competence grids for HR work in companies, including the possibilities for combining them with the

Europass documents, are described separately. The "international business processes" sphere of activity is addressed separately due to its trans-national relevance.

### *Denmark*

In Denmark, the interviews were conducted mostly with small and medium-sized enterprises from rural regions working in the fields of CNC production, state-of-the-art forging technology, machine and toolmaking. An interview was also conducted with the metal workers' union which in Denmark plays a key role in the formulation and ongoing development of vocational training courses. The interview partners see the competence dimensions as being sufficient and correctly described, however, they do see room for expansion. The technical/professional level is generally more important whilst the social and personal competences are regarded more as an integral part of the personality of a "normal" apprentice. Older vocational school graduates are generally believed to be more competent than younger graduates.

### *Germany*

In Germany, the interviews were conducted with medium-sized and bigger group companies in the metals and electrical sectors in the capital region of Berlin-Brandenburg. These companies are, for instance, suppliers of precision tools, milling and turning parts as well as electronic components. The definition of the spheres of activity and of the process phases for the selected fields of activity were found to be correct and easy to understand although with different weighting in the everyday work of the occupations examined. With a view to competence dimensions, those interviewed would like to see uniform definitions in the different frameworks. However, personnel and training professionals are used to dealing with different structures in a flexible manner and are capable of applying the instruments as needed.

### *France*

In France, the interviews were conducted with small and medium-sized companies in the Rhône-Alpes region working, for instance, in precision machining, tool and mould construction. The majority of the companies interviewed agree to the spheres of activity proposed, both with a view to the concept and the content, because they allow a clear presentation of the roles and tasks of an employee. The break-down of phases was seen to be an interesting approach for addressing a sphere of activity because it enables all aspects of an activity to be addressed. Those interviewed see the selected competence dimensions as a realistic way to break down competences in order to gain a complete picture of the knowledge and skills required for a job.

### *Italy*

In Italy, the interviews were conducted with bigger companies (component manufacturers, automation systems) in the Veneto region and with national experts working in vocational training, personnel and organisation development. The spheres of activity described for

mechatronics engineers and lathe operators are seen to be suitable; the break-down of phases appears to be interesting but too detailed. The importance of the competence dimensions on a social and personal level varies, depending on the size and organisational structure of a company. A quantitative method to measure the competence level would be helpful, as would be the formulation of standards based on the competence grids, in order to identify competence gaps and derive individual development possibilities.

### *Spain*

In Spain, the interviews were conducted in medium-sized companies and in one large company; these companies work mostly in mechanical engineering in the province of Barcelona. Those interviewed regard the spheres of activity and the competence dimensions to be suitably defined, demarcated and plausible. The process phases are not explicitly defined in the Spanish model of the competence grids, instead, they are briefly and clearly described within the competence fields. The competences described largely match the requirements of the company. The competence-orientated models proposed are welcomed by the companies.

### *Hungary*

In Hungary, the interviews were conducted in medium-sized and large, sometimes group, companies working in the fields of mechanical engineering, vehicle construction, tool making and apparatus engineering as well as automation systems. The interviews confirm that the spheres of activities presented in the profiles cover the main tasks carried out by the technicians. The break-down of phases is largely confirmed in the form proposed. In some individual cases, a higher degree of detail would have been welcomed. Generally speaking, the competence dimensions were also seen to be plausible and were accepted. At times, uniform competence definitions in different frameworks would have been welcomed. But the use of different instruments and frameworks to describe competences for different purposes appears to be practical.

### 3.1 SWOT analysis: strengths, weaknesses, opportunities and threats of the competence grids

The concept behind the COMMET project is competence orientated and expresses efforts to make qualifications in Europe both transparent and comparable. The strengths and weaknesses, as well as the opportunities and threats of the competence grids developed can be compiled on a trans-national level in a SWOT analysis. The focus here is on the deriving process and methodology of the competence grids for mechatronics engineers and lathe operators which can be transferred to occupations in other sectors.

#### *Strengths*

The advantage of the competence grid is its clear, easy-to-understand structure. The presentation in the form of spheres of activity makes it possible to start with the subject matter and process of the company whilst at the same time describing individual employee competences. The concept of spheres of activities leaves room for interaction between areas and several activities and is thus in keeping with the reality in companies. The competence grid offers support in the form of standardisation for people in charge of HR and vocational training. At the same time, flexible adaptation, expansion or compression are easily possible. This instrument makes it possible to present an occupation with a series of activities of a different nature which therefore also call for different types of competence. There are many different ways in which the competence grids can be used in HR work. Instruments like these can be helpful, especially for smaller companies which do not have the resources needed for in-company HR work.

