Feasibility Study VET-LSA
A comparative analysis of occupational profiles and VET programmes in 8 European countries – International report

Vocational Training Research volume 8
The BMBF's vocational training research initiative

We need a consistent vocational training policy if we want to increase the attractiveness and viability of our vocational training system and improve young people’s integration prospects during their transition from school to training and from training to work. Given the complex factors and conditions influencing vocational training policy, the findings of vocational training research will provide a sound basis for political decision-making.

The initiative was launched in 2006 by the Federal Ministry of Education and Research (BMBF) and is supported by the Federal Institute for Vocational Education and Training (BIBB). Its orientation is continuously adapted to the requirements of education policy programmes. The projects conducted under the vocational training research initiative are aimed at generating information, data and recommendations in the form of expert opinions and empirical studies which provide a basis for education policy-making. In addition, the initiative is expected to intensify communication between science and politics.
Feasibility Study VET-LSA
A comparative analysis of occupational profiles and VET programmes in 8 European countries – International report

Vocational Training Research volume 8
Foreword

The final international report summarises the results of the Feasibility Study VET-LSA, which addressed the question of whether there is a common basis for a possible future VET-LSA. The comparison was focused on selected vocational areas (carmechatronics, electricians craft/industry, business and administration, social and health care) in 8 European countries (Austria, Denmark, Finland, Germany, Norway, Slovenia, Sweden, Switzerland). The report concludes with recommendations to the Steering Group (government representatives of participating countries).

The Feasibility Study was implemented in all participating countries between July 2008 and May 2009. We would like to thank all who have contributed to the final international report. We are aware that the work that was put into the Feasibility Study was done within a very limited timeframe and under challenging conditions.

We thank all international experts for their valuable input, in particular the national coordinators: for Austria, Lorenz Lassnigg and Franz Gramlinger, for Denmark Hanne Shapiro and Signe Kofoed, for Finland, Mari Räkkoläinen, for Norway Ole Johnny Olsen, for Slovenia Slava Pevec Grm, for Sweden Marianne Lindbla and Switzerland Claudia Zahner and Lars Balzer.

We also thank our German colleagues for coordinating the work in the international expert groups. For carmechatronics Markus Müller and Andreas Schelten, for electricians Bernd Geißel and Reinhold Nickolaus, for business and administration Klaus Breuer, Stefanie Hillen, Frank Achtenhagen and Esther Winther and for social and health care Thomas Bals and Eveline Wittmann.

For their engagement and support we thank the Federal Ministry of Education and Research (BMBF), in particular Kornelia Haugg, Peter Thiele, Arne Simon and Gudrun Steeger. Many thanks also to our external evaluators Lorna Unwin (UK) and Annie Bouder (France) for their helpful suggestions for improving this report.

Finally, we would like to thank our colleagues in the Sociological Research Institute (SOFI), Bärbel Dehne and Erika Beller, for their continuous efforts to bring this report into a presentable format, Markus Wieck for the development of the Excel Tools to support national data collection and finally Antonia Barke for data processing within a very short timeframe.

Goettingen, August 31st, 2009
Martin Baethge, Lena Arends
# Table of contents

List of Tables, Figures and Boxes .................................................................................................................................................................... 4

## CHAPTER 1
Feasibility Study VET-LSA: objectives, methods and implementation.......................................................................................................................... 7

1.1 The impact of VET-LSA in the context of European VET policy ................................................................................................................................. 7

1.2 International large-scale assessment of VET (VET-LSA) in the context of international comparative surveys of students and adults....................................................................................................................... 8
  1.2.1 The concept for VET-LSA.................................................................................................................................................................................. 8
  1.2.2 Recent comparative studies in education ....................................................................................................................................................... 10

1.3 Methods of comparative research in VET ................................................................................................................................................................. 11
  1.3.1 The need for a Feasibility Study prior to VET-LSA ............................................................................................................................................... 11
  1.3.2 Approaches to a comparative analysis of occupational profiles: ISCO and O*NET .................................................................................. 11
  1.3.3 Approaches to a comparative analysis of learning outcomes at the end of VET ..................................................................................... 12

1.4 Implementation of the Feasibility Study ......................................................................................................................................................... 13
  1.4.1 Organisational structure.................................................................................................................................................................................. 13
  1.4.2 Agreement process/international and national workshops ....................................................................................................................... 14

1.5 Methods of analysis in the Feasibility Study: qualitative comparative analysis of occupational tasks, qualification requirements and evaluation tasks ........................................................................................................... 15
  1.5.1 Research design: qualitative approach with quantitative elements .............................................................................................................. 15
  1.5.2 The sample of experts ................................................................................................................................................................................... 16
  1.5.3 The research tools ...................................................................................................................................................................................... 17
  1.5.4 Qualitative and quantitative analysis of results ......................................................................................................................................... 22

## CHAPTER 2
National VET systems in participating countries: similarities and differences ........................................................................................................... 25

2.1 VET as part of national education systems ......................................................................................................................................................... 25

2.2 Governance and financing of VET ................................................................................................................................................................. 28

2.3 Quality monitoring in VET ................................................................................................................................................................................... 30

2.4 Organisation of VET according to national occupational profiles and traditions ............................................................................................. 31

2.5 Links between VET and the labour market ..................................................................................................................................................... 31

2.6 Conclusion ...................................................................................................................................................................................................... 32
Annexes to chapters as CD-ROM

1. Minutes of international workshops
2. Carmechatronics
3.2 Electricians craft & industry
3.3 Business & administration
3.4 Social & health care
List of Tables, Figures and Boxes

Figures, Tables and Boxes Chapter 1
Figure 1.3.-1: Link between curricula in VET and occupational profiles in the labour market ..........................................................11
Figure 1.4.-1: Organisational structure Feasibility Study ..................................................................................................................14
Figure 1.5.-1: Research design: qualitative approach with quantitative elements ..................................................................................16
Table 1.2.-1: VET-LSA in the context of recent comparative studies in education .......................................................................................10
Table 1.5.-1: Sample of experts’ job function/institution and vocational area (absolute numbers) ....................................................................17
Table 1.5.-2: Selected occupations according to ISCO 08 ..........................................................................................................................18
Table 1.5.-3: Occupational tasks adapted from o*net for carmechatronics (Research Tool 1) ........................................................................19
Table 1.5.-4: Qualification requirements adapted from o*net for carmechatronics (Research Tool 1) ..........................................................20
Table 1.5.-5: International set of assessment tasks for carmechatronics (Research Tool 2) .......................................................................21
Box 1.-1: Glossary of statistical concepts applied in the Feasibility Study ................................................................................................24

Figures and Tables Chapter 2
Figure 2.1.-1: Participation in general and vocational education at ISCED 3 (percentage of total participation in ISCED 3) ............26
Figure 2.1.-2: Youth unemployment rates 1994 and 2007 by selected age groups 15 to 24 ..................................................................32
Table 2.1.-1: Structure of vocational education (upper secondary level) by countries ........................................................................27
Table 2.1.-2: Entry rates at tertiary level in participating countries (in 2006) .........................................................................................28

Figures and Tables Chapter 3
Figure 3.1.-1: Carmechatronics: occupational tasks – relevance (country means) ..............................................................................35
Figure 3.1.-2: Carmechatronics: occupational tasks – relevance (mean across countries) .................................................................36
Figure 3.1.-3: Carmechatronics: occupational tasks – frequency (mean across countries) ........................................................................37
Figure 3.1.-4: Carmechatronics: qualification requirements – relevance (country means) .................................................................39
Figure 3.1.-5: Carmechatronics: qualification requirements – relevance (mean across countries) ........................................................39
Figure 3.1.-6: Carmechatronics: evaluation tasks – educational objectives (country means) .................................................................42
Figure 3.1.-7: Carmechatronics: evaluation tasks – educational objectives (mean across countries) ...................................................43
Figure 3.1.-8: Carmechatronics: evaluation tasks – complexity (country means) ..................................................................................44
Figure 3.1.-9: Carmechatronics: evaluation tasks – complexity (mean across countries) .................................................................45
Figure 3.2.-1: Electricians – craft sector: occupational tasks – relevance (country means) .................................................................51
Figure 3.2.-2: Electricians – craft sector: occupational tasks – relevance (mean across countries) .......................................................52
Figure 3.2.-3: Electricians – craft sector: occupational tasks – frequency (mean across countries) ......................................................52
Figure 3.2.-4: Electricians – industry sector: occupational tasks – relevance (country means) ...........................................................54
Figure 3.2.-5: Electricians – industry sector: occupational tasks – relevance (mean across countries) ................................................55
Figure 3.2.-6: Electricians – industry sector: occupational tasks – frequency (mean across countries) ...............................................55
Table 3.3-4: International set of evaluation tasks for business and administration (Research Tool 2) .................................................. 83
Table 3.4-1: General information on VET programmes – social and health care ..................................................................................... 86
Table 3.4-2: International set of evaluation tasks for social and health care (Research Tool 2) ..................................................................................... 93

Figures and Tables Chapter 4

Figure 4.3.-1: Basis for further steps in the next project phase ........................................................................................................... 107
Table 4.2.-1: Kendell’s W measure for concordance ......................................................................................................................... 102
1. Feasibility Study VET-LSA: objectives, methods and implementation

Preliminary Remarks

The major aim of the Feasibility Study is to find out whether there is a common basis for comparison in selected vocational areas in all participating countries, which is the precondition for a large-scale assessment of vocational education and training (VET-LSA). The focus of the Feasibility Study is to identify comparable occupational profiles in selected occupational fields and learning outcomes at the end of respective VET programmes. The results of the Feasibility Study will provide a basis for both the construction of frameworks in each vocational area and the definition of measurement dimensions for subsequent test development in a possible future VET-LSA. The final definition of measurement tools for VET-LSA needs to be made in the next project phase. The comparison is focused on a medium level of proficiency, that is, initial VET programmes at ISCED level 3 and corresponding to occupations requiring medium or considerable vocational preparation.

Eight European countries participated in the Feasibility Study: Austria, Denmark, Finland, Germany, Norway, Slovenia, Sweden, and Switzerland. In previous discussions with international researchers in VET, four major vocational fields were selected as a starting point for an international comparison:

- carmechatronics,
- electricians,
- business and administration, and
- social and health care

(Baethge, Achtenhagen & Arends, 2008; Baethge, Achtenhagen, Arends, et al., 2007; Baethge, Achtenhagen, Arends, et al., 2006). The Feasibility Study is therefore focused on comparing occupational profiles and learning outcomes in the four selected vocational fields.

To understand the meaning and character of the Feasibility Study, it would seem useful to emphasise the impact of VET-LSA in the context of European VET policy. The European Commission has set itself the ambitious economic and social goal of becoming “the most competitive and dynamic knowledge-based economy in the world”\(^2\). In the field of VET, this aim is being pursued through the Copenhagen Process. The European Commission’s proposal for a European Qualifications Framework (EQF) offers opportunities to increase mobility and enhance permeability between educational sectors. In the Bordeaux Communiqué (2008), Education Ministers specified four priority areas for future action in VET: (1) implementing tools for cooperation in VET (European Qualifications Framework (EQF) and national qualification frameworks, the European Credit System for VET (ECVET), (2) the European Quality Assurance Framework (EQARF), (3) improving the quality and attractiveness of VET, improving links between VET and the labour market, and (4) strengthening European cooperation arrangements (European Commission, 2008a).

The development and implementation of European tools for increasing transparency and comparability is the most visible and successful part of the Copenhagen process. The fundamental basis of these instruments is the shift towards learning outcomes (CEDEFOP, 2009). Therefore, the development of tools for valid and reliable measurement of learning outcomes in VET is of major importance. In the recent report on progress towards the Lisbon objectives, it is emphasised that “internationally comparable large-scale assessment programmes often concentrate on general competences (e.g. reading, information processing, numeracy and problem solving) whereas many employers argue that there is an increasing need to conduct surveys which focus as well on the assessment of vocational skills and competences” (European Commission, 2008b, p. 58).

There is a general consensus that indicators for measuring quality are key instruments for improving the quality of education and training and are necessary for the good governance of education systems and structures (e.g. European Commission, 2004). International comparative studies (e.g. PISA\(^2\), IALS\(^4\)) provide standardised and internationally comparable indicators to reveal the differences between the development of com-

---

1 Some countries did not participate in all four occupations (see Chapter 3).


3 Programme for International Student Assessment.

4 International Adult Literacy Survey (IALS)
petences of students in compulsory education and adults in everyday life in different education systems and give insights into systemic factors impacting competence development on the basis of benchmarks. These indicators provide policy makers with a tool on which to base future policy choices.

In VET (at upper secondary level) there are no indicators for international benchmarking and neither ISCED (UNESCO, 2006) nor EQF provide a tool for comparing the performance of different VET systems. ISCED is focused on formal criteria of transition and is not specific enough for comparing outcomes of VET⁵ (Mueller, 2008), whereas EQF is a generic framework and a tool for classifying different formal and non formal learning outcomes on the basis of level descriptors. An international, comparable, objective, valid and reliable outcome-based measurement of differences between countries in the level and distribution of vocational competences could provide an empirical basis for improving the classification of learning outcomes in classification systems, such as EQF and ISCED.

1.2 International large-scale assessment of VET (VET-LSA) in the context of international comparative surveys of students and adults

During its council presidency in 2007, the German Government (Federal Ministry of Education and Research) resumed the discussion on quality in VET and started an initiative for an international Large-Scale Assessment in VET (VET-LSA).

VET-LSA (Large-Scale Assessment for Vocational Education and Training) is a concept for an international comparative study of young adults’ competencies as they are developed in initial vocational education and training at the upper secondary level. The main objective of VET-LSA is to investigate the ways in which young adults are prepared for the world of work in selected vocational tracks in Europe. VET-LSA will provide insights into the strengths and weaknesses of VET programmes in different occupational fields as an opportunity for different countries to learn from each other and provide a basis for evidence-based policy in VET. (For previous discussions, see Baethge, Achtenhagen & Arends, 2008; Baethge, Achtenhagen, Arends, et al., 2007; Baethge, Achtenhagen, Arends, et. al., 2006).

1.2.1 The concept for VET-LSA

The basis for the feasibility study builds on a concept for an international large-scale assessment in VET (VET-LSA), which was developed in cooperation with an International Advisory Committee for the Feasibility Study on a PISA-VET consisting of researchers from different European and non-European countries (Baethge, Achtenhagen, Arends, et. al., 2006). The concept was discussed in detail and accepted by national experts and coordinators responsible for the implementation of the Feasibility Study in all eight countries during the first international workshop on July 3rd - 4th 2008. The international Advisory Committee agreed on the following key aspects for VET-LSA, which were introduced and accepted by the participating countries of the Feasibility Study at the first international workshop:

- An international comparison of vocational education and training must be based on a common understanding of the goals of VET. There are three central goals, which VET systems must address at the system level: (1) the development of the individual’s potential occupational mobility, self-regulation and autonomy; (2) the safeguarding of

---

⁵ In particular ISCED 3B/3C, 4 and 5B.

---
human resources in a society, and (3) the warranty of social participation and equal opportunity. These goals should function as reference points for the definition of competencies in a possible future VET-LSA.

- Contrary to existing international assessment programmes for students and adults, VET-LSA does not aim to be an overall representative survey; the focus will be on the measurement of competencies in specific vocational areas (e.g., carmechatronics) and not in all occupations.

- VET-LSA seeks to assess the competencies in domain-specific and cross-occupational aspect that are required for successful participation in the world of work in the twenty-first century and link them with basic competences (e.g., reading, writing):
  - Vocational and occupational domain-specific competencies denote young adults’ abilities to successfully apply their knowledge and experience to authentic occupational situations in selected vocational areas in the world of work. Unlike basic competences referring to the concept of literacy for successful participation in society (e.g., PISA, ALL, PIAAC), domain-specific competences are focused on knowledge, skills and abilities in specific vocational areas in economies based on the division of labour.
  - Cross-occupational competencies refer to young adults’ abilities to successfully perform in today’s labour market and workplaces and to develop occupational identities. They are linked to the notion of “key skills”, which comprise abilities in and knowledge about the structures of organisations and labour markets, interacting in groups, and acting autonomously in work situations (Baethge, Achtenhagen, Arends, 2007).
  - Institutional and individual context factors are fundamental for young adults’ competence development. Therefore, key variables of VET relating to institutional conditions and individual background will be included in the survey. A multi-level approach – an analysis of systemic, school, and instructional characteristics and their influences on the development and use of competencies – taking into account interactions between individual and social factors, is recommended.

- The international comparison of domain-specific competencies is new. That means that new tests have to be developed. The proposed item format is a realistic task in a computer-simulated work environment. The main advantage of this format is the short testing time (approx. one day) compared to real working tasks (several days or weeks) and its validity, i.e. the test reflects professional tasks that are common in the vocational area. It ensures that the test measures the concept that is to be measured. Another advantage of the computer-simulated format is that students will enjoy doing the test and this will enhance the data quality (Achtenhagen & Winther in press; Nickolaus, Gschwendtner & Abele (in press). Since the requirements for reducing measurement error are relatively low, the test length would be suitable for a large-scale assessment with reasonable time restrictions.

- It is proposed to start with a cohort-based, cross-sectional study with individual or institution-based samples at the end of VET. From a research perspective, there is agreement that a longitudinal study, with a minimum of three panels waves (one at the beginning of VET, a second at the end of VET and a third 3 to 4 years after entering the labour market), is considered the “gold standard” for a comparative large-scale assessment in VET. From a pragmatic point of view, a cross-sectional study, initially having one measuring point in a homogeneous age cohort, represents a remarkable alternative to a longitudinal study. Each participating country has the opportunity to add one or two cohorts: one at the beginning of VET programme(s) and/or one three to four years after entry into the labour market. Measurement is focused on students aged around 19-30. In the case of simple random sampling, a sample of about 400 individuals was estimated (see Baethge, Achtenhagen, Arends, et al., 2006, p. 105). In selecting the vocational areas, the aim was to include the most important industrial/technical, commercial/administrative and care occupations in the sample, which led to a first selection of 1) industrial/technical occupations in industry and trade, 2) commercial and commercial/administrative

---

7 The concept of competence in the context of an international large-scale assessment of VET is discussed in detail in the feasibility study PISA-VET (Baethge, Achtenhagen, Arends, et al., 2006).

8 In addition to work-related competencies, basic competencies (e.g., reading, writing, mathematics) should be included as covariates. In addition to cross-occupational competencies relevant for all vocational areas, it should be taken into consideration that some cross-occupational competences are performed in specific domains (e.g., communication with clients versus communication with patients).

9 For cross-occupational competences it should be checked whether instruments from existing large-scale assessments, e.g. PIAAC, could be adapted.

10 Item Response Theory as it is used in PISA is recommended for test modelling in VET-LSA (Rost, 2006).

11 Computer-based tests could be supplemented by other formats, e.g. paper and pencil.

12 The exact sample size in each country was based on subsamples of different VET, institution-based sampling, panel construction cannot be precisely determined at this point. The sample of 400 refers to a model calculation for Germany based on the following assumptions: simple random sampling with 5 percent accuracy. The final sample size will depend on the method of implementation (household-based cluster survey, number of controlled variables. The model calculation is based on institution-based random samples, including all relevant variables (Kühnel expertise, Annexe programmes D in Baethge, Achtenhagen, Arends, et al., 2006).
occupations in commerce and other services, 3) healthcare occupations in the field of individual-related services, and information and communications technology in the field of information/technical services. Finally, the following occupations and vocational areas were selected: carmechatronics, electricians in industry and craft, business and administration, and social and health care.

The selection of occupations and vocational fields for VET-LSA was an important milestone. However, whether the corresponding occupational profiles would be comparable in each participating country was still an open question. The aim of the Feasibility Study is to identify comparable occupational profiles and learning outcomes at the end of initial VET as a starting point for the subsequent steps required for VET-LSA, which are not included in the Feasibility Study.

1.2.2 Recent comparative studies in education

VET-LSA must be considered in the context of recent comparative studies in education (PISA, PIAAC, World Skills; Table 1.2-1). International large scale assessment programmes (PISA, PIAAC) mostly concentrate on measuring and comparing general competences of students in compulsory education (PISA) or adults in everyday life (PIAAC). In the Programme for International Student Assessment (PISA), competence models in the subject areas of reading, mathematical and science literacy were developed to measure the application of knowledge and skills to problems in a real-life context. The PIAAC initiative aims to measure competences among adults with the focus on core adult competences required in the information age: problem solving in technology-rich environments, literacy, numeracy and reading in general (Schleicher, 2008; OECD, 2008c). Neither PIAAC nor PISA aims to measure young adults’ competences in specific vocational areas.

Whereas the aforementioned international large scale assessment programmes are representative of a country’s student and/or adult population, World Skills International is centred on the most excellent VET students in different countries. Test instruments are designed for skills measurement in a competition, not for the representative measurement of young adults’ competences at an average level in VET. In World Skills, students’ performance is measured on the basis of real work tasks, sometimes taking up to three days of testing time, which is too long for an international large scale assessment.

The preparation and implementation of an international large scale assessment in VET is much more complex than in compulsory education. Whereas international student assessment programmes (e.g. PISA) are based on well-grounded research traditions and internationally validated concepts, such as standards in education, VET cannot draw upon comparable concepts (Baethge, Achtenhagen & Arends, 2008).

<table>
<thead>
<tr>
<th>PISA</th>
<th>VET-LSA</th>
<th>PIAAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>students (aged 15-16)</td>
<td>young adults (aged 19-30)</td>
<td>adults (aged 16-64)</td>
</tr>
<tr>
<td>4,500–50,000 per country</td>
<td>approx. 1,500–2,000 per country</td>
<td>5,000 per country</td>
</tr>
<tr>
<td>testing time: about 2 h.</td>
<td>testing time: about 0.5 day</td>
<td>testing time: about 1–1.5 h</td>
</tr>
<tr>
<td>direct assessment of reading, mathematics, science</td>
<td>direct assessment of domain-specific and cross-occupational competences</td>
<td>direct assessment of problem-solving in technology-rich environments, literacy, numeracy, reading</td>
</tr>
<tr>
<td>optional modules: learning progress over time, instructional aspects, ICT use of technology</td>
<td>direct assessment of basic competences</td>
<td>indirect assessment of skills used at work (JRA)</td>
</tr>
<tr>
<td>background questionnaire -&gt; computer-based assessment in 2012</td>
<td>background questionnaire</td>
<td>background questionnaire</td>
</tr>
</tbody>
</table>

---

13 Subsequent steps include e.g. the definition of frameworks for measurement in each selected vocational area, the development of test instruments (including descriptions of situational requirements, professional settings, test contents, test environments; situational requirements; ranges of performance; level requirements, coding, pilot-testing), the definition of samples and the number of measurement points.

14 Whether there are possibilities for adapting well-developed test items from PISA or PIAAC in a possible future VET-LSA, in particular with regard to cross-occupational competences, basic competences, or the background questionnaire, must be investigated in detail.

15 http://www.worldskills.org/
1.3 Methods of comparative research in VET

1.3.1 The need for a Feasibility Study prior to VET-LSA

Contrary to large scale assessments of students in compulsory education and adults in everyday life, the focus on domain-specific competences in VET-LSA puts high emphasis on implementing a Feasibility Study to carefully examine the comparability of occupational profiles and learning outcomes in VET in participating countries. With regard to a future VET-LSA, it is not sufficient to compare the content of VET in terms of vocational curricula; the contexts for VET differ markedly and VET operates in multiple ways – even in the same sector or country. Moreover, there is a link between vocational curricula and occupational profiles, very often with regard to broad sets of skills required for the labour market. Whereas standards for curricula in VET are less focused on specific occupational tasks required in the workplace, practical training in firms is obviously very closely linked to occupational profiles.

Depending on national labour market structures and traditions of work organisation in firms, the corresponding occupational profiles are broader/narrower in some countries than in others. In the less-specified vocational fields of business and administration, and social and health care, the definition of common occupational profiles is even more difficult. To measure and compare competences in specific vocational areas, there must be a common basis for comparison and the differences in preparing young adults for the world of work in different VET programmes must be identified systematically to get a clear picture of those VET programmes and corresponding occupational profiles that are comparable and might be included in an international comparison (e.g. OECD, 2008b, Baethge, Arends, Winther, 2008). How big the differences between occupational profiles and corresponding VET programmes in participating countries are is not known.

Figure 1.3.-1 illustrates the link between curricula in VET and occupational profiles in the labour market.

In the Feasibility Study, valid information regarding both, occupational profiles on the labour market and learning outcomes in VET is needed for two reasons: firstly, the concept of VET-LSA is not limited to the measurement of competences at the end of VET but also includes aspects of the labour market three to four years after completing VET. Secondly and more importantly, we have to look at the links between vocational education and occupational profiles because VET always refers to labour market requirements and occupational needs. However, occupational profiles and VET processes are not necessarily directly linked, since they pursue different rationalities. In the world of work, occupational tasks and qualification requirements are defined by organisations (enterprises) as requirements for their employees to achieve organisational objectives; occupational tasks and qualification requirements are stimuli given in an organisational context of work. On the other hand, learning outcomes at the end of VET – compared on the basis of evaluation tasks in the Feasibility Study – refer to educational objectives specified in national curricula with the aim of individual competence development, including domain-specific and general aspects of education.

Due to the different objectives in defining occupational tasks in the labour market and developing individual competences in educational contexts, a continuing mismatch between labour market demands and VET outcomes can be observed in most European countries. During the past decade, this mismatch has become a top priority in European VET policy, (improving the links between VET and the labour market is one of the major objectives in the Bordeaux Communiqué, for example). There are a number of approaches to comparing occupational profiles and educational contents internationally. In the following two paragraphs, the most important approaches will be discussed against the background of the Feasibility Study.

1.3.2 Approaches to a comparative analysis of occupational profiles: ISCO and O’NET

Occupational classification systems and wage groups are often used for international comparisons of occupational profiles\(^\text{17}\). However, there is no substantive literature on cross-national job analysis but a considerable body of best practice (e.g. PIAAC OECD, 2008d). To date, the only internationally binding classification of occupations is the International Standard Classification of Occupations (ISCO). ISCO is one of the main internation-

\(^{16}\) There is a difference between whether the organisation of work in firms is more rooted in the Tayloristic tradition or guided by complex occupational tasks, for example.

\(^{17}\) E.g. ERA wage agreement in Germany, IG-Metall Bezirk Baden Württemberg (2004).
al statistical standards and classifications, frequently used as a framework to reconcile national classifications in comparative research. ISCO divides jobs into major groups, with each group further organised into sub-major, minor and unit groups (ILO, 2008). In the Feasibility Study, the updated version ISCO-0818 was used in a first step towards reaching agreement on common jobs. However, for a comparative analysis of occupational profiles in different national contexts ISCO is not detailed enough; there are no internationally validated descriptors for occupational tasks or qualification requirements available for the selected jobs.

Other approaches have been developed on the basis of ISCO to compare specific aspects of the world of work internationally. The DISCO (Dictionary of skills and competencies) 19 provides a multilingual thesaurus for vocational skills and competences mainly for Curricula Vitae (e.g. Europass), job advertisements, job profiles and the like. A further approach that should be mentioned here is the VQTS (Vocational qualification transfer system) model. By using a matrix, the model aims to provide a structured description of work-related skills in specific occupations and an instrument for VET providers to transfer and recognise qualifications acquired in official VET systems in foreign countries (Luomi-Messerer & Markowitsch, 2006; Markowitsch, Becker, Spöttl, 2006). A pilot matrix for “Mechatronics”20 and “Technician middle management WEI Mechanical engineering constructions and machines”21 has so far been developed.

None of these approaches, however, are detailed enough for a comparative analysis of occupational profiles: there are no descriptors for occupational tasks and qualification requirements in DISCO, and the VQTS model is limited to a few occupations and not yet validated internationally.