#### *Weaknesses*

The degree of detail in the fully formulated competence grids is too extensive for some users. In contrast to that, however, a more precise description within the individual "cells" of the matrix was at times called for. This means that it depends on who wishes to use the instrument and for what purpose. Another – more theoretical – weakness is the different competence definitions in the different instruments/frameworks for identifying competence. If the actual manifestations of a certain individual's competences are to be assessed, the question is also who can perform such assessment and using which scale.

#### *Opportunities*

The advantage of the competence grid model is that it can be easily transferred to other occupations and sectors. The deriving process and methodology are clear and easy to understand. The competence grid can provide foreign employers with a very precise competence picture. This also applies to parent companies abroad which are not familiar with occupations in the countries of their (new) subsidiaries. The trans-national comparability of qualifications is also possible as long as the grids are not too strongly modified for a specific country or company. The competence grids could be used as a basis to develop checklists (if applicable, IT-based) for user-friendly application in companies.

## *Threats*

One problem that could arise with the use of the competence grids is related to the topic of remuneration. Assessment processes can lead to both uncertainty and to wage demands, i.e. they must be well communicated to the workforce. A separate identification of competence can also lead to additional requests for personnel development. If these requests are not (or cannot be) fulfilled, this can be expected to have a negative impact on motivation.

### 3.2 Possibilities for using the competence grids for PR work in companies

The competence grids developed in the COMMET project provide a set of information regarding the occupational competences of an individual, group, organisation or the competences required for a task or workplace. This information is broken down according to spheres of activity, process phases and competence dimensions. This information can thus be arranged as requirements profiles when dealing with the requirements which a workplace, job or specific task demands of the employee, or as ability profiles when it comes to the abilities and skills (i.e. competences) which an employee has.

Competence grids or competence profiles can be basically used in all phases of HR work. The personnel experts interviewed saw assessments as a central area of use. It is then possible to use the results of an assessment or a comparison in different areas of application, for instance, in personnel development planning, including skills and talent management, to balance competence (in the sense of "human capital") and as support for drawing up references. The competence grids can also be used as a basis for job and workplace descriptions. When selecting staff, applicants can add a detailed description to their occupational competences; the information from the competence grid provides the employer with a correspondingly complete applicant competence profile.

The problems that could arise in conjunction with the use of competence grids were already mentioned in the SWOT analysis. On the whole, companies welcome the instrument, however, they do emphasise the necessity for the most unbiased assessment method possible.

### 3.3 The "international business processes" sphere of activity

The "international business processes" sphere of activity was examined in the project partner countries. This topic was discussed with the partners at the companies interviewed for the overall project and was addressed in additional questionnaires for vocational education experts, executive staff and skilled workers attending external training. The competence grids used for this sphere of activity were derived from the national curricula of the two occupations analysed with a view to international learning output.

English skills were unanimously seen to be an important competence. However, for the occupations examined, basic or elementary English skills are expected, so that English

documentation can be understood. Reading and understanding English instructions appears to be more relevant for everyday work than communicating in English which is seldom required, especially in the case of lathe operators.

Special social and personal competences on an international scale are required to clarify customer contracts whilst taking international business practice and cultural standards into consideration. Demands for specialist and methodological competence in the field of IT (e.g. CNC programming) and when dealing with complex production orders are higher if international, technical or legal standards of the destination country have to be observed.

On the whole, the "international business processes" sphere of activity is seen to be very demanding and, in this respect, by and large too difficult within the framework of vocational training as a skilled worker. The competences required are more likely to be developed within the scope of work experience and are usually implemented by a individual with executive responsibility, e.g. by sales engineers. With a view to the two occupations analysed, the requirements apply more to mechatronics engineers, as the more demanding of the two qualifications, who are more likely to have customer contact.

Inter-cultural conflicts can also arise within a company, for instance, in a team. Pragmatic solutions are sought for here. It is often the direct superior (foreman) who is in charge of this and who may often not have any formal qualifications to solve the conflict, but ideally will have the required personal and social competence.

Generally speaking, the required extent of international competence depends on the degree of international interaction, along with the dimensions, working structure and organisational structure of the company. International customer and supplier relations as well as flat hierarchies increase expectations for international competence even for the occupations analysed.

#### 4 The competence grids in the context of the Europass documents

Europass is a free service provided by the European Commission which makes it possible to present qualifications, skills and competence in a manner that is clearly and easily understood throughout Europe. The Europass documents (CV, Language Passport, Mobility, Diploma Supplement, Certificate Supplement) can be used to depict individual profiles for people in training, apprentices, students and employees that can be understood across borders. Two of the Europass documents that are standardised throughout Europe are relevant for the COMMET project. These are the Europass Mobility and the Europass Certificate Supplement.

The Europass Mobility documents learning and work experience of any kind, on any level and with any goal as long as certain quality criteria are observed. It provides information about stays for the purpose of learning, training or individual periods of vocational training or education or studying in another European country. Participants can document in an understandable manner the skills and competence which they have acquired, whilst

companies can gain a clear insight into the skills acquired abroad and are in a position to better assess the quality of such skills. When it comes to job applications, an informative Europass Mobility document benefits both sides. Individual elements of the competence grids developed in the COMMET project for the mechatronics engineer and the lathe operator can serve as a blueprint for describing skills and competence in the Europass Mobility. The structure of the competence grids makes it easier to complete the sections provided in the Europass Mobility for the activities/tasks performed and for occupational, organisational and social competences acquired.

The Europass Certificate Supplement describes national standards for apprentice occupations and supplies a brief description of the knowledge, skills and competence acquired during vocational training, including additional information about the duration, type and level of vocational training, as well as ways in which these can be obtained. The Europass Certificate Supplement also provides information about typical sectors and fields of activity where the qualifications of this vocational training are required, as well as information related to the evaluation scale for grades. The Europass Certificate Supplement is for people who hold a vocational education and training certificate; in addition to the information contained in the original certificate, it provides details of the holder's qualifications and competences, making it much more transparent, especially for those holders applying for a position abroad.

The Europass Certificate Supplement is issued by the relevant authorities in the respective EU member state. In countries where there is still no Europass Certificate Supplement for mechatronics engineers and lathe operators, the spheres of activity in the COMMET competence grids can be used as a basis for the profile of the occupational abilities and the vocational fields of activity. If Europass Certificate Supplements are available, the complete competence grids can be used as a detailed supplement or as optional, additional information. For the occupations examined in the COMMET project, the situation in the project partner countries is as follows:

### *Denmark*

In Denmark, CIRIUS, which is part of the Danish Ministry of Education, is the government institute in charge of Europass Certificate Supplements. All Danish courses/specialisation courses in vocational education and training have been described and translated into German, English and French. The Certificate Supplement has been included in the Danish guidelines for vocational education and training. The Europass Certificate Supplement is available for turners, millers and mechatronics engineers.

### *Germany*

In Germany, the Europass Certificate Supplements are drawn up by the Federal Ministry of Education and Research and the Federal Institute for Vocational Training (BiBB) together with the social partners. In the case of occupations for which no Europass Certificate Supplement is yet available, so-called vocational training profiles provide short descriptions.

In addition to the German version, the Europass Certificate Supplements are also available in English and French. Up to now, there is one Europass Certificate Supplement for recognised vocational training as a mechatronics engineer.

#### *France*

The Europass Certificate Supplements are co-ordinated in France by L'Agence **Europe Education Formation** France. The Europass Certificate Supplements can be found on the website of France's national qualifications framework, the Répertoire National de la Certification Professionnelle (*National Index of Vocational Qualifications*) right next to the official French description. The documents are also to be made available in English, Spanish and German. Europass Certificate Supplements are available for the mechatronics engineer and the lathe operator.

#### *Italy*

The Centro Nazionale Europass Italia is responsible for the **Europass Certificate Supplements in Italy**. Draft Europass Certificate Supplements were prepared in this project for the mechatronics engineer and the lathe operator.

#### *Spain*

In Spain, the Ministries of Education, Labour and Immigration are in charge of Europass. Since no Europass Certificate Supplements are yet available for the mechatronics engineer or the lathe operator, proposals were drawn up in this project.

#### *Hungary*

Hungary's national Europass Center is part of the *Education Public Service Company* and belongs to the Federal Ministry for Education and Culture. The Europass Certificate Supplements have been slightly modified by the authorities in order to adapt them to Hungary's vocational education system. The Europass Certificate Supplements for the mechatronics engineer and the lathe operator are available in Hungarian.

All of the documents referred to can be found in the appendix.

Most of the partners interviewed in the COMMET project were familiar with the Europass documents. The project was hence able to make Europass more well known among decision-makers in companies in the participating partner countries, especially since the instruments presented met with interest and acceptance among the dialogue partners.

## 5 Conclusion and outlook

The experience gained in the COMMET project shows that there is a keen interest in competence-based approaches in company practice. There is a need for instruments that allow occupational competence to be described in a transparent manner. There is an even greater need for orientation when it comes to comparing occupations in Europe that are less known and differ. The logically structured competence grids could provide practical support here. They are easy to understand, they can be used in many different ways, and they can be easily transferred to other occupations and sectors. They are, to a certain degree, compatible with the Europass Certificate Supplement and Mobility. The advantages of this model are that they are competence orientated and easy to understand despite the high degree of detail. In the interest of European employers and employees, the potential for using and developing the competence grids as demonstrated by the practitioners and education experts involved should be pursued further.

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