The most comprehensive database reflecting the latest research in the field of job analysis is the US Occupational Information Network (o*net). A range of detailed questionnaires and surveys on skills and job requirements have been developed by o*net, and data has been organised in a comprehensive database (e.g. Peterson et al. 1995). O*net reports on a number of employer surveys that aim to identify skills that employees should possess. O*net offers levels of requirements for individual abilities and skills. In addition to skills, which are divided into basic skills and cross-functional skills, the o*net model also includes knowledge and education as work requirements. In addition to these, and essentially recognised as being of equal value, there are work characteristics, divided into values, work style, occupational interests and capabilities, and other characteristics such as occupational requirements and occupation-specific information.

A similar approach based on job requirements is currently being tested for indirect skills measurement in PIAAC. The principles underlying the Job Requirement Approach (JRA), which has been used for decades for qualitative and quantitative labour requirement analysis, were adapted mainly from the UK Skills Survey but also from o*net (OECD 2008d). By identifying and describing the key components of modern occupations, o*net supplies updated information critical to the effective training, education, counselling and employment of workers. It contains data describing over 1,000 occupations and contains links that cross-link occupational titles to eight other classification systems (DOT, MOS, OPM, etc.). The o*net database is updated on a regular basis. These updates occur as a result of the Data Collection Programme currently underway. Updated data for the ninth subset of occupations is now included in the 13.0 release. A tenth subset of occupations will be updated as a part of the next major database release, expected in June 200922.

O*net provides an independent frame of reference and a tool for identifying a common set of occupational tasks and qualification requirements in each vocational area, enabling the researchers to identify a common basis for comparison in the Feasibility Study. However, o*net cannot be used as a tool for direct competence measurement in VET-LSA (it could be used for indirect measurement of background variables, as is proposed for PIAAC).

1.3.3 Approaches to a comparative analysis of learning outcomes at the end of VET

In addition to occupational tasks and qualification requirements, the educational content of VET needs to be compared internationally. The International Standard Classification of Education (ISCED) is still the only internationally accepted classification system for education programmes, distinguishing six levels, beginning with elementary school (level 1) and extending to a PhD and postgraduate programmes (level 6). A joint effort to develop a European Qualification Framework (EQF) based on learning outcomes to compare and transfer qualifications in different sectors across Europe is still under way.

---

18 ISCO has been updated to take into account developments in the world of work since 1988. The updating did not change the basic principles and structure of ISCO-88 but significant changes were made in some areas. The updated classification known as ISCO-08 was used in the Feasibility Study.

19 http://www.disco-tools.eu/

20 Drafted in a workshop together with experts from Germany and Austria

21 Dutch secondary vocational qualification.

22 The ninth major update from the o*net Data Collection Programme brings the number of comprehensively updated occupations to 809. Highlights of this update include: Addition and update of Task Statement ratings (importance, relevance, and frequency) for 106 occupations; updated Abilities, Work Activities, Knowledge, Skills and Work Context data for 106 occupations; additional Work Content data for 106 occupations; addition and update of Training and Work Experience and Education data for 106 occupations; addition and update of Work Styles data for 106 occupations; addition and update of Job Zones data for 108 occupations; addition and update of Interests and Work Values data for 812 occupations.
Even though most European countries have either embarked on or intend to establish national qualification frameworks (NQF), the process will not be completed before 2012. For the purpose of agreement on a common educational level to narrow the focus of comparison, ISCED level 3 was used in the Feasibility Study as an overarching frame of reference for the selection of national VET programmes.

Curriculum analysis is commonly used to compare educational content and to prepare frameworks for the development of measurement tools in international large-scale assessments. For example, the TIMSS curriculum analysis effort set out to understand the intentions, visions and aims shaping mathematics curricula in 50 nations. The results of a pre-feasibility Study (Baethge, Arends, Winther, 2008) showed that an analysis of national descriptions of learning outcomes and occupational tasks in formal documents at different levels of aggregation does not provide a sufficient basis for comparison: some are very detailed and others rather abstract, embedded in national VET systems, work cultures and labour market contexts.

To overcome this challenge, a comparison of learning outcomes in VET on the basis of evaluation tasks was proposed in the Feasibility Study. Irrespective of the task format (practical, theoretical) or duration (one day, several weeks), evaluation tasks are indicators of expected learning outcomes in major core areas at different levels of performance at the end of national VET programmes. Thus, a comparison of evaluation tasks gives first insights into the major educational outcomes of VET, and is not a collection of possible test items for a possible future VET-LSA.

The main objective of the Feasibility Study is to find a common basis for a comparison of vocational areas in participating countries. International comparative surveys in education show that implementing qualitative research methods is a challenging task. A balance must be struck between meeting countries’ needs and meeting the needs of the international comparative analysis. To ensure international comparability in the Feasibility Study, data collection in all participating countries was based on the same data collection instruments developed in each international expert group following the same procedures and the results were analysed following the same methods.

The following paragraphs describe the methods for ensuring comparability of procedures across countries in the Feasibility Study.

### 1.4 Implementation of the Feasibility Study

The organisational structure for implementing the Feasibility Study follows structures typically applied in international large-scale assessments (e.g. PISA, PIAAC), distinguishing between the international level, in charge of all strategic decisions (research tools, procedures of implementation) and the national level, responsible for the implementation of procedures defined at the international level (Figure 1.4-I).

Whereas international coordinators are responsible for overall management of the Feasibility Study, the international expert group coordinators are in charge of coordinating the work in the international expert groups.

In each participating country, national coordinators implement the Feasibility Study in cooperation with the national experts for each vocational area. National implementation consists of two national workshops for the discussion and the rating of occupational tasks, qualification requirements and evaluation tasks, as well as the writing of the national report with the documentation and analysis of national results by the national coordinators.

---

23 The typical entrance qualification for level 3 is nine years of full-time education and completion of level 2; the typical entrance age is 15 or 16. ISCED 3A giving access to higher education; ISCED 3B: giving access to 5B programmes and the labour market; ISCED 3C: giving access to the labour market or other level 3 programmes (UNESCO, 2006). The different classification of national VET programmes at ISCED level 3 (A/B/C) is often not related to different contents but to the official classifications of the countries. For example, the Swedish and Finnish programmes are classified at ISCED 3A since the vocational programmes also give access to higher education. Thus, the decision factor in the Feasibility Study is that all programmes are classified at ISCED level 3.

24 In the SMSO project, an analysis of curricular materials was conducted as a basis for developing a curriculum framework onto which the intended curriculum of a country could be mapped. The frameworks include a content domain, performance expectations, and context (e.g. Schmidt, 1995; Schmidt, Raizen, Britton, Bianchi & Wolle, 1997). The curriculum framework was applied to a set of curriculum syllabi and was revised as necessary.

25 In the pre-feasibility study, all participating countries provided details for national VET programmes (title, duration, level, training, number of students, learning outcomes) corresponding to the four selected areas as well as occupational tasks and associated jobs. Most of the countries provided a collection of official documents, such as training regulations; EUROPASS certificate supplements, national curricula and official statistics.

26 International valid test items for VET-LSA will be developed in the main study.

27 National coordinators and national experts for each occupation were nominated by government representatives of each participating country.

28 The national reports from all participating countries are available from the national coordinators (see Foreword).
1.4.2 Agreement process/international and national workshops

To ensure international comparability of procedures in all participating countries, four international workshops were conducted:

1. The first international workshop was held on July 3rd – 4th 2008 in Bonn with all the participants of the Feasibility Study from eight European countries: national coordinators, national experts, international coordinators and expert group coordinators. The following agreements were reached:

   - A common understanding of the concept for VET-LSA (see Chapter 1.2.2).
   - Organisational structure, timeline, tasks and responsibilities for implementing the Feasibility Study.
   - Agreement on a strategy for comparison based on a qualitative approach at two levels: occupational tasks and qualification requirements on one hand, and evaluation tasks at the end of VET on the other hand.
   - The international sets of occupational tasks and qualification requirements will be rated by national experts in a first national workshop in each vocational area.

2. The second international workshop for national coordinators was held in Berlin on October 14th 2008 with the objectives of discussing and revising the research tools, clarifying the procedures for data collection, discussing the structure of the national reports and revising the timetable for the Feasibility Study.

3. The third international workshop for national experts was held on January 14th 2009 in Berlin. The aim was to compare and discuss the results of the first national workshop and to agree on a procedure for selecting the international set of evaluation tasks for rating during the second national workshop. Each group identified core areas for the selection of evaluation tasks. To be able to compare different task formats in different national languages, the tasks were to be submitted in the form of a 1/2 page summary in English to the international expert group coordinator. The proposal for a selection of 15-20 tasks by the international expert group coordinator was submitted to the expert group for agreement in a follow-up via e-mail.

   - A proposal for occupational tasks and qualification requirements selected from o*net was prepared by each expert group coordinator and discussed with the expert group during the workshop. The final version of the research tool was agreed on in a follow-up to the workshop via e-mail.

   - The international set of evaluation tasks will be rated by national experts in a second national workshop in each vocational area.
4. The final international workshop held on May 5th–6th 2009 in Bonn focused on the discussion of international results and the resulting recommendations for the Steering Group. The discussion was based on the international draft report of the Feasibility Study prepared by the international coordinators and international expert group coordinators. All the recommendations for the Steering Group were confirmed by the participants (for detailed minutes of each international workshop, see Annexe 1).

Expert ratings were collected during two national workshops per vocational area in each participating country. The first workshop addressed actors from the world of work (e.g. professionals, supervisors, trainers in companies), actors in VET (e.g. teachers, school principals) and researchers in the vocational area. The aim of the first workshop was to introduce the participants to the concepts of VET-LSA and the Feasibility Study and to rate the set of occupational tasks and qualification requirements. The second workshop addressed a larger group of participants involving representatives in chambers, examination boards, VET institutes and social partners, in addition to the participants of the first workshop. The aim of the second workshop was to discuss the results of the first workshop and to rate the international set of evaluation tasks.

To support the implementation of the workshop, standardised manuals and PowerPoint presentations were prepared and provided to each country.

1.5 Methods of analysis in the Feasibility Study: qualitative comparative analysis of occupational tasks, qualification requirements and evaluation tasks

1.5.1 Research design: a qualitative approach with quantitative elements

Aiming at identifying a basis for comparison in the selected vocational areas (carmechatronics, electrician, business and administration, social and health care), the Feasibility Study was confronted with the challenge of specifying differences and commonalities in the four vocational areas across the eight countries. Due to the link between occupational profiles and VET programmes, differences and commonalities had to be analysed, on the one hand in terms of occupational profiles corresponding to the four vocational areas, and on the other hand in terms of the qualification requirements needed to successfully master the different occupational tasks in the world of work. The second major challenge is to identify students’ abilities at the end of VET on the basis of learning outcomes. Evaluation tasks give insights into what is expected of students at the end of VET.

To identify common occupational tasks, qualification requirements, and learning outcomes at the end of VET in participating countries, a qualitative empirical approach on the basis of expert ratings was proposed. In addition, quantitative methods were selected to support the results of qualitative analysis. Quantitative data must therefore be interpreted with care.

Due to the size of the participating countries and the specific national features of each of the selected vocational fields, the national coordinators decided to select small samples of national experts for each occupational field (e.g. minimum seven for the first national workshop)29. The selected qualitative approach comprises three steps:

- The international coordinators and each international expert group are responsible for all strategic decisions. To ensure international comparability, standardised sets of occupational tasks, qualification requirements and evaluation tasks were identified and agreed on in each expert group and subsequently rated by national experts in each participating country.

---

29 One might take into consideration another pragmatic argument: any other qualitative approach would be more time and resource consuming without ensuring more precise results in terms of comparable occupational profiles and learning outcomes in participating countries.
To incorporate specific national features, the results of expert discussions during national workshops were analysed and interpreted in the international report on the basis of national reports (for details, see Chapter 3). Two national workshops were implemented for each vocational area. During the workshops, problems of comparability from the national perspective were discussed on the basis of the international sets of occupational tasks, qualification requirements and assessment agreed on in each international expert group.  

The discussions in the expert groups during the three international workshops provided a forum for analysing domain-specific aspects of comparability and specific national features. In this way, quantitative results of national ratings could be validated again. The combination of national expert ratings and international expert discussions follows procedures typically applied in large-scale assessments for the development of conceptual frameworks (e.g. PISA, PIAAC) to specify domains for assessment. 

For the Feasibility Study, a limited number of experts for each vocational area can be considered sufficient and representativeness is not a necessary condition (expert ratings with small samples are typically used in clinical research (e.g. Craigie, Loader, Burrows, et.al., 2002; Cendales, Kirk, Moresi, et.al., 2006; Braithwaite, Luft, Bender, et.al., 2007). However, this assumption needs to be verified empirically and proven by evaluating the results. 

In anticipation of the major findings outlined in Chapter 3, it can be stated that all the methodological premises were confirmed: there was a consistently high level of consensus among the experts in all four occupations. However, to ensure that there is sufficient congruence in each vocational area, which is a pre condition for VET-LSA, the findings must be interpreted carefully. They provide a basis for the identification of measurement dimensions for subsequent test development in a possible future VET-LSA. The final selection of test items must be validated internationally and tested in a pilot study in all participating countries (it is important to emphasise this aspect here because some countries misunderstood the function of evaluation tasks in the Feasibility Study – the ratings of evaluation tasks are not the basis for the selection of test items in a possible future VET-LSA). 

### 1.5.2 The sample of experts 

Experts for small samples must be selected with particular care. Experts were selected for both national workshops according to the following criteria:  

- A minimum of seven experts should carry out the rating per vocational area in the first national workshop. The number of ratings in the second national workshop should be higher than in the first national workshop so as to include representatives from the policy and administrative level (including social partners). 

- Participants in the first national workshop should include professionals in the vocational field, teachers in vocational schools, professionals (e.g. supervisors, trainers) and researchers. In addition to the participants in the first workshop, the second workshop should address representatives from vocational/further education institutions, examination boards, education committees, social partners and administration at the policy level. 

- All participants should be closely related to the respective vocational area to ensure homogeneity in the domain. In this way, a relatively homogeneous sample of experts could be provided in all participating countries. 

![Figure 1.5.1: Research design: qualitative approach with quantitative elements](image)

---

30 The results of the discussions were recorded with a standardised form of record (2nd workshop) and data was collected with standardised Excel Tools 1&2. 
31 E.g. for the selection of the sample, aspects such as firm size, sub-branches, and the size of VET institutions were not taken into consideration. 
32 The reason for the deviation of ratings for evaluation tasks in business and administration is explained in Chapter 1.3.4.
Table 1.5.-1 shows that, on average, the criteria for sampling mentioned above was met across all eight countries. Thus, a homogeneous sample can be assumed. The specific composition of the three groups varies in some countries (Table 1A-5), but this is due to specific national features of VET organisations. 342 experts participated in the first national workshop and 349 in the second national workshop. Increasing numbers of participants not directly involved in VET participated in the second national workshop. This was important to ensure the qualitative control of ratings from the first workshop. The criterion of a minimum of seven participants per vocational area in the first national workshop was met by almost all countries.

### 1.5.3 The research tools

Creating mutual trust is a precondition for successful cooperation across national and institutional borders (e.g. discussion on EQF, EQARF). To ensure that all the actors involved in the Feasibility Study had a mutual understanding of the basis for comparison, an empirical approach was implemented. In a first step, agreement was reached in each expert group on a common set of occupational tasks and qualification requirements for the labour market. In a second step, agreement was reached in each expert group on a common set of evaluation tasks at the end of national VET programmes at ISCED level 3 in accordance with major core areas. In a third step, these common sets were validated by national experts in the respective vocational areas in each country. In the following, the two research tools for data collection in national workshops will be introduced and illustrated on the basis of carmechatronics\(^{33}\) (the research tools were developed following the same procedures in each vocational area).

**Research Tool 1: identification of comparable occupational tasks and qualification requirements for the labour market**

Two job classification systems were used as an overarching frame of reference for the identification of comparable occupations and corresponding occupational tasks and qualification requirements: the draft version for ISCO 08 codes and the o*net database from the U.S., with descriptors for occupational tasks and qualification requirements relevant for the labour market.

Agreement on sub-major and minor groups for each occupational area with ISCO 08 was reached in a first step. The selected ISCO codes for each occupation are shown in Table 1.5.-2:

---

33 More details on carmechatronics are provided in Chapter 3
O*net was chosen as an overarching frame of reference for determining common occupational tasks and qualification requirements in the labour market corresponding to the occupations selected from ISCO. In o*net, each occupation is described in terms of occupational tasks, qualification requirements, level (job zone) and specific vocational preparation (SVP range).

- The job zone provides information on how most people get into the work and how much overall experience, education, and on-the-job training is needed to do the work. Occupations at levels 3 (occupations that need medium preparation) and 4 (occupations that need considerable preparation) were included in the Feasibility Study.

- The specific vocational preparation (SVP) range gives details of the amount of time required by a typical worker to learn the techniques, acquire the information and develop the facility needed for average performance in a specific job situation. This training may be acquired in different environments (e.g. school, work, institutional, vocational). Occupations at SVP ranges 6 and 7, which include over one year and up to and including four years of specific vocational preparation, were included in the Feasibility Study.

In each international expert group, a set of major occupational tasks and qualification requirements corresponding to job zone 3 and SVP range 6>7 was selected from a limited number of occupations in each vocational area by the international coordinator. The focus on job zone 3 / SVP range 6>7 ensures that the selection of occupational tasks and qualification requirements corresponds to a medium skills level accessible for VET programmes at ISCED level 3.

To take specific features of the European labour market into account, the descriptors were adapted in each international expert group (for details on the agreement process in each vocational area, see Chapter 3). The basis for the identification of relevant occupational tasks is the data collection with a standardised instrument agreed on in the international expert group and used not only for data collection but most importantly as a basis for discussion and comments in all the first national workshops (see 1.4.2). To take the specific features of countries into account, workshop participants had an opportunity of adding additional occupational tasks/qualification requirements of major importance for the national setting to the research tool. The response scales for the ratings of occupational tasks and qualification requirements in the first national workshop were adapted from o*net (Peterson, 1997, p.74); the sets of occupational tasks were rated on basis of 5-point rating scales in terms of “relevance” (1=not relevant; 5=extremely relevant) and “frequency” (1=several times a year; 5=several times daily); the sets of qualification requirements were rated regarding their “relevance”.

**Example Carmechtronics**

Selected o*net occupations:

- 49-3023.01 Automotive Master Mechanics
- 49-3023.02 Automotive Speciality Technicians

The following **occupational tasks** were selected from the selected o*net occupations and adapted to the European setting:

---

34 It does not include the orientation time required by a fully qualified worker to become accustomed to the special conditions of any new job. Specific vocational training includes vocational education, apprenticeship training, in-plant training, on-the-job training, and essential experience in other jobs.

35 During the second national workshop it was agreed that “importance” would be exchanged for “relevance” to be more precise in meaning.

36 The seven-point scale from o*net was changed to a five-point scale since fewer scale points allow less scope for cultural variation.
Table 1.5.-3: Occupational tasks adapted from o*net for carmechatronics (Research Tool 1)

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Occupational task (O*NET task descriptors)</th>
<th>How relevant is the task on average to the performance of carmechatronics?</th>
<th>How often is the task performed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sensual (e.g., visual) and functional examination of vehicles to determine extent of damage or malfunctions.</td>
<td>not relevant</td>
<td>several times a year</td>
</tr>
<tr>
<td>2</td>
<td>Test components and systems, using standard set of tools and special equipment such as infrared engine analysers, compression gauges, oscilloscopes, multimeters, computerised diagnostic devices, brake test stand.</td>
<td>somewhat relevant</td>
<td>no answer</td>
</tr>
<tr>
<td>3</td>
<td>Specifically use electronic test equipment to locate and correct malfunctions in fuel, ignition, and emissions control systems.</td>
<td>relevant</td>
<td>several times a week</td>
</tr>
<tr>
<td>4</td>
<td>Follow checklists (service plans) to ensure all important parts are examined, including belts, hoses, steering systems, spark plugs, brake and fuel systems, wheel bearings and other potentially troublesome areas.</td>
<td>very relevant</td>
<td>several times a month</td>
</tr>
<tr>
<td>5</td>
<td>Plan work procedures, using charts, technical manuals, vehicle data bases and experience.</td>
<td>extremely relevant</td>
<td>several times a week</td>
</tr>
<tr>
<td>6</td>
<td>Test and adjust repaired systems to meet manufacturers’ performance specifications.</td>
<td>no answer</td>
<td>several times a week</td>
</tr>
<tr>
<td>7</td>
<td>Perform routine and scheduled maintenance services such as oil changes, lubrications and tune-ups.</td>
<td>several times a day</td>
<td>daily</td>
</tr>
<tr>
<td>8</td>
<td>Disassemble units and inspect parts for wear, using micrometers, calipers and gauges.</td>
<td>several times daily</td>
<td>no answer</td>
</tr>
<tr>
<td>9</td>
<td>Overhaul or replace aggregates, component groups and components such as blowers, generators, distributors, starters and pumps.</td>
<td>daily</td>
<td>several times daily</td>
</tr>
<tr>
<td>10</td>
<td>Repair and service the HVAC system such as air conditioning, heating, engine-cooling, and electrical systems.</td>
<td>no answer</td>
<td>several times daily</td>
</tr>
<tr>
<td>11</td>
<td>Repair or replace engines, manual and automatic gearboxes and transmission parts or whole aggregates such as pistons, rods, gears, valves and bearings.</td>
<td>several times a month</td>
<td>several times a month</td>
</tr>
<tr>
<td>12</td>
<td>Tear down, repair and rebuild faulty assemblies such as power systems, steering systems and linkages.</td>
<td>several times a week</td>
<td>several times a week</td>
</tr>
<tr>
<td>13</td>
<td>Repair, overhaul and adjust automobile brake systems.</td>
<td>several times a day</td>
<td>several times a day</td>
</tr>
<tr>
<td>14</td>
<td>Repair suspension and undercarriage.</td>
<td>several times a day</td>
<td>several times a day</td>
</tr>
<tr>
<td>15</td>
<td>Please add occupational tasks of major importance in the national setting not mentioned in the list (maximum 3)</td>
<td>no answer</td>
<td>no answer</td>
</tr>
</tbody>
</table>

Each occupational task was rated by national experts during the first workshop in terms of relevance (“How relevant is the task on average to the performance of carmechatronics?”) and frequency (“How often is the task performed?”).

The following qualification requirements were selected from the selected o*net occupations and adapted to the European setting (domain-specific qualification requirements were enriched with examples):
Table 1.5.4: Qualification requirements adapted from o*net for carmechatronics (Research Tool 1)

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Qualification requirements (O*NET knowledge descriptors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mechanical — Knowledge, skills, and abilities of machines and tools, including their designs, uses, repair, and maintenance. e.g.: tools and methods for testing and gauging: voltage or current meters, pressure indicators, automotive exhaust emission analysers, leak testing equipment; assembling tools, adjustable wrenches, specialty wrenches, pneumatic impact wrenches, pullers, torque wrench, screwdrivers, brake repair kits</td>
</tr>
<tr>
<td>2</td>
<td>Engineering and Technology — Knowledge, skills and abilities of the practical application of engineering science and technology. This includes applying principles, techniques, procedures and equipment to the design and production of various goods and services. e.g.: engines: designs of engines, devices of engines, lubrication and cooling of engines, engine control systems, incineration trains, devices and systems of fuel management (Otto/Diesel); exhaust systems: pollutant emission and reduction of emission, noise emission and reduction, legal tests of pollutant emissions, classifications of pollutant emission; transmission: systems of transmission, gearboxes manual and automatic; undercarriage and break systems: break systems, geometry of undercarriage, fault diagnosis, effects of changing at the undercarriage</td>
</tr>
<tr>
<td>3</td>
<td>Computers and Electronics — Knowledge, skills, and abilities of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming. e.g.: technical systems of information, communication and documentation: circuit diagrams; Electrical and electronic devices and systems: circuits, basic principals, signals, regulation of checking electrical and electronic systems: functional diagrams and troubleshooting plans: graphic symbols and terminal designation, circuits and circuit connections; topology of electronic networks and busses: conventional and BUS data communication, system interfaces, diagnoses of actuating elements; basic circuit arrangements in automatic control technique: circuit plans, symbols, logical connections, systems of diagnoses, rules of installation, control chain and control circuit, sensors and actors; comfort and security systems</td>
</tr>
<tr>
<td>4</td>
<td>Customer and Personal Service — Knowledge, skills and abilities of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction. e.g.: standards of service: service plans, concepts and extent of services, legal tests and checking, checking records, accountability law; communication: verbal and nonverbal communication, rules of communication and negotiation, conflict avoidance</td>
</tr>
<tr>
<td>5</td>
<td>Mathematics — Knowledge, skills and abilities of arithmetic, algebra, geometry, calculus, statistics, and their applications.</td>
</tr>
<tr>
<td>6</td>
<td>Physics — Knowledge, skills and abilities and prediction of physical principles, laws, their interrelationships, and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic and sub-atomic structures and processes.</td>
</tr>
<tr>
<td>7</td>
<td>Chemistry — Knowledge, skills and abilities of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques and disposal methods.</td>
</tr>
<tr>
<td>8</td>
<td>National Language — Knowledge, skills and abilities of the structure and content of the national language including the meaning and spelling of words, rules of composition and grammar.</td>
</tr>
<tr>
<td>9</td>
<td>Foreign (English) Language — Knowledge, skills and abilities of the structure and content of the Foreign (English) language including the meaning and spelling of words, rules of composition and grammar.</td>
</tr>
</tbody>
</table>

Please add qualification requirements of major importance in the national setting not mentioned in the list (maximum 3)!
Each qualification requirement was rated by national experts during the first workshop in terms of relevance (“How relevant is the qualification requirement for carmechatronics workers to perform successfully in the labour market?”).

One important aspect frequently discussed during the implementation of the Feasibility Study will be addressed here: the formulation of o*net descriptors, in particular for qualification requirements, was sometimes considered to be too abstract. A thorough discussion proved that there is one theoretical argument and two empirical arguments against this assumption:

- From a theoretical perspective, it must be taken into consideration that the formulation of o*net descriptors, which are updated on a regular basis, is not incidental but reflects recent changes in occupational tasks and more importantly in qualification requirements. Today’s world of work is characterised by increasingly knowledge-intensive work processes, requiring in-depth knowledge to fulfil these demands. This has been emphasised in a number of papers on the post-industrial or knowledge-based society for the past 30 years (e.g. Bell, 1972, Polanyi 1966, Nonaka/Takeuchi 1997, Child/Heavens 2001).

- In order not to over-emphasise the theoretical perspective, o*net descriptors were adapted to the Feasibility Study by modifying items and incorporating specific national features of participating countries.

- Options for adding additional items during national workshops were also provided in both research tools. This option was used by a number of experts and resulted in a set of additional items of major importance in the national setting.

Due to these empirical mechanisms, both the level of abstractness and concreteness in the formulation of descriptors for occupational tasks and qualification requirements should be covered sufficiently in the Feasibility Study.

Research Tool 2: identification of comparable learning outcomes at the end of VET on the basis of evaluation tasks

ISCED was used as an overarching frame of reference for the selection of national VET programmes, “VET programme which is mainly designed to lead participants to acquire the practical skills, know-how and understanding necessary for employment in a particular occupation or trade or class of occupations or trades. Successful completion of such programmes leads to a labour market relevant vocational qualification…” and might provide access to higher education (adapted from UNESCO, 2006).

The typical entrance qualification for level 3 is nine years of full-time education and completion of level 2; the typical entrance age is 15 or 16. To compare educational levels at the end of VET programmes, evaluation tasks corresponding to major core areas were collected from each participating country and compiled in an international set of 15-20 evaluation tasks. To obtain agreement on a common set of evaluation tasks, a set of core areas with major learning outcomes at the end of VET was identified in each vocational area.

Example carmechatronics

A total of 16 tasks corresponding to five core areas were selected by all participating countries and agreed on in the international carmechatronics expert group (Figure 1.1.5).

<table>
<thead>
<tr>
<th>Core areas</th>
<th>Task heading</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM</td>
<td>Engine management and pollutant emission</td>
</tr>
<tr>
<td>EM 1</td>
<td>Repair fuel injection (benzin) and test pollutant emission</td>
</tr>
<tr>
<td>EM 2a</td>
<td>Repair diesel injection</td>
</tr>
<tr>
<td>EM 2b</td>
<td>Troubleshooting pollutant emission (diesel)</td>
</tr>
<tr>
<td>EM 3a</td>
<td>Replacement of toothed belt (practical)</td>
</tr>
<tr>
<td>EM 3b</td>
<td>Replacement of toothed belt (theoretical)</td>
</tr>
<tr>
<td>BS</td>
<td>Brake system</td>
</tr>
<tr>
<td>BS 1</td>
<td>Inspection brakes and ABS</td>
</tr>
<tr>
<td>BS 2</td>
<td>Troubleshooting brake system (ABS/ESP)</td>
</tr>
<tr>
<td>UC</td>
<td>Undercarriage</td>
</tr>
<tr>
<td>UC 1</td>
<td>Axle measurement</td>
</tr>
<tr>
<td>UC 2</td>
<td>Suspension</td>
</tr>
<tr>
<td>PT</td>
<td>Power transmission</td>
</tr>
<tr>
<td>PT 1</td>
<td>Gear box</td>
</tr>
<tr>
<td>PT 2</td>
<td>Repair clutch</td>
</tr>
<tr>
<td>PT 3</td>
<td>Drive axle repair</td>
</tr>
<tr>
<td>CSS</td>
<td>Comfort and security systems</td>
</tr>
<tr>
<td>CSS 1</td>
<td>Repair air conditioning</td>
</tr>
<tr>
<td>CSS 2a</td>
<td>Troubleshooting AC</td>
</tr>
<tr>
<td>CSS 2b</td>
<td>Maintenance AC</td>
</tr>
<tr>
<td>CSS 3</td>
<td>Programming convenience functions</td>
</tr>
</tbody>
</table>

---

37 See Chapter 3 and Tables 3.1-A1, 3.1-A2, 3.2-A1, 3.2-A2, 3.3-A1, 3.3-A2, 3.4-A1, 3.4-A2
The core areas are:

- Engine management and pollutant emission (EM)
- Brake system (BS)
- Undercarriage (UC)
- Power transmission (PT)
- Comfort and security systems (CSS)

The pre-selection of evaluation tasks for carmechatronics from participating countries was based on the following criteria:

1. Does the task represent one of the core areas?
2. Is the task considered relevant for occupational tasks and qualification requirements (Research Tool 1) in the labour market?
3. Are the tasks independent of specific national features (e.g. national law)?
4. Is the length of the task feasible for expert ratings during the second national workshop?
5. Are tasks from all participating countries included in the selection?

To be able to include different task formats (e.g. students projects) and reduce the translation effort, national experts were asked to provide a 1/2 page summary of the task in English. The proposal for selection by the international coordinator was agreed on via e-mail with the national carmechatronic experts from all participating countries.

Each evaluation task was rated by national experts during the second national workshop in terms of educational objectives (“The task is representing major educational objectives at the end of VET for carmechatronics?”) and complexity (“Indicate the level of complexity!”). The sets of evaluation tasks were rated on the basis of four-point scales in terms of “educational outcomes” (1=strongly disagree; 4=strongly agree) and “level of complexity” (1=little complexity; 4=high complexity). To get clear positive or negative statements, four-point scales were applied. The research tools were translated into the national languages in almost all countries.

Regarding the international sets of evaluation tasks, another important aspect sometimes discussed during the implementation of the Feasibility Study will be addressed here.

During the final international workshop, the question arose as to whether the selected core areas could cover all major aspects of the selected national VET programmes. This question can be answered empirically and systematically as follows:

1. The international set of evaluation tasks was developed empirically in each international expert group. All the national experts were asked to submit national evaluation tasks corresponding to the core areas for their selected VET programme. From all the national evaluation tasks, the international expert group coordinator selected a set of tasks and submitted it to the national experts for agreement. The final set of evaluation tasks was approved by all participating countries. Thus, it can be assumed that it represents the major educational content in all national VET programmes.

2. From a theoretical point of view, the high congruence of ratings of the evaluation tasks across countries is not surprising. There is a long-standing international debate in social science about whether there is a tendency towards a diverging or converging development of work forms across countries (e.g. Berger/Dore 1996). Details of this fundamental debate should not be discussed here. For the Feasibility Study it should be taken into consideration that there is a tendency towards converging task profiles and qualification requirements due to the globalisation of markets and ubiquity of technologies in modern societies. This does not imply that specific national features of VET do not play a role anymore; there remain some specific national features involving types of work organisation within the prevailing tendency towards concordance. With regard to a future VET-LSA, converging aspects of different VET programmes that presumably also correspond with major aspects of national VET programmes in participating countries are of particular importance.

### 1.5.4 Qualitative and quantitative analysis of results

#### Qualitative analysis

Qualitative analysis was integrated into the process of the Feasibility Study, consisting of a number of expert discussions at the national and international level, which were documented and analysed (see Annex Chapter 1). The discussions in the four international expert groups were taken into consideration throughout the entire project and resulted in adaptations of items in the research tools.

---

38 For reasons of the confidentiality of some evaluation tasks, research tool 2 with the original items, cannot be provided at full length in the Annex; some countries did not give their permission for publication of the original evaluation tasks.

39 Except Norway; Denmark: research tool 1 carmechatronics, electricians industry, research tool 2 all vocational areas.

---
At the national level, expert discussions during national workshops on validating the international sets of occupational tasks, qualification requirements, and evaluation tasks in each vocational area were incorporated into national ratings and additional items included. The results of the national workshops were summarised in the national reports and integrated into the international report. The discussions on and ratings of national evaluation tasks during the first national workshop were used as a basis for agreement on an international set of evaluation tasks in each vocational area in accordance with major core areas.

At an international level, the most important steps of qualitative analysis were implemented in international expert group discussions in each vocational area. They provide a platform for the discussion of national aspects and workshop results and for agreement on common sets of occupational tasks, qualification requirements and evaluation tasks. The expert group discussion during the final international workshop was used to reach agreement on a common interpretation of results.

It is the collective effect of these multiple feedback loops that makes it possible and feasible to also implement quantitative procedures. Thus, quantitative results have to be considered as outcomes of previous qualitative agreements on occupational tasks, qualification requirements and evaluation tasks. In the case of random rating, the degree of congruence would be probably lower.

Quantitative analysis

In view of the small sample size and the qualitative and pilot character of the study, non-parametric methods were employed for data analysis (e.g., Bortz & Lienert, 2008, Pett, 1997).

Means and mean absolute deviations for each item were calculated per country from the raw scores of each country (in the following these will be referred to as country means and mean absolute deviation within countries).41

We favoured mean absolute deviations over standard deviations to prevent undue weight being accorded to extreme values in the small sample.

The mean of country means42 and the mean absolute deviation of country means from the mean of country means was computed from the country means to give equal weight to the countries, regardless of the number of expert ratings that entered into the respective country mean (e.g., Business and Administration workshop 2: Slovenia 19 vs. Finland 6 experts).

For the purpose of inferential statistics, country means were transformed into ordinal ranks.43 Concordance in the ratings between individual countries was tested with Kendall’s concordance coefficient $W$ (e.g., Howell, 2009). This method was employed for the cross-country comparisons (N between 6 and 7) as it affords a measure for concordance between a small number of raters on an ordinal scale level. In case of missing country means for individual items, the item has been omitted from the analysis rather than the country (this is indicated in the table as appropriate). In addition to Kendall’s $W$, the equivalent average Spearman’s correlation computed on the rankings of all possible pairs of countries is reported.

The focus of ratings dimensions applied in the analysis is outlined in the following.

For the analysis of occupational tasks and qualification requirements, “relevance” was the main focus, indicating major tasks and requirements for the respective occupational profile in one country. In addition, “frequency” gives insights into those occupational tasks most frequently performed in working life. This information might be useful for the development of test instruments in future steps.

For the analysis of evaluation tasks, “educational objectives” was the main focus, indicating whether the selected tasks represent major educational objectives in the selected national VET programme. In addition, “complexity” gives insight into different levels of task complexity.

The results for each vocational area are reported in Chapter 3.

---

41 The mean was used rather than the median because of the data structure. Consistently high ratings would result in equal values for the median, thus leading to a loss of information.

42 This was used as the main measure of a central tendency rather than a mean calculated from the raw scores across all countries.

43 An additional advantage of the rank ordering of the items for the purpose of testing is that the resulting rank order is more robust with respect to possible differences in the translations of the anchor points of the rating scales.
### Box 1-1: Glossary of statistical concepts applied in the Feasibility Study

**For each country we calculated individually:**

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country means</strong></td>
<td>Arithmetic average of all ratings for each item in one country</td>
</tr>
<tr>
<td><strong>Calculation</strong></td>
<td>The sum of all ratings for each item divided by the number of ratings</td>
</tr>
<tr>
<td><strong>What does this tell me?</strong></td>
<td>The country mean for an item is a measure of the overall view of the experts in the respective country with regard to the item in question</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean absolute deviation within countries</strong></td>
<td>Average deviation (in absolute values) of the individual ratings for each item in a country from the country mean</td>
</tr>
<tr>
<td><strong>Calculation</strong></td>
<td>The sum of the differences of each individual rating from the country mean in absolute terms (i.e. without positive or negative sign) divided by the number of ratings</td>
</tr>
<tr>
<td><strong>What does this tell me?</strong></td>
<td>The mean absolute deviation within countries is a measure of how much – on average – the experts of this country disagree with regard to the item. A higher value signals more disagreement between the experts within the country</td>
</tr>
</tbody>
</table>

**For the comparison of the countries we calculated the analogue measures across the countries:**

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean of country means</strong></td>
<td>Arithmetic average of the means of all participating countries for each item</td>
</tr>
<tr>
<td><strong>Calculation</strong></td>
<td>The sum of all country means for each item divided by the number of countries.</td>
</tr>
<tr>
<td><strong>What does this tell me?</strong></td>
<td>The mean of country means for an item is a measure of the overall view of all countries with regard to the item in question. All countries – irrespective of how many experts contributed to the ratings in the country – are represented equally.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean absolute deviation of country means the mean of country means</strong></td>
<td>Average deviation (in absolute values) of the individual country means for each item from the mean of country means</td>
</tr>
<tr>
<td><strong>Calculation</strong></td>
<td>The sum of the differences of each country mean from the mean of country means in absolute terms (i.e. without positive or negative sign) divided by the number of countries.</td>
</tr>
<tr>
<td><strong>What does this tell me?</strong></td>
<td>The mean absolute deviation of country means from the mean of country means is a measure of how much – on average – the countries disagree on the item. A higher value signals more disagreement between the countries.</td>
</tr>
</tbody>
</table>

**Non-Parametric Statistical Methods:**

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kendall’s concordance coefficient W</strong></td>
<td>Measure for concordance between a small number of raters for data on an ordinal scale level. Kendall’s W takes values between 0 and 1. The required ranks were calculated from the means of the individual items for each country.</td>
</tr>
<tr>
<td><strong>What does this tell me?</strong></td>
<td>Kendall’s W is a statistical test that examines whether a number of raters (in our case each country is regarded as a rater) rank items in a similar or dissimilar way. A significant result for Kendall’s W signals that raters show substantial agreement.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Spearman’s correlation</strong></td>
<td>Kendall’s W has an interpretation in more familiar statistical terms. It is equivalent to the average of correlations between the rankings of all possible pairs of countries. This value is reported in addition to Kendall’s W.</td>
</tr>
</tbody>
</table>
2. National VET systems in participating countries: similarities and differences

It is the task of a possible future VET-LSA to provide insights into the performance of different institutional settings in VET on the basis of valid and objective outcome-based competence measurement. VET systems are embedded in national traditions of education and labour markets and specific institutional orders, which shape today’s institutional settings. The aim of Chapter 2 is to compare institutional settings of VET in participating countries in terms of the major factors impacting the quality of VET. Following the structure of the national reports, the following institutional factors were analysed in all participating countries (national reports):

- VET as part of the educational system,
- governance structures of VET,
- quality monitoring of VET,
- organisation of VET according to national occupational profiles, and
- transition into the labour market.

2.1 VET as part of national education systems

VET systems are embedded in national education systems. Depending on links with institutions of general education, VET can be rather integrated into the education system or institutionally separate. Integrating VET into upper secondary education is one of the major priorities in European VET policy in the light of the Bordeaux Communiqué (European Union, 2008) with the focus on increasing the quality and attractiveness of vocational education and training systems: “countries’ efforts to make VET more attractive focus mainly on improving access to higher education, providing differentiated options by diversifying their post-secondary sector and/or introduce non-university tertiary programmes” (Lipinska, Schmid, Tessaring, 2007, p.10).

It is most likely that in those countries with VET systems closely linked to general education (e.g. Sweden, the US), VET is based more on broad concepts of vocational competences, whereas in those countries with VET systems that are institutionally separate from the system of general education (e.g. Germany, Austria), VET is more focused on job and labour market-relevant skills and competences. However, in VET systems closely linked to general education, there might be a lack of labour market-relevant skills in the curricula. Comparing both types of VET systems today allows only a hypothesis of possible outcomes in both systems; in a future VET-LSA, this hypothesis must be validated empirically.

The relationship between VET and general education in participating countries can be characterised according to:

- the percentage of young adults enrolled in general and vocational tracks in upper secondary education,
- the percentage of work-based and school-based learning arrangements in VET, and
- possibilities for progression to higher education.

Despite the global tendency towards higher education during the past decade (in particular in post-industrial countries, see OECD 2008a) more than 50% of young adults in the eight participating countries (except Denmark) were enrolled in vocational education at ISCED level 3 in 2004 (Figure 2.1.1). In countries with traditional dual VET systems (Austria, Germany, Switzerland) even more than 60% and in the EU-27 56% of young adults were participating in vocational education within upper secondary education.

Learning arrangements in VET vary to a large extent in participating countries and very often within one country: on the one hand, in terms of the division between training at the workplace and learning in vocational schools, on the other hand in terms of forms of organisation: alternating (e.g. dual system 1-2 days at school, 3-4 days at work) versus longer periods of training. In all eight countries there is a large variety of institutional settings in VET, ranging from dual systems to vocational schools and colleges, sometimes including mixed arrangements (e.g. vocational schools with integrated long periods of practical training in firms). The coexistence of different forms of VET systems makes it very difficult to specify the ratio between work-based training and school-based learning in each country. Even though in most national reports rough estimations of organisation/learning arrangements are given, they vary according to specific VET programmes and institutional factors.


45 These characteristics should be considered a proxy-indicator for the link between general education and VET, mostly referring to the dual system; school-based systems (which increased in all participating countries except Switzerland) integrate practical parts in VET schools.

46 E.g. Austria, there are variations in different regions within one programme.
tional settings. In countries with mostly dual systems (Austria, Denmark, Germany, Switzerland) the amount of work-based training ranges from 55% to 80%, whereas in school-based VET systems, the percentage of work-based training is much lower (Sweden about 15%, Slovenia max. 24%)47. This shows that in a possible future VET-LSA, different organisational/learning arrangements and institutional settings will have to be analysed carefully in each of the selected four occupations/occupational fields.

The Swedish and Finnish reports state that all national programmes provide basic eligibility for entrance to higher education after successful completion of the programme. In Slovenia, secondary technical education provides possibilities for accessing higher education and in Norway students qualify for access to higher education by transferring from VET to general education.

In German-speaking countries with established dual systems there is little progression from VET to higher education. In Germany, for example, only 1% of apprentices without an entrance qualification for university access higher education. To create new bridging mechanisms, Austria and Switzerland have introduced vocational maturity examinations (Austria “Berufsreifeprüfung”48; Switzerland “vocational baccalaureate”) during the past decade, which might be a first step towards increasing permeability between VET and higher education in countries with dual systems. Possibilities for accessing post-secondary education at ISCED level 4 exist in most countries.

It can be assumed that possibilities for accessing higher education would improve the attractiveness of VET and students’ motivation to learn. Therefore, possibilities for accessing higher education should be analysed in detail in a possible future VET-LSA.

A comparison of entry rates at tertiary level between type A and B shows that low entrance rates below the OECD average (e.g. Austria, Germany, Switzerland) correspond with high proportions of dual VET participants in upper vocational education (see Table 2.1-2). The question of whether there is a causal relation between the focus on general education subjects in school-based VET systems and higher entrance rates at a tertiary level cannot be answered at this point. The impact of possibilities for accessing higher education on the quality of VET programmes and the composition of students’ cognitive levels must be analysed in detail in the next project phase.

47 All numbers are based on the national reports provided by the countries.

48 In Austria a separate track of VET colleges is providing a maturity examination, which provides access to universities.
Table 2.1-1: Structure of vocational education (upper secondary level) by countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Structure of VET upper secondary education ISCED 3*</th>
<th>Duration (average years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>apprenticeship dual system (1/3 of students)</td>
<td>3.5 - 4</td>
</tr>
<tr>
<td>Denmark</td>
<td>apprenticeship pathway in dual system</td>
<td>3-4</td>
</tr>
<tr>
<td>Finland</td>
<td>vocational institutions (combined with learning in the workplace) 82% of all VET-students</td>
<td>3</td>
</tr>
<tr>
<td>Germany</td>
<td>apprentice-ship in dual system (appr. 70% entrants 2006)</td>
<td>3-3.5</td>
</tr>
<tr>
<td>Norway</td>
<td>9 VET programmes main model: 2 years at school followed by 2 years apprenticeship</td>
<td>4-4.5</td>
</tr>
<tr>
<td>Slovenia</td>
<td>short cycle vocational education (2 years)</td>
<td>2-4</td>
</tr>
<tr>
<td>Sweden</td>
<td>13 national VET-oriented programmes organised by schools</td>
<td>3</td>
</tr>
<tr>
<td>Switzerland</td>
<td>apprentice-ship in dual system (appr. 84% in 2007)</td>
<td>3-4</td>
</tr>
</tbody>
</table>

Structure of VET upper secondary education ISCED 3*:

- **Austria**: Apprenticeship dual system (1/3 of students)
- **Denmark**: Apprenticeship pathway in dual system
- **Finland**: Vocational institutions (combined with learning in the workplace) 82% of all VET-students
- **Germany**: Apprentice-ship in dual system (appr. 70% entrants 2006)
- **Norway**: 9 VET programmes main model: 2 years at school followed by 2 years apprenticeship
- **Slovenia**: Short cycle vocational education (2 years)
- **Sweden**: 13 national VET-oriented programmes organised by schools
- **Switzerland**: Apprentice-ship in dual system (appr. 84% in 2007)

Duration (average years):

- Austria: 3.5 - 4
- Denmark: 3-4
- Finland: 3
- Germany: 3-3.5
- Norway: 4-4.5
- Slovenia: 2-4
- Sweden: 3
- Switzerland: 3-4

* All national VET programmes were classified at ISCED level 3: two at ISCED level 3A, three at ISCED 3B and three at ISCED 3C. In the Finnish national report it is emphasised that upper secondary vocational qualification provides “general eligibility for further studies at polytechnics (new universities) and universities” (p.6) which would include ISCED level 3A; The Swedish report stated that all VET programmes give basic eligibility to higher education. ** Pilot work covering education starting 2008-2010 – not part of the ordinary system. The plan is to introduce apprenticeship education as a regular study path from autumn 2011 (not decided on yet).
### Table 2.1-2: Entry rates at tertiary level in participating countries (in 2006)

<table>
<thead>
<tr>
<th>Country</th>
<th>Tertiary-type A*</th>
<th>Tertiary-type B**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>40</td>
<td>9</td>
</tr>
<tr>
<td>Denmark</td>
<td>59</td>
<td>22</td>
</tr>
<tr>
<td>Finland</td>
<td>76</td>
<td>- (a)</td>
</tr>
<tr>
<td>Germany</td>
<td>35</td>
<td>13</td>
</tr>
<tr>
<td>Norway</td>
<td>67</td>
<td>- (n)</td>
</tr>
<tr>
<td>Slovenia</td>
<td>46</td>
<td>43</td>
</tr>
<tr>
<td>Sweden</td>
<td>76</td>
<td>10</td>
</tr>
<tr>
<td>Switzerland</td>
<td>38</td>
<td>15</td>
</tr>
<tr>
<td>OECD mean</td>
<td>56</td>
<td>16</td>
</tr>
</tbody>
</table>


* Tertiary-type A programmes are largely theory-based and are designed to provide qualifications for entry into advanced research programmes and professions with high skill requirements.

** Tertiary-type B programmes are classified at the same competency level as tertiary-type A programmes but are more occupationally oriented and usually lead to direct labour market access.

### 2.2 Governance and financing of VET

Due to the wide range of students they cater for and the number of stakeholders involved in both decision-making and financing, VET systems in all countries are complex. The impact of governance structures in a future VET-LSA is obvious. VET systems in Europe are still input-oriented and changes are implemented by actors responsible for steering VET – not on the basis of evidence-based policy (Tessaring, 2007)\(^49\).

In general, three types of regulation and governance can be distinguished, as the dominant influence may come either from the state, the market, or interest groups (social partners): the German corporatist dual vocational training system, the state bureaucratic model in France, and the liberal market economy training model in England (Greinert 2005, p. 20 ff.)\(^50\). However, the fact that decisions on the fundamental structures of VET management (e.g. financing, standards and norms) are driven by governments is not questioned in this typology. The model refers to the extent of state governance and the involvement of economic and social actors in preparing, implementing, and monitoring state decisions in VET. Thus, in market-driven systems, state governance is limited to framework legislation without participation in the steering of VET. In corporatist models on the other hand, the most important economic and social actors (in particular social partners) play a major role in the steering of VET (e.g. in the preparation of laws or the implementation and monitoring of VET).

It can be assumed that different ideal types, such as the one for welfare states described by Esping-Andersen and for VET systems outlined by Greinert, are too complex or holistic to represent the governance types of the eight countries participating in the Feasibility Study. They tend to give “a bird’s eye view of the broad characteristics of social or historical situation” (Arts & Gelissen, 2002, p.139). The diversity of governance types in participating countries is probably better characterised in terms of “hybrid” or “mixed” types (see Arts/Gelissen 2002). Therefore, governance structures in the Feasibility Study were classified in a continuum according to the impact of the government and the social partners. Obviously, both have an influence at either of the two poles, but to different degrees. Sweden constitutes one pole, with the main influence exerted by government and less influence coming from the social partners. The other pole is constituted by countries with corporatist governance: in Austria, Denmark, Germany and Switzerland, VET is mainly steered by social partners in terms of norms and control. Norway, Finland and Slovenia are located somewhere between these two poles. It must also be kept in mind that school-based VET programmes, with the main influence coming from the government, also exist in countries with dual systems (e.g. Austria, Germany).

The corporatist pole is characterised by social partners shaping VET policy and participating in a broad range of activities. At the state level, social partners are directly involved in equal representation on boards of vocational education and
training and very often in implementing and monitoring VET. In Germany, for example, the Chambers and examination boards have major responsibilities in the dual VET system. In Denmark, the social partners are even involved in the form of “tripartite collaboration at all decision levels” [National report Denmark, p. 6], which is demonstrated by the strong position of “sector trade committees” in shaping state legislation51. Strong involvement of social partners in the development and validation of qualifications, as well as in the standards and the design of VET programmes, characterises all countries with corporatist systems.

The state-dominated governance model might be characterised to some extent as a counterpart to the corporatist model. In Sweden, for example, the parliament and government are responsible for all relevant decisions in VET. This shows that even when VET is primarily regulated by governmental control, decentralisation with a high degree of local responsibility for the organisation of VET and the distribution of resources is possible (national report Sweden, p. 3).

In addition to the impact of government and the social partners, a further aspect of governance structures has to be distinguished: the issue of centralisation/decentralisation and cooperation at different levels to ensure more efficient decision making and better responses to local and regional needs. In participating countries with corporatist governance systems there are large differences in levels of decentralisation. In Denmark and Finland, steering is rather decentralised, whereas Germany is characterised by state-wide regulations for implementing VET on the basis of centralist traditions – although there are also decentralised activities within the chambers of industry and commerce or craft. In Finland, corporatist decentralisation is demonstrated by the fact “that each VET provider has to establish a local board including representatives of working life”, for example (national report Finland, p. 10.).

**Financing** is an important instrument for steering VET. Financing can be regulated by the state (public funding) or by private institutions (e.g. firms). In the eight countries there are different forms of public funding (e.g. Sweden, Slovenia, Finland) and mixed public and private funding (Austria, Denmark, Germany, Norway). In countries with dual VET systems, enterprises are typically responsible for funding work-based training52, whereas the school-based part is funded by the government. In the past decade, public financing of work-based training has increased and in-company training has been more frequently subsidised by national governments (e.g. Austria, Germany) to get through difficult times.

From a governance point of view, private financing can either refer to single enterprises or collective arrangements among employers, which is the case in Denmark for example, or in some VET programmes in Germany (e.g. construction). The majority of private financing is based on individual financing models in enterprises, which means that the quantity and quality of training offers depends on the economic situation and management decisions of individual enterprises.

In countries with mixed financing systems, the school-based element of dual VET and full-time vocational school programmes are financed by the national government. In the past decade there has been an increase in the number of full-time vocational schools in the majority of countries (e.g. Austria, Denmark, Germany).

There are very few comparative figures on expenditures on vocational education and training (e.g. European Training Foundation, 2005). This is due to the problem of clearly identifying the cost of VET53 and the fact that, very often, costs are not specified clearly enough in terms of what is included (direct costs and/or indirect costs). Moreover, it is difficult to obtain estimates of the purchasing power and currencies between countries. Nevertheless, proxy figures were provided in some national reports, illustrating remarkable differences in annual costs per student across countries. The highest costs were reported for dual VET in Germany (a total of 10,900 EUR per year; for school-based VET 5,800 EUR per year). In Denmark the costs amounted to 5,500 EUR for commercial programmes and 8,400 EUR for technical programmes, in Finland to 8,300 EUR, in Norway to 6,000 EUR, in Slovenia to 4,500 EUR and in Sweden to 8,000 EUR54. The impact of governance and financing on the quality of VET is not known. Therefore, both institutional factors should be analysed in a possible VET-LSA.

---

51 The national reports of the Feasibility Study refer more to institutional conditions for involvement than to an empirical analysis of involvement regulations in practice.

52 In Norway, subsidies are provided to firms by the government: 500 EUR per month per student.

53 The difficulties of exact estimations of VET costs are discussed in e.g. CEDEFOP 2009, p. 50.

54 All numbers rounded.
2.3 Quality monitoring in VET

Recent developments in European VET policy show that quality monitoring and quality assurance in VET is becoming a major issue in most countries (e.g. Lipinska, Schmid & Tessaring, 2007; European Union, 2008). The debate on quality assurance in VET is closely linked with the development of classification systems to link education outcomes in different educational systems in Europe (EQF, ECVET). As a precondition for trust in learning outcomes, quality assurance has become one of the main issues. Several countries recommend that the common quality assurance framework (ECQAF) guidelines should be applied to their VET system (e.g. Finland). Measures for quality assurance have a direct impact on outcomes of VET. Therefore, quality assurance must be incorporated as a background variable in the project design for a future VET-LSA.

Measures for quality monitoring in participating countries consist of all the national activities for assuring quality in VET highlighted in the national reports. This includes evaluation activities and measures for improving teachers’ and trainers’ competence levels, the development of standards in VET, measures for improving cooperation between VET providers, and reporting and counselling. With regard to a possible future VET-LSA, it can be assumed that quality management closely linked to VET processes would be most effective (see examples in the Finnish national report, p.12).

Measures for making VET systems more transparent and flexible, and for ensuring quality are a major focus in all national reports. The development of standards for VET and assessments of quality in VET are more of a focus than the competences of teachers and trainers in VET. In all countries, a university entrance certificate (in some countries additional professional experience) is required for teachers in VET schools. The qualification and status of VET trainers in firms is less regulated. Training is often a task added to a master craftsman’s, journeyman’s or skilled worker’s regular job (in some countries, e.g. Germany, Switzerland, pedagogical qualifications for adult education are required).

In almost all national reports, the development of standards for evaluating quality in VET is a top priority. In traditional dual systems (Austria, Germany, Switzerland), this is less of a focus due to the revision of training occupations and the corresponding development of occupation specific standards in the past decades.

Approaches to quality assurance in VET differ in participating countries. Therefore, statements must be formulated carefully here. These differences are mostly in the area of the relation between centralisation by standards with decentral implementation in local institutions. In the Danish report for example, this is specified as follows: “the system has evolved from a rather prescriptive system based on detailed regulations to a framework-governed system” not to a “single, nation wide quality approach”. In Denmark, there are “common principles and measures at system level, and different approaches at both system and provider level” (national report Denmark, p. II).

The implementation of quality monitoring within a national framework at the local level is demonstrated in the Finnish report. The Finnish National Board of Education develops national curricula as a framework for VET providers at the local level. VET providers must ensure that their own curricula are based on the national framework and “include assessment plans and methods, which have to be approved by the multi-stakeholder steering committee at local level” (national report Finland, p. 12). VET providers are monitored at a local level by steering committees as one element of quality monitoring. VET providers have the freedom to choose the method for self-evaluation, which is supported by “Recommendations for Quality Assurance in Vocational Education and Training”, published in 2008 by the Ministry of Education. A further approach to improving the quality of VET was the introduction of the “skills demonstration” into all upper secondary VET qualifications to provide a link between working life and the assessment of student’s vocational skills. VET providers are requested to publish the main results of their evaluations and performance-based financing systems are becoming increasingly prevalent (national report Finland, p. 12-15).

Compared to other participating countries, the Finnish VET system is highly differentiated in terms of quality development. The issue of whether methods of self-evaluation or external evaluation are more effective for quality assurance in VET is not a point for discussion in the Feasibility Study. However, what is evident from the Finnish report is that in a future VET-LSA, a detailed analysis of methods for quality monitoring in different countries will be required to explain differences in the test results of competence measurement in participating countries.

55 Methods for self-evaluation are also favoured in Switzerland.
56 References for outcome-orientation were reported in the Austrian national report (QIBB programme in full-time schools/colleges).
2.4 Organisation of VET according to national occupational profiles and traditions

In most countries, there is a close relation between VET and employment structures and specific economic and policy development paths – in particular in the German and the Slovenian reports. In Germany, this can be explained by the tradition of craftsmanship in industry and trade, with the corresponding training occupations strengthened in industry and trade as major foundations of the dual system, qualifying young adults in enterprises over decades. In Slovenia, the close relation to school-based VET, which was formerly implemented by the Yugoslavian authorities, is reflected in current difficulties in increasing work-based training. The specific features of VET and employment structures in participating countries are described in the national reports.

With regard to a possible future VET-LSA, the following can be concluded: the selected occupations/occupational fields (carmechatronic, business and administration, electrician craft & industry, social and health care) are strongly represented in almost all participating countries, which confirms that they provide a solid basis for an international large-scale assessment of VET[see Chapter 3]57.

57 Except for Norway, with low numbers of graduates in the VET programme for the electricians industry.

2.5 Links between VET and the labour market

Improving the transition between VET and the labour market is traditionally one of the major issues in VET research and policy (European Commission, 2008). In today’s labour markets, which are characterised by increasing insecurity and volatility due to globalisation and structural changes in the economy, matching these processes has become more difficult in many countries. Therefore it is not surprising that this issue is discussed directly or indirectly in all the national reports.

In international reports on comparative statistics (e.g. OECD, 2008b) youth unemployment rates are typically used as indicators of the transition from education into the labour market. Figure 2.1-2 shows that there have been large differences in youth unemployment rates in participating countries since 1990. In German-speaking countries, youth unemployment rates increased (on a relatively low level), whereas decreasing numbers were reported in Scandinavian countries and the EU-25 average during this period58.

The lower rates in Austria, Germany and Switzerland in 1994 could be explained on the basis of labour market theory. Owing to the strong position of enterprises in dual systems, there is a close link between VET and labour markets and labour supply and demand, which supports a smooth transition from education into the labour market59. On the other hand, the high youth unemployment rates in 2007 indicate that the close link between VET and the labour market had become looser in the dual systems. Opposite tendencies in Scandinavian countries could be explained by the organisational aspects of education, better transition systems, or general labour market developments.

Youth unemployment rates will be an important indicator in a future VET-LSA in two ways: on the one hand, for comparing youth unemployment rates within the vocational areas of comparison and on the other hand, for comparing youth unemployment rates with unemployment rates at different qualification levels (e.g. university graduates). It is likely that occupations with high youth unemployment rates will be less attractive to young adults than occupations with lower rates, which also impacts VET. Dealing with youth unemployment and problems of the transition from education into the labour market shapes national VET systems and requires major attention in developing VET policy.

58 Except Sweden which remained the same.
59 In dealing with youth unemployment rates in countries with traditional dual VET systems, it must be taken into consideration that apprentices are counted as part of the labour force, which increases the denominator of unemployment rates and reduces youth unemployment rates to a certain extent. This must be taken into account in interpreting youth unemployment rates in countries with traditional dual VET systems.
In the national reports, problems of the transition from VET into the labour market are discussed directly and indirectly in the context of recent reforms of VET. In countries with traditional dual systems, building on the close link between VET and the labour market, this is less the case. Problems of the transition from VET into the labour market are mostly emphasised in the Swedish and Slovenian reports. Measures for reducing the mismatch between VET and the labour market include, for example, the “skills demonstrations” in Finland and individualised learning pathways in “highly flexible, competence-based VET-systems” where the trainees themselves shape their own training in Denmark (Danish report, p.4). The question of whether decreasing youth unemployment rates in those countries can be attributed to these measures cannot be answered here. Transition management in VET systems must be included in a possible future VET-LSA as a background variable in the project design.

2.6 Conclusion

As expected, there are commonalities in VET structures but also differences in institutional settings which favour an international comparison of VET (VET-LSA). In this chapter, direct factors (e.g. quality assurance) and indirect factors (e.g. governance structures) impacting VET were analysed.

All selected national VET programmes are located at ISCED level 3 (3A, 3B, 3C) and the corresponding VET programmes and occupational profiles are regarded as important in all participating countries. In a possible future VET-LSA, the differences in institutional setting must be analysed in detail to be included as background variables so as to explain differences in competence measurement results.

Indirect background factors mainly involve different governance structures, e.g. the extent and type of participation of social and economic groups, or the relation between central and decentral steering, and the type of financing with regard to the amount and expenditure of resources. Indirect factors include permeability to higher education and links to the labour market. These must be analysed carefully because it is likely that they have an impact on the perceived attractiveness of VET and students’ motivation to learn.

Direct background variables consist of all the factors impacting VET processes, such as the professionalism of teachers and trainers, standards and norms for shaping VET processes, and methods for quality assurance – for the latter ongoing changes are reported in most countries. Quality monitoring has been presumed to have a major impact on VET outcomes, so participating countries could learn a great deal from one another.
3. Comparative international analysis of occupational tasks and qualification requirements for the labour market and assessment tasks at the end of VET in participating countries

3.1 Carmechatronics
(Markus Müller / Andreas Schelten)

The occupational field of carmechatronics can be described as a field with widespread agreement in all participating countries. The findings show high levels of congruence in terms of formal requirements for selected national VET programmes, occupational tasks, qualification requirements for the labour market, and learning outcomes at the end of VET. In the following paragraphs, a detailed analysis of results regarding each aspect, including overview diagrams and interpretations, is provided. The analysis is based on national reports from Austria, Denmark, Finland, Germany, Norway, Slovenia and Sweden.

3.1.1 Specific features of national VET programmes for carmechatronics

The participating countries provided information about their VET programmes for carmechatronics, which is shown in Table 3.1.1. On the whole, the selected programmes meet the profiles of reference that were defined. The total durations of the VET programmes range from 3 to 4 years. All the programmes are classified at ISCED level 3 (two at 3A, two at 3B, three at 3C). Thus, all the selected programmes provide access to at least ISCED levels 3A or 5A (e.g. craftsman’s master education or technical college) or higher (e.g. polytechnics). Completed compulsory school education is the minimum requirement for entry into carmechatronics programmes.

The number of graduates varies from 500 (Slovenia and Norway), to 732 (Denmark), to about 18,000 (Germany). Thus, with regards to a possible future VET-LSA, it would be feasible to draw a sample of 400 participants for carmechatronics from each of the selected national VET programmes. In terms of the organisation of the programmes (respectively programme periods), different types can be distinguished:

- in Austria, Germany, Denmark and Norway the selected VET programmes are predominantly workplace oriented,
- in Slovenia, Finland and Sweden the programmes are mainly school based.

Education or training combines periods in educational institutions / training centres with time spent in workplaces. The alternating scheme varies in all participating countries. In Norway, for example, students are enrolled in vocational schools for the first two years, with a general focus on many occupations in a field, and subsequently sign up for a more specialised apprenticeship. In traditional dual systems (Switzerland, Austria, Germany) on the other hand, education or training combines periods in an educational institution or training centre with time spent in the workplace. The alternating scheme typically combines 3-4 days at work with 1-2 days in school on a weekly basis. Apprentices are contractually bound to the employer and receive remuneration.

The basis for the identification of relevant occupational tasks is the data collection with a standardised instrument agreed on in the international expert group and used not only for data collection, but most importantly as a basis for discussion and comments in all first national workshops in participating countries (for general aspects of the research tools, see Chapter 1). The set of occupational tasks and qualification requirements was selected from the following o*net occupations: 49-3023.01 Automotive Master Mechanics and 49-3023.02 Automotive Speciality Technicians.
### Table 3.1-1: General information on VET programmes – Carmechatronics

<table>
<thead>
<tr>
<th></th>
<th>Austria</th>
<th>Denmark</th>
<th>Finland</th>
<th>Germany</th>
<th>Norway</th>
<th>Slovenia</th>
<th>Sweden</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total duration (years)</strong></td>
<td>3.5 years</td>
<td>4 years</td>
<td>3 years</td>
<td>3.5 years</td>
<td>4 years</td>
<td>3 years</td>
<td>3 years</td>
<td>3 years</td>
</tr>
<tr>
<td><strong>ISCED level</strong></td>
<td>38</td>
<td>3C**</td>
<td>3A</td>
<td>38</td>
<td>3C**</td>
<td>3A</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td><strong>Entry requirements</strong></td>
<td>completion of compulsory school</td>
<td>completed compulsory education</td>
<td>basic (compulsory) school certificate; no entry requirements for C* and ap*</td>
<td>completed compulsory education</td>
<td>completion of compulsory education</td>
<td>successful completion of primary school (9 years) or lower vocational education programme (2 years after general education)</td>
<td>completion of compulsory school</td>
<td>successful completion of lower secondary level (i.e. 9 years of compulsory education)</td>
</tr>
<tr>
<td><strong>Access to next level of education/training</strong>*</td>
<td>a) craftsman’s master education b) with additional examination entry to higher (university) level education (vocational route) c) with supplementary exams entry to polytechnic universities (ISCED 5B)</td>
<td>eligibility for higher education in polytechnics and universities</td>
<td>advanced VET programmes at ISCED 5A or education programmes at ISCED 4A-C</td>
<td>Technical College (4B) or university level (5A) after one year supplementary general study</td>
<td>continue schooling in the Carmechatronics Technician programme (2 years) providing access to ISCED 4A</td>
<td>basic eligibility to higher education</td>
<td>prepares for entry into specific occupations or direct access to higher education</td>
<td></td>
</tr>
<tr>
<td><strong>Organisation/learning arrangements:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>work-based learning %</td>
<td>school-based learning %</td>
<td>w: 80% / s: 20%</td>
<td>w: 75% / s: 25%</td>
<td>w: 17% / 70%ap / 70%cp*</td>
<td>w: 75% / s: 25%</td>
<td>w: 60% / s: 40%</td>
<td>w: 24% / s: 76%</td>
<td>w: 15% / s: 85%</td>
</tr>
<tr>
<td>alternating programme/periods of training</td>
<td>in rural areas: longer periods of training in school, remaining time in the workplace; in urban areas: 1 day a week in school, 4 days in the workplace</td>
<td>basic part: 20 weeks in vocational school; main part: alternate periods in both school and apprenticeship</td>
<td>apprenticeship-based and competence-based education can alternate or consist of longer periods of training in school and in the workplace</td>
<td>dual system: alternate training in both vocational school and in firms</td>
<td>2 years at school; 2 years apprenticeship</td>
<td>practical training is done in employers’ organisations</td>
<td>full-time school-based with at least 15 weeks of workplace training</td>
<td>dual system: training alternates in both vocational schools and in firms</td>
</tr>
</tbody>
</table>

* C = curriculum-based education; AP = apprenticeship-based education; CP = competence-based education,
** expert agreement no official ISCED classification;
*** regulations are recently changing rapidly in the countries;
**** KFZ Mechaniker, KFZ Mechatroniker. Source: investigated in 2008
3.1.2 Comparative analysis of ratings for occupational tasks

Selection procedure and criteria of o*net task descriptors

A pre-selection of occupational tasks and qualification requirements was prepared by the international expert group coordinator, based on national documents for carmechatronics provided by the countries previously (pre-feasibility study). The selection was based on the following criteria:

- relevance of tasks in the national contexts,
- relevance of tasks in o*net,
- discussion of the first draft during first international expert workshop,
- adaptation of tasks to a European context if necessary.

The proposal was agreed on by all carmechatronic experts from participating countries via e-mail. The final set consisted of 14 occupational tasks considered relevant for all countries (research tool 1 with the original items shown in full is provided in Annexe 3.1; Table 3.1-A1). The research tool was translated from English into the national language in most of the countries for rating in the first national workshop.

The following diagram shows the set of occupational tasks and gives an overview of the results of expert ratings of the selected set of occupational tasks (mean values for expert ratings in the countries in terms of “relevance”: “How relevant is the task on average to the performance of carmechatronics?”)

---

64 O*net shows the degree of relevance of tasks in certain occupations; here the selected occupations are automotive master mechanic and automotive speciality technician.

65 International expert meeting in Bonn on the 4th of July 2008.
Figure 3.1-1 shows that there is broad congruence in terms of the “relevance” of the selected occupational tasks in all countries. The findings show that all of the selected tasks are relevant for the occupational field of carmechatronics. Apart from the ratings in Sweden and one item in Finland, all the mean values of rating in the countries are at levels ranging from ‘relevant’ up to ‘extremely relevant’. The lowest means in the countries and thus the lowest mean of means were recorded for tasks 11 (M=3.1), 8 (M=3.3), 12 (M=3.5), 9 (M=3.6) and 10 (M=3.6). All these items correspond to mechanical tasks involving repairs to parts of vehicles, which have lately become less important for carmechatronics. Tasks involving “examination”, “testing” and “using electronic equipment for diagnosis” were rated very highly (e.g. tasks 1 to 4: very relevant to extremely relevant) by all experts. These items mainly refer to tasks involving diagnosis and troubleshooting or checking cars.

The following diagram presents these findings. It shows the mean values across the countries with error bars, indicating the mean absolute deviation of country means.

Figure 3.1-2 shows that, a) all the tasks were rated as relevant or very relevant by the national experts, and b) the mean absolute deviations for all tasks are relatively low. This indicates that there is broad congruence in terms of the “relevance” of the selected tasks. Thus, the occupational profiles for carmechatronics can be regarded as very homogeneous across countries. Given that the focus of the action in occupational contexts, namely the “cars”, should be equal in all countries, this is not surprising and specific national features obviously do not play a major role.

---

66 E.g. average age of cars, different standards of techniques, different consumer habits, such as preferring different types of engines, different standards for car equipment in terms of comfort or security systems, different climate situations in northern and southern countries and different legal regulations on technical checking or pollutant emissions.
The results for items 1-7 indicate the predominant relevance of tasks involving diagnosis and troubleshooting. On the other hand, items 8-12 show lower ratings, indicating that mechanical tasks have tended to lose relevance in the occupational profile. Item 13 differs from the remaining items. In the past, brake systems have been mainly mechanical/hydraulic, but recently they have been combined with electronic systems such as ABS, ESP, downhill brake control, brake assistant and automatic parking brake systems. The mechanical tasks of repairing brake systems have therefore been extended to include diagnostic duties. Mechanical tasks have certainly not become completely irrelevant, but the emphasis has shifted from repairing to replacing parts. For a description of the occupational tasks relevant for the performance of carmechatronics, this should be taken into consideration in future steps, as should the fact of a general shift within the occupational field of carmechatronics occurring more or less simultaneously in all participating countries. The Kendall’s W confirmed the congruency in the ratings for occupational tasks with the value of $W = .701$. Figure 3.1-3 refers to Figure 3.1-2 and shows the ratings for the same occupational tasks in terms of “frequency” (how often an occupational task is performed). The additional occupational tasks during the national expert workshops, participants had the opportunity to add tasks of major importance in the national setting. Table 3.1-2 summarises all the additional tasks mentioned by experts in participating countries and covered in the national reports. The additional tasks are commented on by the research team in the “remarks” column. Recommendations for an extension of the list of occupational tasks will be given below.

In terms of frequency, the findings confirm the results. The very relevant tasks (1-7 and 13) are very frequently performed, while the less relevant tasks (8-12) are less often required. The findings underline the interpretation provided above: highly rated items tend to be related to diagnosis, troubleshooting and car checking. Even though the mean absolute deviation is a little larger for a few items, there is high concordance in the ratings for task frequency (how often an occupational task is performed in carmechatronics jobs). This is confirmed by the Kendall’s W value reaching $W = .852$, indicating even higher concordance between the ratings in the participating countries (the country means and mean absolute deviations within country means for each country are provided in Annexe 3.1; Tables 3.1-A3, 3.1-A4, 3.1-A5, and 3.1-A6).
### Table 3.1-2: Additional occupational tasks of importance in the national setting in participating countries

<table>
<thead>
<tr>
<th>Occupational task description</th>
<th>Country</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis of electronically BUS systems (CAN-BUS)</td>
<td>Germany</td>
<td>Of increasing importance recently and in the near future; refers to tasks no. 2 and 3</td>
</tr>
<tr>
<td>Preparing vehicles for technical inspection ordered by law or pollutant emissions tests / quality, function and road safety</td>
<td>Germany, Sweden, Slovenia</td>
<td>Refers to tasks no. 4 and 6</td>
</tr>
<tr>
<td>Expanding of additional systems (e.g. independent vehicle heater, trailer tow hitch, LPG systems, audio systems, comfort systems)</td>
<td>Germany, Austria</td>
<td></td>
</tr>
<tr>
<td>Identifying vehicles and parts in databases</td>
<td>Germany, Austria</td>
<td>Refers to tasks no. 2 and 3</td>
</tr>
<tr>
<td>Checking possible delivery of spare parts in databases</td>
<td>Germany</td>
<td>Refers to task no. 5</td>
</tr>
<tr>
<td>Test, service and repair of security and comfort systems (e.g. ABS, AC)</td>
<td>Germany, Austria</td>
<td>Included in tasks no. 10 and 13</td>
</tr>
<tr>
<td>Repairing windscreens</td>
<td>Germany</td>
<td>Mostly specialist task and less frequent</td>
</tr>
<tr>
<td>Communication with customers</td>
<td>Germany, Finland, Sweden</td>
<td>Refers to qualification requirement no. 4</td>
</tr>
<tr>
<td>Automotive, technical language / speak another language</td>
<td>Sweden, Denmark</td>
<td>Refers to qualification requirements no. 8 and 9</td>
</tr>
<tr>
<td>Confer with customers to obtain descriptions of vehicle problems and to discuss work to be performed and future repair requirements</td>
<td>Finland</td>
<td>Refers to qualification requirement no. 4</td>
</tr>
<tr>
<td>Act according to safety, environmental and quality requirements and legal regulations</td>
<td>Denmark, Norway</td>
<td>Refers to qualification requirements no. 4 and 7; concerns attitude more than tasks or requirements</td>
</tr>
</tbody>
</table>

At first glance, the list of additional tasks gives the impression of a number of extensions required in the research tool. However, a closer look reveals that the diversity is an indicator of broad coverage in terms of occupational tasks for carmechatronics and the selected items in the research tool. Most of the additional tasks can be considered as being strongly related or redundant to the tasks or qualification requirements already selected (see Chapter 3.1.3). Two additional aspects have to be taken into consideration: firstly, the increasing importance of BUS technology, which should be emphasised more in tasks such as nos. 2 and 3 (testing components and using electronic equipment) and secondly, the after-sales enhancement of vehicles with additional systems.

To summarise, the results of the expert ratings reveal a high level of concordance for occupational tasks in carmechatronics jobs in all participating countries. The common occupational profile is mainly characterised by the increasing relevance of tasks involving diagnosis/troubleshooting and maintenance.

On the other hand, tasks involving repairs to car parts tend to be less relevant and frequent. Thus, it can be assumed that the set of occupational tasks is suitable for describing occupational requirements for the performance of carmechatronics.

#### 3.1.3 Comparative analysis of ratings for qualification requirements

The list of qualification requirements was taken from the o*net frame of reference specified above (see Chapter 3.1.1). As with the selection of the o*net task descriptors, the selection of and agreement on a common set of qualification requirements was conducted according to the following steps:

- first: pre-selection by the international expert group coordinator on the basis of the pre-feasibility study,
• second: discussion of the pre-selection with national coordinators and subsequently with national carmechatronic experts,

• third, enrichment of technical/vocational requirements with content descriptions at a medium level of concreteness by the international expert group coordinator, and

• finally, validation of the set of qualification requirements with national experts as a basis for rating in the first national workshop.

The results of the expert ratings for qualification requirements are depicted in Figure 3.1-4. The diagram shows the set of qualification requirements and gives an overview of mean values for expert ratings in the countries in terms of “relevance” (“How relevant is the qualification requirement on average to the performance of carmechatronics?”)

Two subgroups can be distinguished within the set of qualification requirements: technical/vocational qualification requirements (items 1-4: mechanical, engineering and technology, computers and electronics, customer and personal service) and more general qualification requirements (items 5-9 mathematics, physics, chemistry, national language, foreign language). Figure 3.1-4 shows that technical/vocational qualification requirements are rated much more highly than general qualification requirements in all participating countries. Within the general qualifications, higher ratings were reported for national and foreign languages than for the natural sciences. Whereas technical/vocational qualifications were enriched with examples for skilled workers at a medium level of proficiency in the Research Tool, descriptors for general qualifications were provided at an abstract level. Apparently, the formulations for qualification requirements in mathematics and natural sciences appeared too abstract, suggesting high cognitive demands, so that experts rated these items as being of low relevance. In most countries, vocational curricula do not directly refer to the relevance of natural science qualification; they are integrated more into descriptions of learning outcomes. In some countries, national science qualifications are contained in the curricula in the first years of education.

Figure 3.1-4: Carmechatronics: qualification requirements – relevance (country means)

[Diagram showing the rating of qualification requirements by country, with questions and mean value comments]

67 International meeting in Berlin on 14th of October 2008

68 Denmark is an exception: the mean values concerning the natural sciences are the only ones higher than M=3.0.
Figure 3.1-5 presents these findings. It shows the mean values across the countries with error bars, indicating the mean absolute deviation of country means.

The diagram shows high levels of concordance in the ratings for qualification requirements. In particular, the technical/vocational qualifications (items 1-4) are ranked as very relevant. With regard to the general qualification requirements, national experts emphasised during the final international workshop that they are relevant and mostly integrated into technical/vocational qualifications. However, they do not play a key role in VET. The Kendall’s W confirmed the congruency in the ratings, with the value of W = .864 (the country means and mean absolute deviations within country means for each country are provided in Annexe 3; Tables 3.1-A7, 3.1-A8).

Additional qualification requirements

During the first national workshops, the participants were asked to add qualification requirements of major importance in the national setting if necessary. The following two additions were suggested (Table 3.1-3).

The short list of additional qualification requirements indicates that the selected set covers a broad range of qualification requirements relevant for carmechatronics. Moreover, it

### Table 3.1-3: Additional qualification requirements of importance in the national setting

<table>
<thead>
<tr>
<th>Qualification requirement description</th>
<th>Country</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social competences / communication with colleagues</td>
<td>Austria, Norway, Denmark</td>
<td>Refers to qualification requirement no. 4</td>
</tr>
<tr>
<td>Knowledge of and ability to read domain-specific technical language</td>
<td>Austria, Norway, Sweden, Denmark, Germany</td>
<td>Refers to qualification requirement no. 8</td>
</tr>
</tbody>
</table>
can be assumed that the formulations are both concrete and detailed enough to ensure a common understanding of the contents and broad enough to cover the main aspects from an expert point of view. Additional qualification requirements might be relevant in the case of including disadvantaged students. This should be taken into consideration in future steps of sampling in the next project phase.

The findings show that the qualification requirements relevant for carmechatronics in the labour market are very similar in all participating countries and the selected set is broad enough to cover a broad range of qualification requirements relevant to the performance of carmechatronics in all participating countries. Relevant qualification requirements are mainly characterised by technical/vocational requirements, while general qualification requirements are integrated into vocational aspects.

### 3.1.4 Comparative analysis of ratings for evaluation tasks

#### Compilation of international set of evaluation tasks

The carmechatronics expert group agreed on five core areas for the selection of evaluation tasks for the rating in the second national workshop:

1. Engine management and pollutant emission (EM)
2. Brake systems (BS)
3. Undercarriage (UC)
4. Power transmission (PT)
5. Comfort and security systems (CSS)

To facilitate the selection and comparison of evaluation tasks, the international expert group coordinator provided a table of criteria for the selection and a short description of evaluation tasks. The national experts provided various examples of evaluation tasks (original format), filled in the table of contents with criteria for the selection of tasks, and added a short description. The selection of the international set of evaluation tasks was based on the following criteria:

- coverage of all five core areas, with at least two tasks in each area,
- spread over all types of tasks (diagnoses/troubleshooting, maintenance, repair/replace),
- origin of tasks, spread over different countries, and
- variance of complexity of tasks.

The proposal was sent to the carmechatronics expert group for agreement via e-mail. Finally, a set of 16 evaluation tasks from different countries was agreed on for rating in the second national workshop in each participating country (the complete set of evaluation tasks, research tool 2 with the original items displayed in full length, are provided in Annex 3.1 in the final publication, Table 3.1-A2).

Table 3.1-4 gives an overview of the selected evaluation tasks and the corresponding core areas.

<table>
<thead>
<tr>
<th>Core areas</th>
<th>Task heading</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EM</strong></td>
<td><strong>Engine management and pollutant emission</strong></td>
</tr>
<tr>
<td>EM 1</td>
<td>Repair fuel injection (benzin) and test pollutant emission</td>
</tr>
<tr>
<td>EM 2a</td>
<td>Repair diesel injection</td>
</tr>
<tr>
<td>EM 2b</td>
<td>Troubleshooting pollutant emission (diesel)</td>
</tr>
<tr>
<td>EM 3a</td>
<td>Replacement of toothed belt (practical)</td>
</tr>
<tr>
<td>EM 3b</td>
<td>Replacement of toothed belt (theoretical)</td>
</tr>
<tr>
<td><strong>BS</strong></td>
<td><strong>Brake system</strong></td>
</tr>
<tr>
<td>BS 1</td>
<td>Inspection brakes and ABS</td>
</tr>
<tr>
<td>BS 2</td>
<td>Troubleshooting brake systems (ABS/ESP)</td>
</tr>
<tr>
<td><strong>UC</strong></td>
<td><strong>Undercarriage</strong></td>
</tr>
<tr>
<td>UC 1</td>
<td>Axle measurement</td>
</tr>
<tr>
<td>UC 2</td>
<td>Suspension</td>
</tr>
<tr>
<td><strong>PT</strong></td>
<td><strong>Power Transmission</strong></td>
</tr>
<tr>
<td>PT 1</td>
<td>Gear box</td>
</tr>
<tr>
<td>PT 2</td>
<td>Repair clutch</td>
</tr>
<tr>
<td>PT 3</td>
<td>Drive axle repair</td>
</tr>
<tr>
<td><strong>CSS</strong></td>
<td><strong>Comfort and security systems</strong></td>
</tr>
<tr>
<td>CSS 1</td>
<td>Repair air conditioning</td>
</tr>
<tr>
<td>CSS 2a</td>
<td>Troubleshooting AC</td>
</tr>
<tr>
<td>CSS 2b</td>
<td>Maintenance AC</td>
</tr>
<tr>
<td>CSS 3</td>
<td>Programming convenience functions</td>
</tr>
</tbody>
</table>

The set of evaluation tasks was rated in terms of “representativeness of educational objectives” and “level of complexity”.

---

Table 3.1-4: International set of evaluation tasks for carmechatronics
Figure 3.1-6 shows the ratings of the international set of evaluation tasks from a comparative international perspective.

**Figure 3.1-6: Carmechatronics: evaluation tasks – educational objectives (country means)**

Question: "The task represents major educational objectives at the end of VET carmechatronics programmes" (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree; for rating results of Sweden concerning items 13 and 14 see commentary below)
The results of the second national workshop in all participating countries show strong agreement and high levels of coherence with restrictions on items 9 (suspension), 10 (gearbox), 13 (repair air-conditioning) and 14 (troubleshooting air-conditioning).

During the final international workshop, Sweden emphasised in respect of tasks 13 (repair air-conditioning) and 14 (troubleshooting air-conditioning) that working on vehicles’ air conditioning is not included in their VET programme but is supplemented as a further qualification for working on vehicles’ air conditioning. This explains the lower mean value in Sweden and the relatively wide mean absolute deviation for these tasks. Fading out the Swedish rating would lead to strong agreement with a low mean absolute deviation across all countries. Item 15 (air conditioning maintenance) also refers to tasks relating to vehicles’ air conditioning, but is rated highly by the Swedish experts. This suggests that the core area of comfort and security systems (CSS) itself is very representative for educational objectives in national VET programmes. However, at the level of evaluation tasks there might be some variance in rating due to specific national features.

The mean value and high mean absolute deviation of task 10 (gearbox) results from the low ratings in Sweden, Germany and Finland. The Swedish rating is surprising: in the first national rating of a national set of evaluation tasks, the core area of power transmission (PT) got the highest rating values (M=4.0) of all for relevance. The low rating values for some evaluation tasks in the international set can be ascribed to the contents of this concrete task. The German experts emphasised that a major part of the task refers more to workers with higher skill levels than to average service station workers. In addition, gearboxes are now no longer opened and repaired in service stations, but are replaced by new aggregates. Task 11 (repair clutch) refers to similar work procedures as those in task 10 (disassembling and assembling gearbox) with high rating values. Thus, task 10 cannot be recommended for further steps. Nevertheless, the high relevance of the core area of power transmission (PT) was confirmed. For task 9 (suspension) the lower mean value and higher variability of the mean absolute deviation can be explained by the Swedish rating. Together with item 8 (axle measurement), the core area of undercarriage (UC) can be considered as highly relevant for all countries.

There have been some general remarks on the ratings of evaluation tasks concerning the level of complexity in a number of national reports. It was emphasised that the quality of information on the tasks and conditions of assessment varies. Indeed, the depth and amount of information on the tasks varied from a few lines of description at a relatively high level of abstraction up to several pages of detailed information in the form of concrete assignments of tasks. For some tasks a few experts also indicated the duration involved.

In an overarching view some experts tend to see the rating process as a kind of assessment of specific evaluation tasks. However, this was not the purpose of the evaluation tasks; the aim was to provide an affirmation of core areas and a comparison of educational contents at different levels of complexity expected at the end of VET in the selected national VET programmes. Finally, Kendall’s coefficient of concordance points
to significant agreement in the overall profile of the countries' ratings (Kendall’s $W = .411$) and reflects the impression of considerable commonality between the countries' ratings of the set of evaluation tasks (for reasons concerning items with lower mean values and higher mean absolute deviations see interpretations to items 9, 10, 13 and 14 above.)

The results confirm that all five core areas can be considered as relevant and the selected evaluation tasks represent major objectives at the end of VET programmes for carmechatronics in participating countries.

The results for ratings of complexity of the selected evaluation tasks are shown in Figures 3.1-8 and 3.1-9.

The results for “task complexity” show relatively broad variance between the countries for some items. The rankings of tasks involving the more mechanical procedures of repairing or replacing parts show more diversity across countries than the ratings of the tasks of diagnosis and troubleshooting. The more mechanical tasks were rated as less complex, which is not surprising. The raw data and item analysis reveal high mean absolute deviations between countries for some items. Obviously the rating for complexity appears as quite complex itself. This may be due to different individual perceptions of various determinants of the tasks and their descriptions (content and degree of detail; form of task description; circumstances of task; information about provided materials in task situation; duration of task; bases of evaluation).

**Figure 3.1-8: Carmechatronics: evaluation tasks – complexity (country means)**

![Complexity Graph](image)

Question: “Indicate the level of complexity of the task!” (1= little complexity to 4=high complexity)
The relatively high variance of mean absolute deviations for some items is due to the ratings of particular countries (see also Figure 3.1-8). Mainly the Swedish (items 4, 5, 6, 8 and 16) and the Danish ratings (items 4, 6, 9, 15 and 16) differ from those of other countries. The concordance in ratings of the complexity of evaluation tasks is confirmed by Kendall’s W ($W = .517$; the country means and mean absolute deviations within country means for each country are provided in Annexe 3.1; Tables 3.1-A9, 3.1-A10, 3.1-A11, and 3.1-A12).

The degree of concordance is mainly decreased by the rating results from Denmark, with low correlations to the ratings of the other countries. However, this is only the case for ratings of evaluation tasks. The ratings for occupational tasks and qualification requirements in Denmark correlate highly with those of the other countries.

### Additional evaluation tasks

To conclude, the congruence of the ratings of evaluation tasks in the five core areas in terms of the representativeness of major educational objectives can be evaluated as very good. In particular, the tasks in the core areas of engine management (EM; tasks 1-5) and brake systems (BS; tasks 6-7) indicate high

---

**Table 3.1-5: Additional evaluation tasks of importance in the national setting**

<table>
<thead>
<tr>
<th>Assessment task description</th>
<th>Country</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Systems (CAN-Most)</td>
<td>Germany</td>
<td>Refers mainly to core areas EM and CSS</td>
</tr>
<tr>
<td>Security systems (airbag/SRS and belt pretensioner)</td>
<td>Germany, Sweden</td>
<td>Refers to core area CSS</td>
</tr>
<tr>
<td>Electrical systems (starter, generator, accumulator)</td>
<td>Germany</td>
<td></td>
</tr>
<tr>
<td>Workshop environment, work safety</td>
<td>Sweden</td>
<td>Included in the tasks provided</td>
</tr>
<tr>
<td>Laws and regulations</td>
<td>Sweden</td>
<td>Included in the tasks provided (e.g. pollutant emission regulations)</td>
</tr>
<tr>
<td>Communication in networks</td>
<td>Sweden</td>
<td>Included in the tasks provided</td>
</tr>
</tbody>
</table>
agreement across countries. Despite the impact of specific national features, in particular for tasks within the core area of comfort and security systems (CSS; tasks 13-16) a high level of agreement was confirmed. In the core areas of undercarriage (UC) and power transmission (PT) the level of agreement depended on the specific tasks. The concordance values for Kendall’s W are reduced to a medium level by few outliers. This is even more the case for task complexity.

The profile of the evaluation tasks corresponding to the core areas in all countries is mainly characterised by strong agreement across all the countries. Diverging ratings can be explained by specific national features of VET, which were discussed in the carmechatronics group in the final international workshop. High ratings for relevance and complexity were also reported for tasks involving diagnosis and troubleshooting, whereas mechanically-oriented tasks tend to be less complex. The results strongly point to the possibility of finding evaluation tasks fulfilling both criteria, obtaining a high validity of representativeness, and reaching an adequate level of complexity in future steps.

### 3.1.5 Summary

Seven countries participated in the field of carmechatronics: Austria, Denmark, Finland, Germany, Norway, Slovenia and Sweden. Based on the selection of national VET programmes, an assortment of occupational tasks, qualification requirements and a representative set of evaluation tasks, the possibility of an international comparison of VET was examined. The findings show that carmechatronics can be described as a field with broad agreement in all participating countries.

There is widespread agreement in all areas of interest. In the following, the major findings of the different approaches will be reviewed. Finally, a recommendation as to the eligibility of carmechatronics for VET-LSA will be provided.

The formal descriptions of national VET programmes in the area of carmechatronics show high levels of similarity. ISCED level, entry requirements, duration, and access to the next level of education can be considered as being nearly equal in all participating countries. The relative number of students varies by approximately 0.5 and 1.5 per 1,000 inhabitants and a minimum of 400 graduates was confirmed by each country. Differences were reported in the percentage of work-based and school-based parts of training, with proportions ranging from 80% work-based in Austria to 85% school-based in Sweden.

Table 3.1-5 gives an overview of the results for each aspect of comparative analysis.

#### Occupational tasks

In general, all the occupational tasks were rated as relevant or very relevant. In particular, tasks involving diagnosis and troubleshooting appear to be very relevant for jobs in the field of carmechatronics. There has been a shift away from traditional tasks of repairing or replacing parts towards diagnostic tasks using electronic equipment. High levels of concordance for ratings of “relevance” and very high levels of concordance for ratings of “frequency” were reported.

The results for frequency differ between the tasks. However, the ratings match very well across countries. There is a tendency for tasks with lower ratings for relevance to correlate with a lower frequency. In this first approach to the field of carmechatronics with occupational tasks in two categories, the ratings appear very consistent across all the participating countries. They indicate a high level of relevance for the main part of the selected occupational tasks and thus provide a promising set for further steps towards a VET-LSA.

### Table 3.1-5: Main findings carmechatronics

<table>
<thead>
<tr>
<th>Ratings 1st &amp; 2nd national workshop</th>
<th>Concordance (Kendal’s W)</th>
<th>Comment on rating results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational tasks relevance</td>
<td>.701</td>
<td>relevant or very relevant</td>
</tr>
</tbody>
</table>
| Occupational tasks frequency        | .852                     | Items 1-7, 13: high frequency  
                                      |                          | Items 8-10, 12, 14: medium frequency  
                                      |                          | Item 11: low frequency          |
| Qualification requirement relevance | .864                     | Items 1-4: very high relevance  
                                     |                          | Items 5-7: in trend low relevance  
                                     |                          | Items 8, 9: medium relevance     |
| Evaluation tasks representativeness | .411                     | predominantly strong agreement |
| Evaluation tasks complexity         | .517                     | predominantly adequate complexity |
**Qualification requirements**

Very high levels of concordance appear in the ratings of the relevance of qualification requirements. Two types of qualification requirements were differentiated, with items 1-4 (mechanical, engineering and technology, computers and electronics, customer and personal service) reporting very high relevance, items 5-7 (mathematics, physics, chemistry) indicating low relevance, and items 8 and 9 (national language, foreign language) showing medium relevance. This confirms higher levels of relevance for qualification requirements strongly related to the core areas in VET than for the qualification requirements of general education for successful performance on the labour market in the participating countries. Qualification requirements of natural sciences should not be taken into consideration in future steps.

**Evaluation tasks**

Concordance in the ratings of representativeness and complexity of evaluation tasks appears to be moderately high. However, the rating results as such mainly show strong agreement and comparable levels of complexity. Only a few disagreements on certain evaluation tasks due to specific regulations in VET programmes were reported. In particular, the core areas of engine management, brake systems and comfort and security systems appear to be very relevant in representing major educational objectives at the end of VET programmes for carmechatronics. In the core areas, the types of tasks can be differentiated according to diagnosis/troubleshooting, repair/replacement or maintenance. In particular, the diagnosis/troubleshooting-related tasks indicate higher levels of complexity and could be very important in subsequent steps of the investigation. This corresponds with the results for occupational tasks. The results strongly point to the possibility of finding test items fulfilling both criteria: obtaining a high validity of representativeness and reaching an adequate level of complexity. The five core areas representing relevant educational objectives in all national VET programmes should be taken into consideration in subsequent steps in the next project phase:

1. Engine management and pollutant emission (EM)
2. Brake systems (BS)
3. Undercarriage (UC)
4. Power transmission (PT)
5. Comfort and security systems (CSS).

In an overarching view of the three content-oriented approaches, the following can be concluded:

- a predominant relevance of diagnosis and troubleshooting-oriented tasks was confirmed for occupational tasks,
- technical and vocational-oriented qualification requirements can be regarded as very relevant for successful performance in the labour market (general qualifications in natural sciences were rated as being low in relevance),
- the selected evaluation tasks were confirmed as representing major educational objectives in all five core areas, in particular for engine management, brake systems and comfort and security systems,
- attention has to be paid to specific national features, and
- different approaches consistently confirm that there is a solid basis for further steps towards a possible future VET-LSA for carmechatronics.

In all the participating countries there are VET programmes corresponding very closely in the field of carmechatronics at comparable levels and with similar educational objectives. The different approaches applied in the Feasibility Study indicate high levels of relevance, representativeness and feasibility with regards to a possible future VET-LSA in the field of carmechatronics; only a few inferior restrictions were evident.

The field of carmechatronics can be recommended as very suitable for an international large-scale assessment in vocational education and training (VET-LSA).
3.2 Electricians

(Reinhold Nickolaus / Bernd Geißel)

In this Feasibility Study, electricians are divided into two sectors: craft and industry. A decision as to whether to incorporate the craft or the industrial sector into a possible future VET-LSA has not been taken, therefore, both sectors were compared. Seven countries participated in the craft sector: Austria, Denmark, Finland, Germany, Norway, Sweden, and Switzerland; six countries participated in the industry sector: Finland, Germany, Norway, Slovenia, Sweden, and Switzerland. The analysis is based on the national reports from all participating countries.

For both sectors, the findings show widespread agreement in terms of formal requirements for selected national VET programmes, occupational tasks and qualification requirements for the labour market, as well as for learning outcomes at the end of VET. Taking into account the fact that the experts from each country have different professional backgrounds, this result is very surprising. This also suggests that clear variances should be expected in the rating of individual countries. In the following paragraphs, a detailed analysis of results regarding each aspect, including overview diagrams and interpretations, is provided. Aspects relevant to both sectors will be addressed first, followed by specific aspects a) for the crafts sector and b) for the industrial sector.

3.2.1 Specific features of national VET programmes for electricians, craft and industry

Electricians – craft sector

The titles of national VET programmes vary across participating countries. The international electricians group agreed to select VET programmes with titles such as “automation”, “electrical engineering” or “industry sector” in their countries. As for the craft sector, the duration of the selected VET programmes varies from 3 (Finland, Sweden) to 4.5 years (Norway). All the programmes are classified at ISCED levels 3 (3A, 3B or 3C), and the number of graduates reaches 400 in all selected programmes. As for the electricians craft sector, a minimum of completed lower secondary school is required for entry to VET in all countries and all selected programmes provide access to continuing (vocational) education at different levels. In countries with dual systems, training is predominantly workplace oriented, whereas in countries with school-based systems, training is mostly school-based.

The organisation of training programmes varies (see Table 3.2-1). In countries with dual systems (Austria, Denmark), Germany, Switzerland) training is predominantly workplace oriented, whereas in countries with school-based systems (Finland, Sweden) training is mostly school-based. In Norway, vocational education starts with a two-year school-based phase, followed by a 2.5-year work-based phase.

Electricians – industrial sector

As for the craft sector, the titles of national VET programmes vary across participating countries (see Table 3.2-2). The international electricians group agreed to select VET programmes with titles such as “automation”, “automatisation”, “electrical engineering” or “industry sector” in their countries. As for the craft sector, the duration of the selected VET programmes varies from 3 (Finland, Sweden) to 4.5 years (Norway). All the programmes are classified at ISCED levels 3 (3A, 3B or 3C), and the number of graduates reaches 400 in all selected programmes. As for the electricians craft sector, a minimum of completed lower secondary school is required for entry to VET in all countries and all selected programmes provide access to continuing (vocational) education at different levels. In countries with dual systems, training is predominantly workplace oriented, whereas in countries with school-based systems, training is mostly school-based.

3.2.2 Comparative analysis of ratings for occupational tasks

Selection procedure of o*net task descriptors

The basis for the identification of relevant occupational tasks was the data collection with a standardised instrument agreed on in the electricians group at the first international workshop (Minutes Annex A1). This instrument was used not only for data collection but most importantly as a basis for discussion and comments in the national workshops. A pre-selection of occupational tasks and qualification requirements was provided by the international expert group coordinator, based on national documents for both sectors: electrician industry and electrician craft, previously submitted by the countries (pre-feasibility study).

The tasks for the craft sector were selected from the o*net occupations Electrician (47-2111.00) and Home Appliance Repairers (the electrical parts only; 49-9031.00). Both occupations refer to Job Zone 3 and SVP-Range 6<7. The tasks for the

69 In addition, the minutes of each national workshop and the Excel Tools 1&2 were analysed.

70 Some countries have specific entry requirements (e.g. in Germany regulation of the federal state).

71 In Denmark, longer periods in vocational schools are included.

72 Except Norway, where only 250 students are reported; this might be problematic for the sample in a future VET-LSA.
### Table 3.2-1: General information of VET programmes – electrician craft sector

<table>
<thead>
<tr>
<th>Country</th>
<th>Title of VET programme</th>
<th>Total duration (years)</th>
<th>Number of graduates</th>
<th>ISCED level</th>
<th>Entry requirements</th>
<th>Access to next level of education/ training***</th>
<th>Organisation/ learning arrangements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Electrical installations engineering Elektroinstallations technique</td>
<td>a) 3.5 years (dual) b) 4 years (school-based)</td>
<td>1,612 in 2007</td>
<td>3B</td>
<td>completion of 9 years’ compulsory schooling (dual); successful completion of lower secondary schooling, in some cases additional tests required (school-based)</td>
<td>external exam for accessing higher education, Higher Education Entrance Examination; master craftsperson course, foreperson course (ISCED 5B); bridging course (apprenticeship) or add-on course at engineering college (ISCED 4A) or university of applied sciences (ISCED 5A), additional tests required</td>
<td>a) dual: w. 75% / s. 25% b) school-based: w. 0% / s. 100%</td>
</tr>
<tr>
<td>Denmark</td>
<td>Electrician Installation technology (craft)</td>
<td>4 years</td>
<td>1,129 in 2007</td>
<td>3C**</td>
<td>completed compulsory education</td>
<td>academic profession degree in Installation Technology; academic profession degree in IT or Electrotechnics Engineering; access to Bachelor of Architectural Technology and Construction Management</td>
<td>basic part consists of 20 weeks in vocational college, main part alternates between periods of school-based training and practical training in companies</td>
</tr>
<tr>
<td>Finland</td>
<td>Electrical Engineering: Electrical Engineering and Energy Technology, Electrician</td>
<td>3 years</td>
<td>962 in 2007</td>
<td>3A</td>
<td>basic (compulsory) school certificate</td>
<td>general eligibility for higher education at polytechnics and universities</td>
<td>apprentice ship-based and competenceship-based education can alternate or consist of longer periods of training in school and in the workplace</td>
</tr>
<tr>
<td>Germany</td>
<td>Electronics technician for energy and building technology</td>
<td>3.5 years</td>
<td>7,966 in 2006****</td>
<td>3B</td>
<td>none / compulsory education</td>
<td>after two years’ work experience, access to master or technical colleges (Techniker / Meisterschule), after exams, access to higher education; access to a technical high school (Elektronikerin/Energie und Gebäudeotechnik) after exams, access to university (partly depends on regulations of the federal states)</td>
<td>dual system: training in vocational schools and in the workplace alternate</td>
</tr>
<tr>
<td>Norway</td>
<td>The electricians’ trade Elektrikerfaget</td>
<td>4.5 years</td>
<td>1,100 - 1,200</td>
<td>3A</td>
<td>completion of compulsory school</td>
<td>Technical College (4B); university level (5A) after one year of supplementary general study</td>
<td>2 years inschool, 2.5 years in apprenticeship</td>
</tr>
<tr>
<td>Sweden</td>
<td>Electricity programme: Electrical engineering</td>
<td>3 years</td>
<td>2,000 in 2008/09***</td>
<td>3B</td>
<td>successful completion of compulsory school</td>
<td>basic eligibility to higher education</td>
<td>full-time school-based with at least 15 weeks workplace training</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Elektrionan Elekroinstallateur</td>
<td>4 years</td>
<td>no graduates yet in 2007 as this is a new job profile</td>
<td>3B</td>
<td>completion of compulsory school</td>
<td>with Federal Vocational Baccalaurate, access to universities of applied sciences (without entrance exam), with professional experience, possibility to take tertiary level national professional exam, first to obtain a Federal PET Diploma, then to obtain an Advanced Federal PET Diploma</td>
<td></td>
</tr>
</tbody>
</table>

* c = curriculum-based education; ap = apprenticeship-based education; cp = competence-based education; ** expert agreement no official ISCED classification; *** estimate by national expert during final workshop. **** regulations are recently changing rapidly in the countries; ***** Elektronikerin Energie und Gebäudeotechnik, Elekroinstallateur

Source: investigated in 2008
### Table 3.2-2: General information of VET programmes – electrician industrial sector

<table>
<thead>
<tr>
<th>Title of VET programme</th>
<th>Finland</th>
<th>Germany</th>
<th>Norway</th>
<th>Slovenia</th>
<th>Sweden</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total duration (years)</strong></td>
<td>3 years</td>
<td>3.5 years</td>
<td>4.5 years</td>
<td>4 years</td>
<td>3 years</td>
<td>4 years</td>
</tr>
<tr>
<td><strong>Number of graduates</strong></td>
<td>615 students (curriculum-based education) in 2006</td>
<td>1,514 in 2006</td>
<td>250 in 2007 new programme, no numbers available yet (appr. 400 students in 2012)</td>
<td>appr. 2,000 in 2008/09</td>
<td>628 in 2007</td>
<td></td>
</tr>
<tr>
<td><strong>ISCED level</strong></td>
<td>3A</td>
<td>3B</td>
<td>3C</td>
<td>3B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td><strong>Entry requirements</strong></td>
<td>basic (compulsory) school certificate</td>
<td>none / compulsory education</td>
<td>lower secondary school (compulsory, comprehensive)</td>
<td>successfully completed compulsory education (9 years) or completed short-cycle vocational education (2 years after basic education) or completed vocational education (3 years after basic education)</td>
<td>completion of compulsory school</td>
<td>completion of compulsory school</td>
</tr>
<tr>
<td><strong>Access to next level of education/training</strong>*</td>
<td>general eligibility for higher education at polytechnics and universities</td>
<td>after two years’ work experience, access to master or technician schools (Techniker-/ Meisterschule), after exams, access: in some states, access to higher education; access to technical high school (Bereitschule), after exams access to university.</td>
<td>Technical College (4B) or university level (5A) after one year supplementary general study</td>
<td>higher vocational education (V1/...), higher professional education (V5), higher academic education (UNI)</td>
<td>basic eligibility for higher education</td>
<td>eligibility for university of applied sciences (FH); with additional examinations, also for ETH (Eidgenössische Hochschule)</td>
</tr>
<tr>
<td><strong>Organisation/learning arrangements:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>work-based learning %</strong></td>
<td>17%/70%/70%/70%/70%/70%</td>
<td>75%/75%/75%/75%/75%/75%</td>
<td>50%/50%/50%/50%/50%/50%</td>
<td>2.6%/2.6%/2.6%/2.6%/2.6%/2.6%</td>
<td>15%/15%/15%/15%/15%/15%</td>
<td>75%/75%/75%/75%/75%/75%</td>
</tr>
<tr>
<td><strong>school-based learning %</strong></td>
<td>83%/30%/30%/30%/30%/30%</td>
<td>25%/25%/25%/25%/25%/25%</td>
<td>50%/25%/25%/25%/25%/25%</td>
<td>97.4%/97.4%/97.4%/97.4%/97.4%/97.4%</td>
<td>85%/85%/85%/85%/85%/85%</td>
<td>25%/25%/25%/25%/25%/25%</td>
</tr>
<tr>
<td><strong>alternating programme/periods of training</strong></td>
<td>apprenticeship-based and competence-based education can alternate or consist of longer periods of training in school and in the workplace</td>
<td>dual system: training in vocational schools and in the workplace alternate</td>
<td>3 years in school; 15 years in apprenticeship</td>
<td>full-time schooling; practical training in employers’ organisation</td>
<td>full-time school-based with at least 15 weeks of workplace training</td>
<td>dual system: without professional maturity: 4 days work, 1 day school, with professional maturity: 3 days work, 2 days school</td>
</tr>
</tbody>
</table>

* c = curriculum-based education; **ap = apprenticeship-based education; cp = competence-based education, *** regulations are recently changing rapidly in the countries

Source: investigated in 2008
industrial sector were selected from the o*net occupations Electrical Engineering Technicians (17-3023.03) and Electronics Engineering Technicians (17-3023.01); both occupations refer to Job Zone 3 and SVP range 6<7.

The proposal was validated with national experts in both sectors via e-mail and by phone. Changes to and/or eliminations of parts of the sentences were decided on for some occupational tasks. One task (electricians – industrial sector: task no. 4) was taken from the o*net occupation Computer Programmers (15-1021.00) and integrated into Research Tool 1 in a slightly adapted version. At the second international workshop, Research Tool 1 for both sectors was presented to the national coordinators and to their national experts for the rating in the first national workshop.

The final set agreed on in the group consisted of 11 tasks for the craft sector and 12 tasks for the industrial sector (research tool 1 with the original items shown in full length is provided in Annex 3.2.1 and 3.2.2; Tables 3.2.1-A1, 3.2.2-A1). The translation of the Research Tool into national languages was recommended.

The ratings in the German-speaking countries (Austria, Germany, Switzerland), were based on a common translated version.

The set of occupational tasks was rated in individual national workshops (both sectors) in all participating countries. Critical statements by workshop participants mostly referred to abstract formulations of occupational tasks, the mix of a number of aspects in one o*net task descriptor, and overlapping of tasks (national reports). In some countries this was discussed during the national workshops. However, problems of interpretation were solved in the electricians group in the final international workshops by an agreement on consistent interpretations of tasks descriptors.

**Electricians – craft sector**

Figure 3.2-1 illustrates the set of occupational tasks for the craft sector and gives an overview of the results of expert ratings for occupational tasks (mean values for expert ratings in the countries in terms of “relevance”: “How relevant is the task on average to the performance of electricians in the craft sector?”).

![Figure 3.2-1: Electricians – craft sector: occupational tasks – relevance (country means)](chart)

**Question:** "How relevant is the task on average to the performance of electricians in the craft sector?"

(1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)
Figure 3.2-1 shows that the lines follow a very uniform course and in the results of all the countries the mean values constantly lie at least within the relevant area. With exception of item 7, all the tasks were considered to be “relevant” or “extremely relevant”, none of the tasks was regarded as “not relevant”.

Item 7 was consistently evaluated as less important by all countries and none of the tasks was considered irrelevant.

Figure 3.2-2 displays the average level of the tasks’ relevance, including information on the scope of congruence or

---

**Figure 3.2-2: Electricians – craft sector: occupational tasks – relevance (mean across countries)**

![Graph showing relevance levels](image)

**Question:** “How relevant is the task on average to the performance of electricians in the craft sector?”

(1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant.)

**Figure 3.2-3: Electricians – craft sector: occupational tasks – frequency (mean across countries)**

![Graph showing frequency levels](image)

**Question:** “How often is the task performed?”

(1= several times a year; 2=several times a month; 3= several times a week; 4=daily; 5= several times a day)
diversity across countries. For the craft sector, very high levels of agreement were reported for all tasks, indicating homogeneity across all the participating countries. In particular, the tasks included in the core areas of installation technology, troubleshooting and maintenance (Chapter 3.2.4) show very high levels of concordance.

The results of the expert ratings illustrate that a comparison of occupational tasks for electricians in the craft sector is possible across countries. The Kendall’s W confirms the congruency with the value of $W=0.45$ ($p=0.000$).

The rating for task frequency (how often a task is performed) shows that all the occupational tasks, except task no. 7, are performed several times per month or more often (see Figure 3.2-3). The ratings across the countries show a high degree of concordance for all tasks; the negative rating for task 7 was confirmed in all countries. The Kendall’s W value is $0.63$ ($p=0.000$), confirming high concordance (the country means and mean absolute deviations within country means for each country are provided in Annex 3.2.1; Tables 3.2.1-A3, 3.2.1-A4, 3.2.1-A5, and 3.2.1-A6).

Additional tasks

To incorporate specific national features, additional tasks were suggested by the participants at some national workshops (national reports). All the tasks were discussed in the international electricians group during the third international workshop (January 2009, Berlin). There was agreement that it would not be possible to include all (nationally specific) entries in an additional rating process for all countries. Even though all the national experts agreed to rate the two additional tasks in a second step, a detailed description of the results cannot be given in this report because some countries’ data is missing (for national results, see national reports). Finally, the group agreed on two additional tasks likely to be of high relevance in all participating countries (Table 3.2-3):

During the final international workshop, all the national experts for electricians craft confirmed that both tasks are relevant in their countries and should be taken into consideration in future steps. The electricians group agreed, however, that the remaining additional tasks should not be included since they were either contained in the existing set, or were too dependent on specific national features.

To conclude, the occupational profile for electricians in the craft sector in all countries is mainly characterised by installation of diverse types of electrical equipment. This includes in detail, work scheduling, installation of wiring and connecting of electrical equipment (e.g. electric motors, switches, power sockets, illumination or other electrical components). Moreover, the common profile includes troubleshooting in case of malfunctions, correcting the problem and inspecting electrical equipment or systems using technical documents (e.g. wiring diagrams, schematic drawings, blueprints). All the operations are performed in accordance with applicable national regulations, standards and technical norms. Aspects of the security and safety of electric installations and equipment also play an important role in all countries.

<table>
<thead>
<tr>
<th>Table 3.2-3: Additional occupational tasks of importance for electricians – craft sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Occupational task description</strong></td>
</tr>
<tr>
<td>Implementation and testing of bus systems for building automation (e.g. EIB/KNX, centralised systems...).</td>
</tr>
<tr>
<td>Installation, testing and documentation of electrical safety measures according to standards, rules and regulations.</td>
</tr>
</tbody>
</table>
Figure 3.2-4: Electricians – industrial sector: occupational tasks – relevance (country means)

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Install / maintain electrical control systems</td>
<td>1</td>
</tr>
<tr>
<td>Assemble electrical / electronic systems and prototypes</td>
<td>2</td>
</tr>
<tr>
<td>Modify electrical prototypes, parts, assemblies, systems</td>
<td>3</td>
</tr>
<tr>
<td>Write, analyse, review, rewrite programmes</td>
<td>4</td>
</tr>
<tr>
<td>Set up, commissioning, test, operate equipment</td>
<td>5</td>
</tr>
<tr>
<td>Identify and resolve equipment malfunctions</td>
<td>6</td>
</tr>
<tr>
<td>Adjust and replace defective or improperly functioning circuitry and electr. components</td>
<td>7</td>
</tr>
<tr>
<td>Analyze and interpret test information</td>
<td>8</td>
</tr>
<tr>
<td>Provide tech. assistance / resolution when electrical / engineering problems are encountered</td>
<td>9</td>
</tr>
<tr>
<td>Read blueprints, wiring diagrams, schematic drawings, techn. manuals, engineering instructions</td>
<td>10</td>
</tr>
<tr>
<td>Prepare sketches or follow blueprints</td>
<td>11</td>
</tr>
</tbody>
</table>

Question: "How relevant is the task on average to the performance of electricians in the industry sector?" (1= not relevant; 2= somewhat relevant; 3= relevant; 4= very relevant; 5= extremely relevant)

Electricians – industrial sector

Figure 3.2-4 shows the set of occupational tasks for the industrial sector and gives an overview of the ratings in all participating countries (mean values for expert ratings in the countries in terms of “relevance”: “How relevant is the task on average to the performance of electricians in the craft sector?”).

As for the craft sector, the lines follow a uniform course (Figure 3.2-5). This shows that all tasks were considered to be relevant. The medium rating values confirm that all tasks are relevant to each particular job description. Therefore, they can be regarded as comparable in all countries. This is also the case for task 7 (rated as less important in Germany) and task 8 (rated as less important in Germany and Finland). Within the limits of the mean deviation, the participating countries appear to be very close to each other.

The results of the expert ratings confirm that the set of occupational tasks selected is important for all countries. The high degree of concordance might also result from tendencies towards technological standardisation. The Kendall’s W confirmed the congruency, with the value of W = .62 (p = .000).

As for ratings in the craft sector, task frequency generally ranges at a lower level. This is probably due to longer-lasting activities or work steps in the industrial sector. Even though the Swiss ratings consistently show frequencies below average, the ratings ranged within the limits of the mean deviation (for Finland, some ratings above average were reported). For tasks 3, 4, 5, 7, 8 and 9, less than “several times per month” was reported by several countries. Of those tasks, items 3, 5, 8, 9 are in particular at least partly related to technical redevelopment and construction and are probably less frequently performed in production processes in general. However, since they are based on broader activities, this should not have an impact on overall comparability. In a possible future VET-LSA, the impact of task frequency should be analysed systematically. The countries’ concordance is statistically significant. The Kendall’s W is .57 (p = .000; the country means and mean absolute deviations within country means for each country are provided in Annex 3.2.2; Tables 3.2.2-A3, 3.2.2-A4, 3.2.2-A5, and 3.2.2-A6).
Figure 3.2-5: Electricians – industrial sector: occupational tasks – relevance (mean across countries)

Question: "How relevant is the task on average to the performance of electricians in the industry sector?"

1 (not relevant) - 5 (extremely relevant)

Error bars indicate mean absolute deviation of country means.

Figure 3.2-6: Electricians – industrial sector: occupational tasks – frequency (mean across countries)

Question: "How often is the task performed?"

1 (several times a year) - 5 (several times a day)

Error bars indicate mean absolute deviation of country means.

Additional tasks

As for the craft sector, additional tasks were suggested by the participants at some national workshops and discussed in the international electricians group during the third international workshop. It was also agreed that it would not be possible to include all additional tasks in an additional rating process. Two additional tasks that are relevant in all the countries were selected. As in the craft sector, both tasks should be taken into consideration in future steps. Both additional tasks are shown in Table 3.2-4:

74 Even though all the national experts agreed to rate the two additional tasks in a second step, a detailed description of the results cannot be given in this international report because some countries’ data is missing (for national results see National reports).
Table 3.2-4: Additional occupational tasks of importance for electricians – industrial sector

<table>
<thead>
<tr>
<th>Occupational task description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementing, parameterising and testing of bus systems (e.g. PROFIBUS or other field bus systems; Industrial Ethernet)</td>
</tr>
<tr>
<td>Installation, testing and documentation of electrical safety measures according to standards, rules and regulations</td>
</tr>
</tbody>
</table>

In conclusion, the common occupational profile for electricians in the industrial sector mainly includes the assembling, installation and commissioning of electric and electronic control and regulation systems, other electric equipment or systems and electric components, and the programming and handling of bus technologies also plays a major role. Diagnosis of malfunctions (troubleshooting), problem solving and putting systems back into operation is certainly included in all tasks. Moreover, electricians in the industrial sector perform tasks of advising on solutions to electric problems, supported by technical documents (e.g. wiring diagrams, blueprints, and engineering instructions), in all countries. As for the craft sector, aspects of the security and safety of electric installations and equipment in accordance with national regulations, standards and norms, play an important role in all countries.

3.2.3 Comparative analysis of ratings for qualification requirements

The set of qualification requirements from o*net was agreed on in a similar procedure for both sectors. Based on the previous discussions in the electricians group, nine qualification requirements were selected for electricians craft and nine for electricians industry. Five of the nine qualification requirements were identical for both electro-technical occupations. The remaining four qualification requirements were sector-specific. The use of five identical qualification requirements does not reveal anything about their possible significance for both sectors. This will become apparent in the following.

During the discussions of qualification requirements in the electricians group, experts often criticised the level of abstraction and the fact that the requirements are formulated without specific reference to occupations. To overcome this challenge, there was an agreement with all national coordinators that parts of the selected qualification requirements would be reformulated to include occupation-specific aspects. Reformulations were developed for qualification requirements 1 to 4 for electricians craft and 1 to 5 for electricians industry. To avoid a conceptualisation that would prefer knowledge aspects over a broad concept of VET, qualification requirements were reformulated in terms of “knowledge, skills and abilities of …”. The changes were subsequently confirmed by all national experts and confirmed for the final set of qualification requirements.

Electricians – craft sector

The following diagrams (Figure 3.2-7 and 3.2-8) show the set of qualification requirements and give an overview of the results of expert ratings for qualification requirements rated in the first national workshop (mean values for expert ratings in the countries in terms of “relevance”: “How relevant is the qualification requirement on average to the performance of electricians craft?”)

Experts from all countries agreed that the core areas of building and construction (no. 1), telecommunication (no. 2), engineering and technology (no. 3), English language (no. 8) and customer and services (no. 9) are considered to be of high importance. The highest mean values were reported for building and construction. This confirms the high importance of installation technology, functional checks, troubleshooting and technical norms for all countries.

As a result, three areas can be identified as being of very high significance (all other areas show a slightly lower degree of relevance). Qualification requirements directly related to occupational aspects were rated particularly highly (1, 2, 3, 9), whereas qualification requirements relating to rather general aspects, such as mathematics, physics or English, were rated somewhat lower. However, it must be taken into consideration that the basics in mathematics and physics are highly important for the development of occupational competences. One reason for the lower ratings (e.g. Austria, Sweden) is that they not only cover the important basic knowledge, they also correspond to higher knowledge, skills and abilities. No qualification requirement was rated as irrelevant.

The comparison of ratings in participating countries shows that there is a broad common framework of required qualifications for electricians in the craft sector. Except for item 3 (engineering and technology, with high ratings in Denmark), the ratings are highly convergent. The Kendall’s W confirms the congruency of ratings in the value of \( W = .57 \) (\( p = .000 \); the country means and mean absolute deviations within country means for each country are provided in Annex 3.2.1; Tables 3.12.1A7, 3.2.1-A8).
Figure 3.2-7: Electricians – craft sector: qualification requirements – relevance (country means)

Question: “How relevant is the qualification requirement for electricians in the craft sector to perform successfully in the labour market?” (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant.)

Figure 3.2-8: Electricians – craft sector: qualification requirements – relevance (mean across countries)

Question: “How relevant is the qualification requirement for electricians in the craft sector to perform successfully in the labour market?” (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant.)
Additional qualification requirements

Some countries added further qualification requirements to include specific national features. All the additional qualification requirements were discussed in the electricians group during the third national workshops. The group agreed not to include any additional qualification requirements to the set for the same reason as for the additional occupational tasks.

To conclude, the common profile of qualification requirements for electricians in the craft sector is mainly characterised by the domain-specific aspects of building and construction, e.g. installation technologies (cable routing, usage and connection of various types of electrical equipment, bus technology), work organisation, functional checks, troubleshooting and electrical systems’ compliance with local norms, standards and regulations; telecommunications, e.g. call systems and telecommunication and telephone systems equipment; engineering and technology (e.g. direct, alternating and three-phase technology, which includes the basics of control and regulation technologies, starting and braking procedures of electric motors, or selecting adequate electric equipment in relation to the technical requirements). On the other hand, the profile is also characterised by the rather general requirements of the English language and customer and personal service (e.g., providing customer and personal services, which also includes customer needs assessment, meeting quality standards for services and the evaluation of customer satisfaction).

Electricians – industrial sector

The following diagrams (Figure 3.2-9 and 3.2-10) show the set of qualification requirements and give an overview of the results of expert ratings for qualification requirements in the first national workshop across countries (mean values for expert ratings in the countries in terms of “relevance”: “How relevant is the qualification requirement on average to the performance of electricians craft?”).

High ratings were reported for the more general qualification requirements of engineering and technology (no. 1), computers and electronics (no. 2) and English language (no. 9). In Norway, average or below average ratings ranging between the mean deviations were reported; production and processing (no. 3), physics (no. 6), mathematics (no. 7) and English language (no. 9) were rated uniformly. Except for telecommunications (no. 5) with diverging ratings from Sweden and Germany, there is widespread agreement between qualification requirements across countries.

The concordance in the ratings is also affirmed by Kendall’s W, with a high value of $W = .51$ ($p = .000$; the country means and mean absolute deviations within country means for each country are provided in Annex 3.2.1, Tables 3.12.1A7, 3.2.1-A8).

Figure 3.2-9: Electricians – industrial sector: qualification requirements – relevance (country means)

Question: “How relevant is the qualification requirement for electricians in the craft sector to perform successfully in the labour market?”

(1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)
Figure 3.2-10: Electricians – industrial sector: qualification requirements – relevance (mean across countries)

Question: “How relevant is the qualification requirement for electricians in the craft sector to perform successfully in the labour market?” (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

Additional qualification requirements

As for the craft sector, the group agreed not to include any additional qualification requirements in the validated set.

To conclude, the common profile of qualification requirements for electricians in the industry sector is mainly characterised by the domain-specific aspects of engineering and technology, e.g. knowledge, skills and abilities for applying direct, alternating and three-phase technology and hardwired programme controllers or programmable logic controllers, including drive technology involving various electric motor types, the possibilities of their control (regulate their rotational speed, starting and braking procedures of electric motors by using frequency converters or more classic control technologies) and the protection of electrical equipment (e.g. motor overload switches, line safety switches, electronic fuses), computers and electronics, e.g. electronic components like power electronics (e.g. transistors, thyristors and so on) and computer or control software, and the more general requirement of English.
3.2.4 Comparative analysis of ratings for the set of evaluation tasks

Evaluation tasks were rated to obtain first insights into whether this approach provides a sufficient basis for comparison. It was not intended to develop evaluation tasks for measuring competences of electricians in the Feasibility Study. The development of internationally valid test items will be the task of the next project phase. It was agreed that a limited number of national evaluation tasks from participating countries should be selected and subsequently rated with regard to content relevance and levels of complexity in each country. All the experts were confronted with different types of evaluation tasks depending on national preferences.

Procedure

National evaluation tasks rated during the first national workshop were used to identify core areas in each sector during the final international workshop. For the selection of evaluation tasks, the electricians group agreed on a set of core areas in both sectors. For the craft sector, seven core areas were identified:

1. Classic installation technology
2. Intelligent building automation: Bus systems (e.g. EIB, KNX, centralised systems)
3. Illumination (Calculation)
4. Drive Technology
5. Measurement technology (especially security and safety; according to guidelines)

For the industrial sector, four core areas were determined:

1. Building control equipment: Programming Logic Controller (e.g. S7 (Siemens) or others) or hardwired programme controller
2. Drive technology
3. Measurement technology (especially security and safety; according to guidelines)
4. Troubleshooting and maintenance

Table 3.2-5 gives an overview of the selected evaluation tasks and the corresponding core areas.

Table 3.2-5: International set of evaluation tasks for electricians craft (Research Tool 2)

<table>
<thead>
<tr>
<th>No</th>
<th>Core area</th>
<th>Task heading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Installation Technology</td>
<td>Installation Technology – electrical device</td>
</tr>
<tr>
<td>2</td>
<td>Installation Technology</td>
<td>Installation Technology – cross connection</td>
</tr>
<tr>
<td>3</td>
<td>Control Technology</td>
<td>Control Technology – silo</td>
</tr>
<tr>
<td>4</td>
<td>Control Technology</td>
<td>Control Technology – anti intrusion alarm</td>
</tr>
<tr>
<td>5</td>
<td>Drive Technology</td>
<td>Drive Technology – frequency converter (model x)</td>
</tr>
<tr>
<td>6</td>
<td>Control Technology</td>
<td>Control Technology – frequency converter (motor)</td>
</tr>
<tr>
<td>7</td>
<td>Drive Technology</td>
<td>Drive Technology – A3 asynchronous motor</td>
</tr>
<tr>
<td>8</td>
<td>Drive Technology</td>
<td>Drive Technology – choose a motor</td>
</tr>
<tr>
<td>9</td>
<td>Illumination</td>
<td>Illumination – calculate need</td>
</tr>
<tr>
<td>10</td>
<td>Illumination</td>
<td>Illumination – wiring fluorescent lighting</td>
</tr>
<tr>
<td>11</td>
<td>Building Automation</td>
<td>Building Automation</td>
</tr>
<tr>
<td>12</td>
<td>Measurement Technology</td>
<td>Measurement Technology</td>
</tr>
<tr>
<td>13</td>
<td>Troubleshooting</td>
<td>Troubleshooting</td>
</tr>
<tr>
<td>14</td>
<td>Installation Technology</td>
<td>Installation Technology – laundry room</td>
</tr>
</tbody>
</table>

75 In a small number of cases these were not essential parts of the national job descriptions e.g. craft sector: Renewable Energies: Photovoltaic, Circuits of Compensation; industrial sector: Ethernet Technology, Networks.

For the industrial sector, four core areas were determined:

1. Building control equipment: Programming Logic Controller (e.g. S7 (Siemens) or others) or hardwired programme controller
2. Drive technology
3. Measurement technology (especially security and safety; according to guidelines)
4. Troubleshooting and maintenance

Table 3.2-6 gives an overview of the selected evaluation tasks and the corresponding core areas.

The method of comparing evaluation tasks led in some cases to uncertainties and criticism within the electricians group. The collection of tasks was misinterpreted as preparatory work for the development of test instruments to be a substantial part of a possible future VET-LSA. It was repeatedly stressed by the expert group coordinator that the selected evaluation tasks were “only” to be used as an instrument for identifying concordance between major educational objectives of the occupations and for gaining insights into the complexity of tasks at the end of national VET programmes. Both objectives can hardly be achieved without using original tasks, e.g. by using...
The group agreed to select about ten evaluation tasks for each sector and submit them to the expert group coordinator. Countries were free to provide practically and theoretically orientated evaluation tasks. To set a limit to the translation effort, the task descriptions were not to exceed one written page in English (not counting illustrations and schematic representations, wiring diagrams etc). They were to be presented as short abstracts, including proposals for solutions.

The proposed set of tasks prepared by the international coordinator was provided to the electricians group and discussed via e-mail. An overview of all the tasks was uploaded at the VET-LSA homepage and a detailed version was sent via e-mail on request.

The pre-selection of evaluation tasks was agreed on by all the participating countries. Slight changes were based on the results of the discussions. In the craft sector, two evaluation tasks were eliminated because they did not represent major educational objectives for all national occupational profiles (craft sector: telecommunication) even though they were part of one core area. One additional task with practical aspects was added to the industrial sector (the complete set of evaluation tasks, research tool 2, with the original items shown in full is provided in Annexes 3.2.1 and 3.2.2; Tables 3.2.1-A2, 3.2.2-A2).

The final set of evaluation tasks was criticised in some national reports, mostly because of misinterpretations in national workshops. This resulted in confusion regarding the task design. Other difficulties were caused by the diversity of country-specific technical regulations and norms. Most of the criticism, however, does not impair the selected set of evaluation tasks because they do not represent suggestions for the assessment of competences for a possible future VET-LSA.

Experts from some countries provided references to their national core industries, such as the oil or the wood-working industries. Other countries considered the general level of the requirements to be too high. These diverse criticisms and discussions during national workshops give first insights into the challenges to be expected in a possible future VET-LSA, and in particular into the importance of planning and working carefully when designing test instruments.

In Norway, evaluation tasks were not rated for the craft sector in the second national workshop. However, as far as the industrial sector is concerned, the Norwegian sector (for automatisation) seems too small for a LSA project. The internal differentiation in terms of the technological profile is also a problem to be considered. Against the background of the ratings of occupational tasks and evaluation tasks, the comparability seems generally acceptable. As for the craft sector, the profile of occupational tasks and qualification requirements also seems generally comparable. Looking at the ratings of evaluation tasks by the experts in the industrial sector, it seems fairly probable that similar results can be expected for the craft sector as for the industrial sector and that the conclusion of general comparability can be drawn.

76 Some comments stated that the tasks do not comply with country-specific norms or that the technical design of electrical equipment sometimes conflicts with national security regulations.

77 National coordinator Norway.
Electricians – craft sector

The results of the expert ratings for evaluation tasks in the craft sector are shown in the following Tables 3.2.11 and 3.2.12.

The rating values for evaluation tasks show strong agreement and high concordance across the countries. For tasks 1 to 4 as well as tasks 7, 8, 10, 12, 13, the expert ratings across all the countries show a clear acceptance of the educational objectives represented by the selected evaluation tasks\(^78\). The tasks showing high levels of agreement in the rating process all relate to the core areas, except for the building automation area. This indicates that a good degree of concordance between the countries can be identified for all core areas.

![Figure 3.2-11: Electricians – craft sector: evaluation tasks – educational objectives (country means)](image)

**Figure 3.2-11: Electricians – craft sector: evaluation tasks – educational objectives (country means)**

The results show that differences can be found within one core area regarding the significance of educational objectives. Therefore, it is important to check comparability in detail. In the core area of “drive technology” for example, task 5 is rejected by Switzerland and Germany but there is a high degree of concordance for task 8, which is also part of the core area of “drive technology”. The same result occurred for the core area of “illumination technology”: task 9 is rejected by Switzerland and Sweden. However for task 10, also a representative for illumination technology, a high degree of concordance was reached between the countries. Tasks 11 and 14 are also rated very differently (see Table 3.2.12).

This shows that the entire core areas of drive technology, illumination technology and control technology were not
rejected, because some of the tasks in the same field were approved. Against this background, it can be expected that it would be possible to create adequate solutions for those areas that are only represented by one task. This might even be the case where ratings of the relevant evaluation task might be partly less positive (e.g. for building automation, which was unfortunately only covered by one task, no. 14). For a possible future VET-LSA it is recommended that additional tasks in this core area be checked. However, during the final international workshop, the national expert confirmed that it would also be possible to identify evaluation tasks in this core area if the task were described without reference to specific firms, manufacturers or enterprises (which was the reason for lower ratings in some countries).

Finally, Kendall’s W indicates significant agreement in the overall profiles of countries’ ratings, with the value W=.32 (p=.028) indicating comparability, despite the restrictions outlined above. The results for ratings of “task complexity” are shown in Figures 3.2.-12 and 3.2.-14.

The findings show that the selected evaluation tasks cover different levels of complexity. Tasks 2 to 6, 9, 10, 11 and 14 were rated comparably across countries, independently of the core areas, and different levels of task requirements were identified, reflecting different levels of complexity in all participating countries. In the core area of control technology, the level of complexity for all selected tasks (3, 4, 6) was considered to be “high” to “very high”. Diverging ratings were reported only for one task in the core area of installation technology. Thus, high levels of concordance in terms of complexity can be confirmed for the selected evaluation task in the craft sector, which is also confirmed by Kendall’s W=.79 (p=.000; the country means and mean absolute deviations within country means for each country are provided in Annexe 3.2.1:Tables 3.2.1-A9, 3.2.1-A10, 3.2.1-A11, and 3.2.1-A12).

To sum up, the profile of evaluation tasks corresponding to the core areas for the craft sector in all countries is mainly characterised by cable routing and connecting diverse electric components (e.g. electric motors and equipments, sockets, lighting, switches); using technical documents (e.g. wiring diagrams, manuals, blueprints); installation of electric circuits (e.g. cross connections, motion sensors, lighting, sockets) not only for (apartment) buildings but also for workplaces and enterprises; installation of electric machines and basic control and regulation systems using hardwired programme controllers or simple programmable logic controllers; selecting adequate technical equipment in accordance with specific technical requirements or customer inquiries (e.g. selecting an appropriate electric motor). Common objectives also exist in the core area of measurement technology (e.g. measuring the loop resistance, insulation resistance and earth electrodes, which also includes security and safety checks of electrical installations). In case of malfunctions or troubleshooting, this is covered by detecting the technical error in the installation or the electrical equipment and correcting it.

The core area of “building automation” was regarded as very relevant for the craft sector by all the national experts and should be taken into consideration in future steps.

---

79 The Swedish experts did not rate tasks Nos. 6 and 7 (Swedish report, p.36)
Figure 3.2-13: Electricians – craft sector: evaluation tasks – complexity (country means)

Question: “Indicate the level of complexity of the task!” (1= low complexity to 4=high complexity)

Figure 3.2-14: Electricians – craft sector: evaluation tasks – complexity (mean across countries)

Question: “Indicate the level of complexity of the task!” (1= low complexity to 4=high complexity)
Electricians – industrial sector

The results of expert ratings for evaluation tasks in the craft sector are shown in the following Tables 3.2-15 and 3.2-16.

Although sound agreement was reached on occupational tasks, diverging ratings were reported for evaluation tasks. These differences are (partly) due to specific normative conceptions of how evaluation tasks should be arranged or designed in the national contexts. In particular, critical results were submitted by Switzerland, whose experts considered only four tasks as generally acceptable (tasks 1, 2, 4 and 11)\(^80\).

80 Even one of the more theoretical tasks (task 5) submitted by Switzerland was not considered acceptable by Switzerland.

In the case of “control technology”, the ratings from Switzerland and Finland show that the specific task is critically evaluated and not the overall subject of control technology. It can be assumed that drive technology, measurement technology and maintenance are core subjects in this occupation in Switzerland as well. In the national reports it is emphasised that only practical tasks are adequate.

Against this background, it can be assumed that the sceptical ratings relating to measurement technology and maintenance will not be considered problematic any more in a possible future VET-LSA if practice-oriented tasks are the focus. During the final expert workshop, the Swiss expert confirmed that some of the low rating results can be explained by the task design (which was too theoretical) rather than the content. The diverging ratings for the tasks relating to measurement technology from Finland, Sweden and Germany show that this area is of high importance. However, these tasks do not fulfil all requirements.

Even though some more obvious deviations became apparent in the ratings of some countries, in general there is widespread agreement on most of the tasks.

The Finnish experts regard 6 out of 11 tasks as acceptable. They also emphasise that only the tasks they submitted meet their absolute requirements. Kendall’s W is at the limit of significance with W=.30 (p=.054; the country means and mean

### Figure 3.2-15: Electricians – industrial sector: evaluation tasks – educational objectives (country means)

<table>
<thead>
<tr>
<th>Task</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Techn. – automatic gate control</td>
<td>1</td>
</tr>
<tr>
<td>Control Techn. – flow control</td>
<td>2</td>
</tr>
<tr>
<td>Control Techn. – PROFIBUS</td>
<td>3</td>
</tr>
<tr>
<td>Control Techn. – rotation reversing connection</td>
<td>4</td>
</tr>
<tr>
<td>Control Techn. – electric drive</td>
<td>5</td>
</tr>
<tr>
<td>Drive Technology</td>
<td>6</td>
</tr>
<tr>
<td>Control Techn. – frequency converter for motor</td>
<td>7</td>
</tr>
<tr>
<td>Measurement Techn. – measurement method</td>
<td>8</td>
</tr>
<tr>
<td>Measurement Techn. – ultrasonic sensor</td>
<td>9</td>
</tr>
<tr>
<td>Maintenance</td>
<td>10</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>11</td>
</tr>
</tbody>
</table>

Question: “The task represents major educational objectives at the end of VET programmes electrician industry” (1= strongly disagree; 2= disagree; 3= agree; 4= strongly agree)
absolute deviations within country means for each country are provided in Annex 3.2.; Tables 3.2.2-A9, 3.2.2-A10, 3.2.2-A11, and 3.2.1-A12).

As in the craft sector, task complexity was rated comparably across countries, in particular for tasks 2, 4, 6, 7 and 8. It is mainly the Swedish ratings that show large deviations: tasks 3, 5, 9 and 10 were regarded as very complex. In the core area of control technology, the level of complexity for two selected tasks was rated highly by Sweden whereas the remaining tasks in the core area were rated comparably across countries. As for the tasks in the craft sector, the selected tasks for the industry sector cover different levels of complexity, with a focus on tasks at a medium level. A high concordance of levels of complexity is confirmed by Kendall’s W with a value of W=.66 (p=.000).

Some countries reported additional educational objectives for the industrial sector which mainly refer to mechanical tasks; tasks of process visualisation, programming (beyond programmable logic controllers), parametrisation, process automation/regulation technology, commissioning, using test and diagnosis software; and different levels of automated systems (steering and field level auditing) and A/D – D/A converting. During the final international workshop the electricians group recommended checking these educational objectives in future steps of analysis.

To sum up, the profile of evaluation tasks corresponding to the core areas for the industrial sector is mainly characterised by control and regulation technologies (e.g. modification of control and regulation systems, circuits of rotation reversing), connecting and parametrising frequency converters, measurement technology and troubleshooting: measuring (physical) characteristics with active and passive electrical sensors (e.g. temperature, size, detecting positions of work pieces or moving machine parts, rotation frequency, speed, charging level), which also includes security and safety checks of electrical installations (in case of malfunction or troubleshooting, this is covered by detecting the technical error in the installation or the electrical equipment and correcting it).

81 Included in additional occupational tasks for the industrial sector.

82 Despite the deviations between countries, this area was regarded as relevant for all VET programmes during the final international workshop, the deviation was explained by specific technologies or manufactures, which are not commonly used in some countries.
Figure 3.2-17: Electricians – industrial sector: evaluation tasks – complexity (country means)

Question: "Indicate the level of complexity of the task!" (1=low complexity to 4=high complexity)

Figure 3.2-18: Electricians – industrial sector: evaluation tasks – complexity (mean across countries)

Question: "Indicate the level of complexity of the task!" (1=low complexity to 4=high complexity)
3.2.5 Summary

Based on an analysis of VET programmes, occupational tasks, qualification requirements and evaluation tasks, the possibility of an international comparison of VET for electricians in the craft sector and in the industrial sector was examined. In the following, the major findings of the different approaches will be reviewed for each sector. Finally, the report will provide a recommendation as to the eligibility of electricians in the craft sector and in the industrial sector for VET-LSA.

Electricians – craft sector

The formal descriptions of national VET programmes for electricians in the craft sector show high levels of concordance. A minimum of 400 graduates was confirmed for all countries, all programmes are classified at ISCED levels 3 (3A, 3B, 3C), and have a duration of 3 to 4.5 years. Completed compulsory school education is the minimum requirement for entering VET and possibilities for accessing continuing education after completion are provided at different levels. The proportion of school-based and work-based training varies: in countries with dual systems training is predominantly workplace oriented, whereas in countries with school-based systems training is mostly school-based.

Occupational tasks

The results for the ratings of occupational tasks show widespread agreement across the countries. Most of the tasks were rated as relevant; only one task was considered less important across the countries. Two additional tasks were regarded as being of high importance by the electricians expert group. It is recommended that these tasks be checked in detail in future steps. Taking into consideration the fact that some tasks are performed several times a month, expert ratings for task frequency match very well; only one task does not fulfill this criterion.

The occupational profile for electricians in the craft sector in all countries is mainly characterised by the installation of diverse types of electrical equipment. This includes work scheduling, installation of wiring and connecting of electrical equipment (e.g. electric motors, switches, power sockets, illumination or other electrical components). Moreover, the common profile includes troubleshooting in case of malfunctions, correcting the problem and inspecting electrical equipment or systems using technical documents (e.g. wiring diagrams, schematic drawings, blueprints). All the operations are performed in accordance with applicable national regulations, standards and technical norms. Aspects such as the security and safety of electric installations and equipment also play an important role in all countries.

Evaluation tasks

The rating of the evaluation tasks was intended to provide a firm reference for checking the comparability of the occupations, especially since the o*net tasks and qualification requirements were often criticised as being too abstract. Unfortunately, this approach seems to have led to confusion among some of the expert groups, who thought that the evaluation tasks were to be taken as potential instruments for measuring vocational competences in a possible future VET-LSA. The offset of evaluation tasks is neither intended nor suitable for this purpose; a different procedure will be required for the development of test items in a possible future VET-LSA.

The ratings of the evaluation tasks in the craft sector showed high levels of concordance in the results for the core areas of installation technology, drive technology, illumination technology, control technology (basics), measurement technology and troubleshooting. There was no concordance in the core area of building automation, which was only represented by one evaluation task.

The findings show a satisfactory concordance of ratings for all countries (except Norway). However, it is possible that these
educational objectives would also be relevant for Norway if the evaluation tasks were changed in the format to emphasise more practical or project-oriented tasks.

The following seven core areas, representing relevant educational objectives in all national VET programmes, should be taken into consideration for subsequent steps in the next project phase:

1. Classic installation technology
2. Intelligent building automation: Bus systems (e.g. EIB, KNX, centralised systems)
3. Illumination (Calculation)
4. Drive technology
5. Measurement technology (especially security and safety; according to guidelines)
6. Building control equipment (basics): Programming Logic Controller (e.g. S7 (Siemens) or others) or hardwired programme controller
7. Service and maintenance

Electricians – industrial sector

As for the craft sector, formal aspects of the selected VET programmes show high concordance and there is no doubt about an international comparison.

Occupational tasks

The congruence of the ratings of occupational tasks for the industrial sector can be evaluated as good. Most of the tasks were regarded as relevant for all countries; only two tasks were rated as less important. Two additional tasks were considered as being of major importance by the electricians group and should be analysed in future steps. There was also high agreement in terms of task frequency (taking into consideration that some of the tasks are performed several times a month). Compared to the craft sector, all the tasks seem to be performed less frequently, which might be due to the extended duration of activities in this field. Due to the fact that they are based on broader activities, this should not have an impact on overall comparability. However, in a possible future VET-LSA, the impact of task frequency should be analysed systematically. In summary, high levels of concordance of ratings for task relevance and frequency can be reported for electricians in the industrial sector.

The common occupational profile for electricians in the industrial sector mainly includes assembling, installing and commissioning electric and electronic control and regulation systems, other electric equipment or systems and electric components, and the programming and handling of bus technologies also plays a major role. Diagnosis of malfunctions (troubleshooting), problem solving and putting systems back into operation are also certainly included in all tasks. Moreover, electricians in the industrial sector perform tasks of advising on solutions to electric problems, supported by technical documents (e.g. wiring diagrams, blueprints, and engineering instructions) in all countries. As for the craft sector, aspects of the security and safety of electric installations and equipment in accordance with national regulations, standards and norms play an important role in all countries.

Qualification requirements

Three areas of major importance for all countries were identified: engineering and technology, computers and electronics, and the English language; all the other requirements were regarded as less relevant.

The common profile of qualification requirements for electricians in the industry sector is mainly characterised by the domain-specific aspects of engineering and technology, e.g. knowledge, skills and abilities for applying direct, alternating and three-phase technology and hardwired programme controller or programmable logic controller into account, including drive technology concerning the various electric motor types, the possibilities of their control (regulating their rotational speed, starting and braking procedures of electric motors by using e.g. frequency converter or more classic control technologies) and the protection of electrical equipment (e.g. motor overload switches, line safety switches, electronic fuses), computers and electronics, e.g. electronic components like power electronics, electronic components (e.g. transistors, thyristors and so on) and computer or control software, and the more general requirements of the English language.

Evaluation tasks

The ratings of the evaluation tasks confirm that there is a good basis for a comparative study. The slightly more critical view of Switzerland indicates that it is important to consider the inclusion of practice-oriented tasks in future steps. The differences that appeared in the ratings of tasks in one and the same area (e.g. measurement technology) not only reveal the significance of these areas, but also indicate that the selected tasks do not yet fulfil all requirements.

Based on the ratings for evaluation tasks, a comparison can be confirmed for Sweden, Slovenia, Norway and Germany. Large areas of concordance can be also confirmed for Finland. For the lower-rated areas, it should be checked whether a modification of the task format could result in a higher level of consensus in the same core area. Against the background of the discussions in the international electricians group during the final inter-
national workshop, this seems very likely. It can similarly be assumed for Switzerland that the disagreement mainly derives from specific ideas related to the configuration of the tasks. It seems very likely that a modification towards more practice-orientated tasks would result in more consensual ratings.

The following four core areas representing relevant educational objectives in all national VET programmes should be taken into consideration for subsequent steps in the next project phase:

1. Building control equipment: Programming Logic Controller (e.g. S7 (Siemens) or others) or hardwired programme controller
2. Drive technology
3. Measurement technology (especially security and safety; according to guidelines)
4. Troubleshooting and maintenance

**Recommendation to the international steering group: electricians – both sectors:**

Against the background of the results presented above, comparability for both occupations can be confirmed. We recommend including both occupations in a possible VET-LSA. This would also take into account the fact that students in both sectors are likely to have clearly different cognitive preconditions. This would provide additional possibilities for statements about different levels of the same occupational field. Moreover, the inclusion of both occupations would also allow for the participation of the whole group of countries.

According to the expert discussions in the workshops and the problems related to the ratings of evaluation tasks, it can be expected that the development of test items in a possible future VET-LSA, will be time-consuming. In particular, differences related to normative main ideas and the focus of competence tests could lead to problems. Therefore it is very important to provide sufficient resources for the test development, also in order to guarantee the adequate quality of the test procedures.
3.3 Business and administration  
(Klaus Breuer / Stefanie Hillen / Esther Winther)

The following chapter presents the baseline of an international comparison in VET, which resulted from protracted joint negotiations on (a) the selection of national programmes, (b) an assortment of occupational tasks, (c) qualification requirements as well as (d) representative evaluation tasks in the field of business and administration. In presenting these, the national results will be compared to provide agreement on conditions of comparison and to prepare a decision on whether an international comparison particular in the field of business and administration is possible. The comparative analysis is based on national reports from Austria, Denmark, Finland, Germany, Slovenia and Switzerland. Sweden decided not to take part in the Feasibility Study because the selected national levels do not correspond with the Swedish educational system. The chosen ISCO 08 work activity for Sweden was the Swedish educational system. The choice ISCO 08 category 33 corresponds with the skills taught in post-secondary education in Sweden, not in upper secondary school-education at the initial level. Norway did not take part in business and administration because the number of students there is too small.

3.3.1 Specific features of national VET programmes for business and administration

The work activities and occupational tasks in the field of business and administration are widespread. Therefore, one of the biggest challenges for each country was the selection of vocational training programmes. The ISCED level contributed to a selection of VET programmes as an orientation. Most countries focused on one or two VET programmes. An exception was Switzerland, which selected a total of four programmes, whereas the vocational training programmes (a, b) can be alternatively undertaken full time at school (c, d). Almost all the training programmes are located at level 3B, with the Finnish program at ISCED 3A, and the Danish vocational programme at level 3C.

The vocational programmes shown in Table 3.3-1 consist mostly of a combination of training on the job or practical training, and training in school. The ratio between different training periods differs from 80% to 17% on work-based training and from 100% to 30% on school-based training. The full time school programme in Switzerland explains their 100% ratio. The timeframes of the training programmes range from three to four years of vocational training, so in this respect they are very comparable. In all participating countries, the educational prerequisite for participation in training programmes in the field of business and administration is the completion of compulsory school education.

3.3.2 Comparative analysis of ratings for occupational tasks

The occupational tasks were selected in different and sequential steps. The very first approach was the use of o*net. In the research context of the Feasibility Study, it was used as an orientation grid to determine what kind of jobs in a first step, and what kind of occupational tasks, as a second step, can be found in the occupational field of business and administration in all countries. Therefore, the specified job zones must be adhered to – all selected jobs are assigned to job zone 3 (for medium preparation) or 4 (for considerable preparation). The SVP range (duration of specific vocational training) was also used as an orientation (specified in Chapter 1.5.1). The jobs shown in Table 3.3.-2 were pre-selected relative to these criteria:

The formal requirements for each of the selected jobs are comparable: most of the jobs refer to job zone 3 and 4; the SVP range from 6.0 to < 8.0. The selection of occupations based on comparable job characteristics is important in illustrating the diversity of the business and administration area and the different facets of the occupational integration of merchants and economists into the labour market.

The selection of occupational tasks as a cross intersection of the tasks was related to all the jobs mentioned above. Therefore, the o*net-database was used as a common reference system. The final decision as to what kind of occupational tasks (see research tool, Table 3.3-A1) should be included in the Research Tool 1 was taken as a follow up to the second international workshop (Berlin, October 2008) in agreement with the business and administration group.

Finally, the business and administration group agreed on nine occupational tasks representing the field (research tool 1 with the original items shown in full length is provided in Annex 3.3; Table 3.3-A1). The tasks are based on the typical activities of employees, such as dealing with sales records, financial statements and invoices, as well as organising customers’

83 Formerly classified in ISCO88: 34 other associate professionals. Description in ISCO 88: (34 Other associate professionals). Definition: Other associate professionals perform (technical) tasks connected with the practical application of knowledge relating to finance and sales, business enterprise administration, bookkeeping, legal, statistical and other services, government activities relating to customs, travel, tax, welfare, job placement, licensing, the police force, as well as with social work, entertainment, sport and religion.[ILO, 1990, p.III].
84 The national expert for Sweden contributed to the discussions in the business and administration expert groups in all international workshops.
85 Classification based on expert agreement, since there is no official ISCED classification in Denmark.
86 http://online.onetcenter.org/help/online/svp
87 There are two exceptions in the selection: Secretaries and Office Clerks are ranked in job zone 2.
88 See as an example in o*net of job tasks of Wholesale and Retail Buyers, Except Farm Products http://online.onetcenter.org/link/summary/13-1022.00
<table>
<thead>
<tr>
<th>Title of VET programme</th>
<th>Austria</th>
<th>Denmark</th>
<th>Finland</th>
<th>Germany</th>
<th>Slovenia</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Bürokaufmann/-frau</td>
<td>C 3B</td>
<td>Clerical Assistant Administration</td>
<td>Business Administration: Customer Services and Marketing, Business Administration</td>
<td>Industriekaufmann/-frau</td>
<td>Economic Clerk (Ekonomski tehnik)</td>
<td>Kaufmann / Kauffrau EFZ: two profiles B (basic) and E (extended)</td>
</tr>
<tr>
<td>b) Industriekaufmann/-frau</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business and Administration: Customer Services and Marketing, Business Administration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industriekaufmann/-frau</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic Clerk (Ekonomski tehnik)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kaufmann / Kauffrau EFZ: two profiles B (basic) and E (extended)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total duration (years)</th>
<th>3 years</th>
<th>4 years</th>
<th>3 years</th>
<th>3 years</th>
<th>4 years</th>
<th>3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>In 2007:</td>
<td>a) Bürokaufmann/-frau: 3,518</td>
<td></td>
<td></td>
<td></td>
<td>no numbers available yet</td>
<td></td>
</tr>
<tr>
<td>b) Industriekaufmann/-frau: 264</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(appr. 3,471 students in 2011)</td>
<td></td>
</tr>
<tr>
<td>(Handelschule: 3,347) (Fachschule für wirtschaftliche Berufe: 2,166)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,098 in 2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,337 in 2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17,952 in 2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11,090 in 2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ISCED level</th>
<th>3B</th>
<th>3C**</th>
<th>3A</th>
<th>3B</th>
<th>3B</th>
<th>3B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry requirements</td>
<td>completed compulsory education</td>
<td>completed compulsory education</td>
<td>basic (compulsory) school certificate; no entry requirements for cp* and ap*</td>
<td>completed compulsory education</td>
<td>successfully completed compulsory education (9 years) or completed short-cycle vocational education (2 years after basic education)</td>
<td>completed compulsory education</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Access to next level of education/training**</td>
<td>Meisterprüfung</td>
<td>Berufsreifeprüfung</td>
<td>ISCED 4</td>
<td>general eligibility for higher education in polytechnics and universities</td>
<td>depending on specific regulations of the Länder access to universities of applied sciences and universities</td>
<td>higher vocational education (VI), higher professional education (VI), higher academic education (V3)</td>
</tr>
<tr>
<td></td>
<td>Studienberechtigungsprüfung</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>higher vocational education (Berufs- und höhere Fachprüfungen, und höhere Fachschulen); with Berufsmaturität access to universities of applied sciences.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organisation/learning arrangements:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>work-based learning %</td>
<td>a) &amp; b): w: 80%; s: 20%</td>
<td>c) &amp; d): 100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>school-based learning %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>alternating programme/periods of training</td>
<td>Apprenticeship training; school</td>
<td>Basic part: 38 weeks vocational school main part; alternation of school-based education and practical training in companies</td>
<td>Apprenticeship-based and competence-based education can alternate or consist of longer periods of training in school and in the workplace</td>
<td>Dual system: training alternates in both vocational school and in the workplace</td>
<td>Full-time school programme with 4 weeks’ practical training in the workplace</td>
<td>Dual system: training alternates in both vocational school and in the workplace</td>
</tr>
<tr>
<td></td>
<td>and work alternate; longer periods or seasonally</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>curriculum-based education; ap = apprenticeship-based education; cp = competence-based education, ** expert agreement no official ISCED classification, *** recently, regulations have changed rapidly in the countries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Source: investigated in 2008</td>
</tr>
</tbody>
</table>
and suppliers’ inquiries. The tasks were rated during the first national workshop in all participating countries.

The ratings (Figure 3.3.1) relating to the question of how relevant a particular task is differ more across the tasks than between the countries. There is only one task (task 4: set up cost monitoring and reporting systems) that is consequently dropped from the list by two of the countries (Austria and Switzerland). For that task, the mean of country means is smaller than the theoretical mean of the scale (3.00) and the mean absolute deviation of country means from the mean of means is critically high (see Figure 3.3.2).

The discussion in the business and administration expert group during the final international workshop showed that “set up cost monitoring and reporting systems/ procedures” (item 4) was considered to be a task for senior accountants at a higher level than skilled workers, which explains the low ratings. The same applies to tasks 7 and 8. For tasks 7 and 8, the ratings between countries reveal a mismatch between the countries as well. For task 8 (“supervising”) the ratings of the Finnish experts are different from the ratings of other countries, whereas the bias in task 7 (“laws and regulations”) is based on the strong agreement of Switzerland. Regarding “laws and regulations” (item 7) in particular, the divergence is based on the specific features in the national VET programmes. In addition, it can be assumed that occupational tasks that are related to the laws and regulations of the different countries would not necessarily be suitable for an international comparison.

Figure 3.3.2 reveals a concordance in the international ratings of the relevance of occupational tasks in the field of business and administration. Most of the selected occupational tasks are relatively positively ranked and the variability in the ratings is pretty low. The highest-ranked item is item 3 (“respond to customers / suppliers inquiries”). Therefore responding to customers and suppliers inquiries is an occupational task that is relevant for all participating countries. Those kinds of occupational tasks deal with customer and supplier support

Table 3.3.2: Selected occupations based on the o*net database

<table>
<thead>
<tr>
<th>Code</th>
<th>Occupation</th>
<th>Job zone</th>
<th>SVP range</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-1022.00</td>
<td>Wholesale and Retail Buyers, Except Farm Products</td>
<td>3</td>
<td>6.0 to &lt; 7.0</td>
</tr>
<tr>
<td>13-1023.00</td>
<td>Purchasing Agents, Except Wholesale, Retail, and Farm Products</td>
<td>3</td>
<td>6.0 to &lt; 7.0</td>
</tr>
<tr>
<td>13-1051.00</td>
<td>Cost Estimator</td>
<td>4</td>
<td>7.0 to &lt; 8.0</td>
</tr>
<tr>
<td>13-1081.00</td>
<td>Logisticians</td>
<td>4</td>
<td>7.0 to &lt; 8.0</td>
</tr>
<tr>
<td>41-3031.01</td>
<td>Sales Agents, Securities and Commodities</td>
<td>4</td>
<td>7.0 to &lt; 8.0</td>
</tr>
<tr>
<td>43-3061.00</td>
<td>Procurement Clerks</td>
<td>3</td>
<td>6.0 to &lt; 7.0</td>
</tr>
<tr>
<td>43-9111.00</td>
<td>Statistical Assistants</td>
<td>3</td>
<td>6.0 to &lt; 7.0</td>
</tr>
<tr>
<td>43-6011.00</td>
<td>Executive Secretaries and Administrative Assistants</td>
<td>3</td>
<td>6.0 to &lt; 7.0</td>
</tr>
<tr>
<td>43-6014.00</td>
<td>Secretaries, Except Legal, Medical, and Executive</td>
<td>2</td>
<td>4.0 to &lt; 6.0</td>
</tr>
<tr>
<td>41-1012.00</td>
<td>First – Line Supervisors/ Managers of Non – Retail Sales Workers</td>
<td>4</td>
<td>7.0 to &lt; 8.0</td>
</tr>
<tr>
<td>43-1011.00</td>
<td>First – Line Supervisors/ Managers of Office and Administrative Support Workers</td>
<td>3</td>
<td>6.0 to &lt; 7.0</td>
</tr>
<tr>
<td>43-9061.00</td>
<td>Office Clerks, General</td>
<td>2</td>
<td>4.0 to &lt; 6.0</td>
</tr>
</tbody>
</table>

Source: investigated in 2008

89 The mean absolute deviation of means of Item 8 is 0.9.

90 The mean absolute deviation of means of Item 3 is 0.3.
Figure 3.3.-1: Business and administration: occupational tasks – relevance (country means)

- Analyse / monitor sales records, trends and economic conditions
- Research / evaluate suppliers
- Respond to customer / supplier inquiries about order status, changes, cancellations
- Set up cost monitoring and reporting systems / procedures
- Review files, records, other documents to obtain information to respond to requests
- Prepare invoices, reports, memos, letters, financial statements, other documents
- Monitor and follow applicable laws and regulations
- Supervise the work of office, administrative, or customer service employees
- Collaborate with other departments as necessary

Question: “How relevant is the task on average to the performance of jobs in the field of business and administration?”
(1= not relevant; 2= somewhat relevant; 3= relevant; 4= very relevant; 5= extremely relevant)

Figure 3.3.-2: Business and administration: occupational tasks – relevance (mean across countries)

Question: “How relevant is the task on average to the performance of jobs in the field of business and administration?”
(1= not relevant; 2= somewhat relevant; 3= relevant; 4= very relevant; 5= extremely relevant)
CHAPTER 3 – COMPARATIVE INTERNATIONAL ANALYSIS

in detail. The field of business and administration defines itself mainly in terms of service orientation and service delivery. This interpretation can be validated with respect to item 6 ("prepare invoices, reports, financial statements, and other documents"). Preparing documents relevant for specific processes of goods and services is also a common occupational task across the countries. It is recommended that the focus of an international comparison be put particularly on occupational tasks that deal with aspects of rendering a service in different ways and are based on different work processes.

To summarise, the results of the expert ratings show that the comparison of occupational tasks is possible and that the judgement of experts across countries is relatively uniform. To provide a clearer picture, the Kendall’s W test is used to indicate the extent to which this concordance has taken place. The trends described above can be confirmed with the Kendall’s W test because a high ratio implies agreement between judges. The countries’ concordance in rating is statistically significant. The Kendall’s W is 0.63 (p = .000).

In addition to the tasks’ relevance, the experts had to rank the frequency of the performance of a task in the first national workshop. The hypothesis is that the frequency of the tasks at the end of the training can capture relevant working procedures and aspects of a job characterisation.

The ratings presented in Figure 3.3.-3 show the occupational task frequency (how often an occupational task is performed). That a task is performed more or less often is not an indicator of its importance or a positive or negative criterion. This rating will exactly explain whether the participating countries have the same judgment on ‘how often an occupational task is performed in jobs in the field of business and administration’ in their countries.

Items 2 ("research/ evaluate suppliers") and 6 ("prepare invoices, reports, financial statements, and other documents") are rated as very comparable. The widest deviation in this rating is related to item 4 ("set up cost monitoring and reporting systems/procedures"). The Kendall’s W value is 0.751 (p = .002), that is, the concordance in rating is high.

In conclusion, it can be stated that the results of task frequency ratings across countries correspond approximately to activities in the workplace. Task 6 ("prepare invoices, reports, financial statements, and other documents") for example, refers to the day-to-day work process of ensuring the execution of order processing by reviewing all the relevant files so as to obtain information to respond to requests. The same is true for task 3; task 3 is dealing with customers and supplier care, including routine procedures such as modifications and changes of deliveries. In contrast, task 1 and task 2 are related to activities that are rather periodical activities, such as sales analysis and trends research (task 1) or operational activities with respect to changes to production processes and to goods and services (task 2). The selection and evaluation of suppliers, for example, is one of those kinds of operational activities (the country means and mean absolute deviations within country means for each country are provided in Annexe 3.3; Tables 3.3-A3, 3.3-A4, 3.3-A5, and 3.3-A6).
During the third international workshop (Berlin, January 09) the international expert group discussed the results of the first national workshop. Some of the main comments from the different country representatives included, “some of the tasks cover several operations of different relevance, which caused difficulties for the assessment by the experts”; “too many tasks in one item. E.g. [...] it’s a different thing preparing invoices and financial statements”; and “some of the categories are rather broad”. Therefore, the international expert group suggested reformulating one item and adding two additional items from o*net for subsequent steps in a possible future VET-LSA. Task 6 was reformulated as follows: “prepare invoices, reports, memos, letters, financial statements and other documents, using word processing, spreadsheet, database, or presentation software (43-6011.00 – Executive Secretaries and Administrative Assistants). Enter data into computers for use in analyses and reports (43-9111.00 – Statistical Assistants)”. The reformulation focuses on the methods of processing goods and services as well as on the occupational equipment necessary for fulfilling the tasks. With respect to aspects of accounting and controlling, two additional tasks were added: “Collect, count, and disburse money, do basic bookkeeping, and complete banking transactions (43-9061.00 - Office Clerks, General)”. These are focused on accounting principles, whereas “Understanding and use of cost monitoring and reporting systems and procedures” is based on controlling concepts and conventions.

Moreover, the possibility of adding extra tasks to specify the national characteristics was taken up in some national workshops. The following additional items were suggested:

- “Accomplish calculations” (Austria)
- “Sales and Marketing” (Finland)
- “Communication and the ability to write reports” (Denmark).

All participants in the business and administration expert group confirmed the relevance of the additional tasks for their countries during the group discussion in the final international workshop92. The additional tasks should be taken into consideration in subsequent steps of framework development in business and administration.

To sum up, the occupational profile in all countries is mainly characterised by service orientation and service delivery as the baseline for tasks related to the support of goods and services. Therefore, employees in the field of business and administration have to be multi-skilled. Those kinds of occupational tasks that focus on the interrelation between employees and customers/providers in order to illustrate internal work processes are particularly recommended for an international comparison.

### 3.3.3 Comparative analysis of ratings for qualification requirements

The procedure of coming to an agreement on the qualification requirements was similar to the one for the selection of occupational tasks. The o*net database was again used as an orientation grid. 13 qualification requirements were selected for the field of business and administration. The range varies from strictly occupational requirements necessary for merchants’ and economists’ job performance such as clerical qualifications (item 1) and qualifications in the field of economics and accounting (item 3) through to generic requirements necessary in life, such as mathematics (item 12), English (item 10) and computer literacy (item 11). The list of qualification requirements is completed by qualifications that correspond to different company areas, ranging from administration and management (item 2) and sales and marketing (item 9), through to operational functions such as production and processing (item 4), as well as customer and personal services (item 5).

The ratings of educational requirements less obviously demonstrate agreement on the relevance of the selected qualification requirements. The Kendall’s W confirmed the congruency in the ratings with the value of W = 0.59 (p = .000). The ratings of Switzerland are especially worth mentioning. The Swiss rankings are statistically anomalous for four qualification requirements: requirements 5 (customer and personal service) and 6 (sales and marketing) are ranked as less relevant, whereas requirements 8 (law and government) and 11 (computers and electronics) are ranked as more relevant, compared to the rankings of other participating countries. During the final international workshop, Switzerland emphasised that the differences refer more to translation differences than to content.

In addition to the Swiss ratings, the ratings of Slovenia diverge the most compared to those of other countries.93 Qualification requirement 9 (education and training) is rated as not relevant (except in the Slovenian rankings). During the final international workshop, Slovenia pointed out that “education and training” was associated more with lifelong learning than instruction than was the case in the other countries.

The most noticeable item is item 6 (“sales and marketing”; absolute mean deviation 0.8). One assumption behind this rating might be that the participating countries stress it distinctly in their educational requirements because of the variety of training programmes. However, during the final international workshop it became obvious that “sales and marketing” does not play a very major role in the Austrian and the Danish VET programmes.

---

92 Further details of the discussion in the expert groups are provided in the Annex (1.6-A3).

93 Correlations: country and mean of all other countries is for Slovenia (0.35) and Switzerland (0.49).
In conclusion, there are at least three qualification requirements that are highly relevant for all participating countries (see Figure 3.3.-5): (1) clerical qualifications, (2) English, and (3) customer and personal service. That result can be interpreted as the baseline for qualifications in the field of business and administration, combining occupation-specific, generic and operational process-related requirements. Whereas clerical qualifications refer to overall occupational job performance, qualification requirements in the field of customer and personal service are related to particular operational functions. The domain of generic qualification requirements is occupied by the English language. Therefore, the result confirms the complexity of occupational activities and the theoretical assumption of different vocational competencies. The business and administration group discussions during the final international workshop revealed that more qualification requirements should be relevant for all participating countries (the country means and mean absolute deviations within country means for each country are provided in Annexe 3.3; Tables 3.3-A7, 3.3-A8).

One remarkable result from the discussions at the third international workshop (Berlin January 09), was the agreement on an additional item. As can be seen below, different countries suggested adding the item ‘communication’.

This led to the formulation of the following additional qualification requirement:

“Communication aspect – internally and externally related to customers and business by using technological communication tools. Attend company meetings and coordinate work activities with other departments. Collaborate with other departments to solve business-related problems, coordinate tasks, meet customer requirements, and take advantage of sales opportunities or, in the case of shortages, to minimise negative impact on business.”

Since communication was considered as being of major importance, it should be taken into consideration in the next project phase for further specifications of the field.
Figure 3.3.-5: Business and administration: qualification requirements – relevance (mean across countries)

Question: “How relevant is the qualification requirement for jobs in the field of business and administration to perform successfully in the labour market?” (1= not relevant; 2= somewhat relevant; 3= relevant; 4= very relevant; 5= extremely relevant)

(Error bars indicate mean absolute deviation of country means)

Table 3.3.-3: Suggestions for additional qualification requirement “communication”

<table>
<thead>
<tr>
<th>Proposal</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication: ability to communicate target-orientated with adequate communication technology</td>
<td>Austria</td>
</tr>
<tr>
<td>Communication with the client (Kommunikation zum Kunden, D)</td>
<td>Germany</td>
</tr>
<tr>
<td>Communication with and consulting of customers (Kunden umfassend beraten und Dienstleistungen vermitteln, Kunden-gespräche führen (CH)</td>
<td>Switzerland</td>
</tr>
</tbody>
</table>
3.3.4 Comparative analysis of ratings for the set of evaluation tasks

The occupational fields of business and administration and their corresponding apprenticeship or training programmes have a huge diversity. At initial international meetings, no agreement on the core content areas could be reached. In almost all other professional fields a definition, classification or demarcation of the core content areas was made in advance. Therefore, it was a challenge for the expert group to find a procedure for reaching agreement on the selection of core content areas to which the evaluation tasks should be related. In a way, the selection procedure was turned upside down.

In the third international workshop (Berlin, January 09), an alternative solution was suggested, involving the choice of criteria for the pre-selection of the final set of evaluation tasks for rating in the second national workshop.

The participating countries agreed that the pre-selected national evaluation tasks should contain three main criteria:

(a) a complete business process,
(b) evaluation tasks should be related to previously agreed occupational tasks in the Research Tool, and
(c) representativeness of the assessment task94.

Assumption (a) is the determining factor for describing evaluation tasks in the field of business and administration. ‘Complete business process’ means an integrated view of the ways in which materials, facilities and staff are used to deliver

![Figure 3.3.-6: Business and administration: evaluation tasks – educational objectives (country means)](image)

94 The criterion of ‘representativeness’ was added because it has been shown that in some of the participating countries evaluation tasks do not exist on a national or on a country level.
services. That is, descriptions of business processes combine function-oriented and process-oriented tasks.

Each country made the very first pre-selection of evaluation tasks. This decision was based mainly on their first national workshop, when the ratings of the national tasks were conducted (see national reports). A clustering was then conducted by the expert coordinator to identify overlapping core content areas and was submitted to the international expert group for agreement. Finally, 14 evaluation tasks were agreed on (see Figure 3.3-6; the complete set of evaluation tasks, research tool 2, with the original items shown in full length, are provided in the final publication in Annexe 3.3, Table 3.3-A2).

The results and their interpretations are ambiguous. At first glance, there are more divergences across the countries than across the evaluation tasks. In some respects these results are a reflection of some diversity among the occupational tasks and national conceptions of core content areas. How do we define the main ideas, most relevant activities, and in the following, which major educational objectives will be most relevant to a valid assessment in the field?

The findings from the ratings in the second national workshop show that at least four selected tasks show an acceptable level of coherence: evaluation tasks 9, 10, 13, and 14. The first three evaluation tasks with high agreement in the rating process (9, 10, and 13) refer to the conceptual idea of complete business processes as a determining factor for assessments in the field. Task 14 stresses the importance of generic qualifications. Therefore, those findings correspond strongly with the selected occupational tasks above. Comparing the other tasks across the countries, it can be shown that the rankings of one or at most two countries will usually be statistically anomalous. The countries agreed that assessment task 2, for example, represents relevant educational objectives (except for Denmark). In consequence, the mean absolute deviation of country means for that evaluation task is in comparison high.

In conclusion, the comparative analysis of evaluation tasks of educational objectives shows more diversity in the results than all other previous ratings (Kendall’s-W is 0.204; p = .255). Specifically, the ratings of Denmark and Austria on the one hand show larger deviations than do those of all the other countries. This was explained by the inclusion of 5 out of 14 tasks with a focus on sales during the discussions in the business and administration group in the final international workshop. On the other hand, the evaluation tasks fit in with the educational objectives of Finland, Germany, Slovenia and Switzerland for most of the tasks in an acceptable way. This was explained by the fact that the selected programmes in those countries are based on a broad approach, whereas in Denmark and Finland the programmes are highly specialised (the Austrian programme is less sales oriented). But the picture provided by the ratings is no less clear; there is no single item among the educational objectives that is rated as not relevant. Based on these results, two developments are necessary for the field of business and administration: (1) the issue of where the differences come from must be examined in detail, and (2) those tasks that represent educational objectives in accordance with the countries have to be expanded. This means that an analysis of their coverage and their representativeness is required.

Figure 3.3.-7: Business and administration: evaluation tasks – educational objectives (mean across countries)

(Error bars indicate mean absolute deviation of country means)

Question: "The task represents major educational objectives at the end of VET programmes in the field of business and administration" (1= strongly disagree; 2= disagree; 3= agree; 4= strongly agree).
In addition to the ratings of the relevance of the evaluation tasks, their complexity was also assessed (see Figure 3.3.8).

The selected evaluation tasks cover a broad spectrum of complexity. The rankings of tasks 1 to 4 and 8 show more diversity across the countries than do the rankings of all the other tasks. Tasks 1 to 4 are designed as complex tasks based on a narrative anchor to support the authenticity and practical importance of the tasks. With respect to the results on educational objectives, the impression is given that there are some misconceptions and misinterpretations of the content and design of the complex tasks between the countries. This was confirmed in the discussions in the business and administration group during the final international workshop (see Figure 3.3-9).

The experts rated items 5, 6, 7, and 9 to 14 uniformly. Therefore, the concordance in ratings of the complexity of the evaluation tasks is higher. Kendall’s W confirms the visual impression. \( W = 0.69 \) \( (p = .000) \); the country means and mean absolute deviations within country means for each country are provided in Annexes 3.3; Tables 3.3-A9, 3.3-A10, 3.3-A11, and 3.3-A12).

It can be concluded that the estimation and evaluation of what complexity means in the evaluation tasks overlaps. The higher or lower rating of an assessment task in terms of complexity is not a positive or a negative criterion. The operative point is an agreement on the level of processing required to solve the tasks. The more the participating countries agree on the different complexity levels, the easier it will be to develop test items in a future VET-LSA.

During the final international workshop, the differences in the ratings for evaluation tasks were explained by the selected set of evaluation tasks, which did not cover all core areas relevant to all selected national VET programmes. Moreover, it was pointed out that some deviations might be explained by the formulation of the tasks in unfamiliar formats (Meta level). Some of the national programmes are rather broad, covering a

![Figure 3.3.-8: Business and administration: evaluation tasks – complexity (country means)](image-url)
number of aspects, whereas other are rather specialised. Broad VET programmes were selected in Slovenia, Germany, Switzerland and Austria (less sales focused), whereas more specialised programmes can be found in Finland and Switzerland (focus on sales/marketing & customer service) and Denmark (focus on organisational activities). For measurement in a future VET-LSA, the possibility of including modules for specialisations (e.g. one module for marketing/sales; second module for organisational activities) should be analysed in detail.

Since the selected set of evaluation tasks for rating during the second national workshop was not broad enough to cover the core areas in all VET programmes, the group agreed on the following six core areas relating to general aspects of learning outcomes in all VET programmes as a common basis for further steps in a possible future VET-LSA:

- Purchasing
- Sales & Marketing
- Stock keeping (basic level)
- Financials/Accounting (basic level)
- Customer service
- Organisational activities

Communication, as defined by the business and administration group, is integrated into all six core areas. Based on the six core areas, each country specified the major focus of their national VET programme: Denmark: Organisational activities; Finland: Sales & Marketing, Customer service; Slovenia: All; Switzerland: Customer service, Organisational activities; Austria: All (less sales) and Germany: Customer service, Organisational activities, Purchasing. Table 3.3.-4 gives an overview of the selected evaluation tasks and the corresponding core areas.

---

**Figure 3.3.-9: Business and administration: evaluation tasks – complexity (mean across countries)**

(Error bars indicate mean absolute deviation of country means)

Question: “Indicate the level of complexity of the task!” (1= low complexity to 4=high complexity)
Table 3.3.-4: International set of evaluation tasks for business and administration

<table>
<thead>
<tr>
<th>Core area</th>
<th>Task heading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing</td>
<td>Hazelnuts</td>
</tr>
<tr>
<td>Purchasing</td>
<td>fashionable sports clothes</td>
</tr>
<tr>
<td>Purchasing</td>
<td>Selection and order of light boxes</td>
</tr>
<tr>
<td></td>
<td>Marshmallows light</td>
</tr>
<tr>
<td>Sales and marketing</td>
<td>Customer marketing</td>
</tr>
<tr>
<td>Customer service</td>
<td>Customer service</td>
</tr>
<tr>
<td>Customer service</td>
<td>Preparing conversation with customers</td>
</tr>
<tr>
<td>Customer service</td>
<td>Exploring consumer demand</td>
</tr>
<tr>
<td>Sales and marketing</td>
<td>Complete business process about placement of orders / customer consulting</td>
</tr>
<tr>
<td>Sales and marketing</td>
<td>Invoicing practice</td>
</tr>
<tr>
<td>Sales and marketing</td>
<td>Invoicing service and goods by letter writing and bank transactions</td>
</tr>
<tr>
<td>Financial/accounting</td>
<td>Planning and follow-up of an enterprise’s finance</td>
</tr>
<tr>
<td>Sales and marketing</td>
<td>Drafting a non-addressed advertising letter</td>
</tr>
<tr>
<td>Customer service</td>
<td>Verification of ongoing orders and sales transactions</td>
</tr>
<tr>
<td>Customer service</td>
<td>Correspondence in a foreign language</td>
</tr>
</tbody>
</table>

3.3.5 Summary

Finding a common ground for comparison proved to be a more challenging task than for the industrial occupations, because the field is broader and much more diverse in participating countries. Six countries participated in the field of business and administration: Austria, Denmark, Finland, Germany, Slovenia and Switzerland. To clarify the basis for comparison, three aspects were focused on: occupational tasks, qualification requirements and evaluation tasks.

Occupational tasks

The selection of occupations based on o*net illustrates the diversity of the business and administration area and the different facets of the occupational integration of merchants and economists into the labour market. Occupational tasks in the field of business and administration are characterised in all participating countries by typical activities of employees, such as dealing with sales records, financial statements and invoices, as well as organising customers’ and suppliers’ inquiries.

The congruence in the ratings of the relevance of occupational tasks can be evaluated as good. Only one task was considered less important across almost all countries, while the judgement on the four tasks indicates a high level of agreement across all participating countries. These tasks are relevant for the description of job and workplace-related activities in the field of business and administration. It is recommended that these tasks – namely, responding to customers and suppliers’ inquiries, reviewing documents, preparing documents, and collaborating with other departments – be checked and specified further in future steps. The judgement of task frequencies is underlined in the findings: using the expert ratings, day-to-day in contrast to periodical occupational activities can be defined. The proposals and suggestions the expert group made, namely to add to the addition items named or to make the critical items mentioned more precise and reduce uncertainty and hence variability in the ratings, should be adopted. There might be a correlation between the unambiguity and the absolute mean deviation in ratings.

Qualification requirements

The experts came to an agreement on the qualification requirements that are of major importance for jobs in the field of business and administration in the labour market. Qualification requirements range from strictly occupational requirements necessary for performing merchants’ and economists’ jobs, such as clerical, economics and accounting skills, through to generic requirements necessary in life such as mathematics, the English language and computer literacy. Moreover, qualification requirements that correspond to different company areas such as administration and management and sales and marketing on the one hand, and to operational functions, such as production and processing and customer and personal services on the other, were seen as important in all countries.

The congruence in the ratings of the relevance of qualification requirements can be evaluated as good. Three qualification requirements were judged to be highly relevant for all participating countries: clerical qualifications, English and...
customer and personal service. It is recommended that those requirements be taken as the baseline for qualifications in the field of business and administration for at least two reasons: (1) the selected qualification requirements are representative examples of occupation-specific, generic and operational process-related requirements, (2) the selected qualification requirements correspond with the theoretical assumption of different vocational competencies – namely generic, occupation-specific and job-specific skills. The proposals of the international expert group to add communication and make the critical items (6, 9) more precise to reduce variability in the ratings should be taken into consideration in the next project phase.

Evaluation tasks

The congruence in the ratings of the relevance of the selected evaluation tasks can be evaluated as satisfactory. However, it was expected that a rating based on the core areas agreed on in the business and administration group at the final international workshop would have been more consistent. The following aspects support that ex-ante expectation. The variability in the ratings might be traced back to the different educational programmes with different educational targets. One central result is that the selected evaluation tasks for Danish and Austrian experts do not fit in with the national major educational objectives as well as the tasks for the other countries. An explanation of that divergence can be seen in the specialisation of some national programmes. The Danish programme for example, focuses more on organisational activities than on sales and marketing, as the Austrian programme does.

Despite some convergence in the ratings for relevance, the congruence in the evaluation tasks for complexity can be evaluated as good. This indicates that the selected VET programmes correspond to comparable educational levels. This is a decisive factor in constructing test items in a possible future VET-LSA and one of the prerequisites for making test items more likely to be comparable as well.

A step towards more consistency was taken during the final international workshop. Six core areas were formulated as a common basis for all selected national VET programmes:

1. Purchasing
2. Sales & Marketing
3. Stock keeping (basic level)
4. Financials/Accounting (basic level)
5. Customer service
6. Organisational activities

Communication is integrated into all six core areas. These core areas should be taken as the basis for the development of a common framework for business and administration and as a basis for test construction in the next project phase.

It should be stated once again that the selection of evaluation tasks and the judgment of their complexity was intended to provide a representative reference to interpret the possibilities for an international comparison. In summary, based on the rating procedures of the evaluation tasks and their complexity, the possibility of a comparison for most of the tasks can be confirmed for Finland, Germany, Slovenia and Switzerland – the consensus across these countries provides an acceptable baseline for comparison. Nevertheless, the diversity of task judgment indicates some difficulties and expected challenges for the development of test instruments for competencies measurement in a possible future VET-LSA. Therefore, it will be most important to provide sufficient resources for test design, test development and test delivery in order to guarantee the validity, reliability and the adequate quality of the test procedures.

In conclusion, the field of business and administration can be recommended as suitable for a possible future international large-scale assessment in vocational education and training (VET-LSA), although more specification of the field is required for the development of a common framework in the next project phase.
3.4 Social and health care

(Thomas Bals / Eveline Wittmann)

3.4.1 Specific features of national VET programmes for social and health care

Denmark, Finland, Germany, Norway, Slovenia, Sweden and Switzerland participated in the Feasibility Study in the field of social and health care. The selected national VET programmes have certain specific features due to differing political, historical and cultural backgrounds. Thus, it was necessary to agree on a common structural framework in advance of the data acquisition for the Feasibility Study.

In the 1st international workshop in July 2008 (Bonn), the experts decided to focus on VET programmes in health care (later renamed ‘social and health care’). Although the VET programme of ‘Nursing’ was precluded, as it is academic in some of the countries, the main orientation towards nursing activities was determined. Therefore, programmes with different focuses such as paramedics were precluded as well. The issue of whether core competencies for the occupations are personal and social skills and competences was discussed, because the ‘work object’ of social and health care workers is – by definition – a person in a situation needing help.

In October 2008, the national coordinators of all the occupational areas met in Berlin. For social and health care, the initially proposed o*net task and knowledge descriptors, based on the ‘Licensed Practical and Licensed Vocational Nurses’ profile, were criticised as corresponding more to a ‘half nurse’ profile than to a social and health care profile. The discussion in the workshop led to the expansion of the occupational field to include social aspects (reflected in its renaming). Finally, the o*net profiles of six occupations were selected as frames of reference and adapted to the European fields of social and health care. In accordance with the o*net reference profiles, the research tool was expanded by the national social and health care expert groups, chaired by the international social and health care group coordinators.

The selected profiles, in particular their corresponding task and knowledge descriptors, provided the framework for the countries’ decision on VET programmes to participate in the Feasibility Study. Some of the countries revised or specified their initial decisions, partly due to the results of the national workshops (e.g. Germany, Finland, Norway). The final selections of VET programmes were presented at the 2nd international workshop in January 2009.

On the whole, the selected programmes meet the determined profiles of reference, although minor specific national features are apparent (for details, see Table 3.4.1). Most importantly, the VET programmes selected by the countries have different titles96. In particular, some of the titles allude to the contextual focus of the programmes, leaning more towards health care than towards social care. Programmes in Norway, Sweden and Slovenia tend to be more health-related, whereas the Swiss programme tends towards the social area, and the Finnish, German and Danish programmes are placed at the intersection of both areas.

The total duration of the VET programmes ranges from three to four years, except for the Slovenian programme, with a duration of four or five years. In first instance, this is due to the Slovenian full-time school programme covering general education as well. The number of students in the selected VET programmes varies widely. This does not imply any information on the programmes’ national significance, as it has to be seen in relation to several factors (the country’s population figures, alternative programmes, labour market etc.). With regard to a possible future VET-LSA, it would be feasible to draw the required sample of 400 graduates from each of the selected programmes. Except for apprenticeship-based education in Finland, the completion of compulsory schooling is a basic requirement in all countries. Some of the countries have further specific entry requirements (e.g. Germany). In general, a completed programme provides access to advanced vocational education and training. In some countries, access to higher education is also provided (universities and universities of applied sciences/polytechnics).

In terms of the organisation of the programmes (respectively programme periods), different types can be distinguished.97

- school programmes (with practical training periods) (curriculum-based education in Finland, Germany, Slovenia, Sweden, school-based education in Switzerland) and

- programmes based on school education and practical training, either alternating or with extended periods of each (Denmark, Norway, apprenticeship-based education in Finland and Switzerland).

The programmes are rather balanced in their proportion of theory and practice (e.g. Denmark, Germany, Norway and school-based programme in Switzerland). The curriculum-based education in Finland, the Swedish and the Slovenian programmes lean towards theoretical learning at school, whereas the apprenticeship-based programmes in Finland and Switzerland lean more towards practical training. Therefore, it must be taken into account that the students’ levels of theoretical/practical knowledge, skills and abilities depend on each programme’s structure. In addition, different types of evaluation tasks, for example with a theoretical or a practical focus, are to be expected.

---

96 It has to be taken into consideration that most of the titles have been translated into English.
97 Leaving aside competence-based programmes in Finland.
<table>
<thead>
<tr>
<th><strong>Title of VET programme</strong></th>
<th>Denmark</th>
<th>Finland</th>
<th>Germany</th>
<th>Norway</th>
<th>Slovenia</th>
<th>Sweden</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social and Healthcare Education</td>
<td>Social and Health Care</td>
<td>Care for the elderly</td>
<td>Health Care Worker</td>
<td>Health Care</td>
<td>Care specialist</td>
<td>Health Care Omvårdnads-programmet</td>
<td>Care specialist Fachfrau /-mann Betreuung</td>
</tr>
<tr>
<td><strong>Total duration (years)</strong></td>
<td>3 years 2 months</td>
<td>3 years</td>
<td>3 years</td>
<td>4 years</td>
<td>45 years</td>
<td>3 years</td>
<td>3-4 years</td>
</tr>
<tr>
<td><strong>ISCED level</strong></td>
<td>3C</td>
<td>3A</td>
<td>3B</td>
<td>3C</td>
<td>3B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td><strong>Entry requirements</strong></td>
<td>completed compulsory education</td>
<td>basic (compulsory) school certificate; no entry requirements for cp* and ap*</td>
<td>ten years of education (&quot;Realschulabschluss&quot; or equivalent qualification) or general school leaving certificate &amp; completed 2 year apprenticeship programme or 1-year VET programme (e.g. elderly care assistant)</td>
<td>successfully completed compulsory education (9 years) or completed short-cycle vocational education (2 years after basic education)</td>
<td>completion of compulsory schooling</td>
<td>completion of compulsory schooling (lower secondary, 9 years of schooling)</td>
<td></td>
</tr>
<tr>
<td><strong>Access to next level of education/training</strong></td>
<td>ISCED 4</td>
<td>general eligibility for higher education in polytechnics and universities</td>
<td>higher education (access to universities of applied sciences or universities after entrance examinations depending on Länder-specific regulations)</td>
<td>University College for nurses, level 5A, after one year supplementary general study.</td>
<td>higher vocational education (VH), for most graduates: access to tertiary-level professional education and training programmes higher professional education (VIS), higher academic education (UNI)</td>
<td>basic eligibility for higher education for most graduates: access to tertiary level professional education and training programmes about 10% of graduates have Federal Vocational Baccalaureate (FVS) (it is possible to complete it during or after the VET-Programme); direct access to universities of applied sciences (LAS)</td>
<td></td>
</tr>
<tr>
<td><strong>Organisation/learning arrangements:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Work-based learning % school-based learning %</strong></td>
<td>w: 60% / s: 40%</td>
<td>w: 65% / s: 35%</td>
<td>w: 65% / s: 35%</td>
<td>w: 60% / s: 40%</td>
<td>w: 6.2% / s: 95%</td>
<td>w: 15% / s: 85%</td>
<td>w: 70% / s: 30%</td>
</tr>
</tbody>
</table>

* Estimated numbers

** Number of graduates 2007 in ‘Schulen des Gesundheitswesens’: 5 567 (cf. Gesundheitsberichterstattung des Bundes 2009), number of graduates in (Berufs-)Fachschulen, Altenpflege*: approximately 8,433 (derived from numbers of first year students cf. Berufsbildungsbericht 2008). Source: investigated in 2008
CHAPTER 3 – COMPARATIVE INTERNATIONAL ANALYSIS

To sum up, the VET programmes selected by the countries meet the given framework of occupational profiles, but have certain specific national features that have to be taken into account in the sampling and the data acquisition of VET-LSA. The specific national organisation of programmes as well as the proportions of theoretical and practical learning must be particularly taken into consideration.

### 3.4.2 Comparative analysis of ratings for occupational tasks

**Selection procedure and criteria of o*net task descriptors**

The basis for the identification of relevant occupational tasks is the data collection with a standardised instrument which was agreed on in the international expert group. This instrument was used not only for data collection but most importantly as a basis for discussion and comments in all first national workshops. The development of this research tool is described in detail in Chapter 1.

Occupational reference profiles, particularly with regard to social aspects, gave a direction to the selection and construction of tasks. The preliminary version of the research tool comprised 15 tasks, which were selected on the basis of the following three steps:

1. identical tasks were excluded from the profiles,
2. similar/related tasks were summarised and compressed, and
3. the profile was sharpened, tasks regarded as not significant were excluded, and others were added.

Finally, the international expert group agreed on a questionnaire based on 19 occupational tasks for both relevance rating and frequency rating. As outlined in section 3.4.1, considerable variance between countries’ programmes was to be expected. Therefore, it was necessary to work with a lengthy questionnaire (the research tool was translated from English into the national language in most countries; research tool 1 with the original items shown in full is provided in Annexe 3.4, Table 3.4-A1).

**Task relevance in the labour market from a comparative international perspective**

Sound agreement was reached on most of the o*net occupational tasks across countries. All the tasks presented are considered to be at least somewhat relevant in all countries in the occupational field of social and health care. Occupational tasks considered to be highly relevant in general correspond to basic care activities (tasks 1, 2, 4 to 7, and 14). Basic care is a core element of the occupational field of social and health care. It is normally part of the curricula and referred to in compulsory law and guidelines.

However, when it comes to consistency across countries, it has to be taken into account that medical/technical care is less relevant for VET programmes focusing more on social care, as indicated for example in the Swiss national report (Switzerland). This means that differences in some basic care-related tasks (tasks 3, 4, 6) result from differences in the selected country-specific profiles. Also, as outlined in the national reports, differences in medical nursing skills-related tasks (items 8, 9) in Sweden and Norway result from differences in the educational systems in those countries, in that they would be carried out by other professionals in the health service or by professionals with a higher level of education.

Tasks pertaining to the area of social care (tasks 12, 13, 15, 16 and 19) are generally held to be relevant by the experts in most countries. The Swedish national report indicates that tasks 12, 13 and 19 are considered to be less important in Sweden, because in the way they are formulated they address the level of supervision so these tasks would be carried out by university educated professionals. This means that congruence of occupational task relevance in the area of social care may be established on condition that it only includes tasks carried out by employees at a sub-managerial level.

The countries’ experts generally agree that occupational tasks in the field of administration and quality insurance can be regarded as important, although slightly less relevant (tasks 10 and 11). This indicates that these occupational tasks are relevant but more secondary aspects of social and health care. Discussions in the final international workshop revealed that they are only somewhat relevant for the Swiss programme because of its social emphasis (see the minutes of the final international workshop). Moreover, there are high levels of agreement in all the countries that the task referring to maintaining health and safety is highly relevant (task 18).

Hence, from the results it can be concluded that the selected country-specific VET programmes in the field of social and health care have a common core of relevant occupational tasks.

---

98 In Sweden, three occupational tasks were added to the research tool by the national expert (cf. national report).

99 Findings presented in chapter 3.4.4 indicate that evaluation tasks on quality assurance are considered to meet an important educational objective in the Swiss programme.
tasks. Moreover, Kendall’s W (Kendall’s coefficient of concordance) for the ratings of the relevance of occupational tasks value (Kendall’s W = 0.479) indicates that there is a high level of concordance for the overall country profiles, areas of dissent notwithstanding.

Figure 3.4-1: Social and health care: occupational tasks – relevance (country means)

Some of the tasks performed most frequently in the labour market are:
- Observe patients / clients, chart/report
- Answer patients’ calls and determine how to assist them
- Measure and record patients’ vital signs
- Help patients with bathing, dressing, personal hygiene, moving in bed, standing, walking
- Record food and fluid intake and output
- Work as part of a health care team in assisting with the assessment of patient needs
- Administer prescribed medications, start intravenous fluids, note times/amounts on patients’ chart
- Prepare patients for examinations, tests or treatments
- Participate in measures of quality assurance in health and/or social care
- Assign work schedules, following work requirements
- Interview individuals and family members and group interests
- Provide information, individuals/advice clients
- Prepare and maintain records of client progress and services performed
- Consult with supervisor concerning reports/problems/programs for individual families
- Oversee day-to-day group activities of clients in institutions
- Perform housekeeping duties and assist families
- Protect health and environment, be responsible for own safety/safety of others
- Organise, lead, promote interest in recreational activities

Question: “How relevant is the task on average to the performance of “social and health care workers?” (1= not relevant; 2= somewhat relevant; 3= relevant; 4= very relevant; 5= extremely relevant)

Basically, the countries also agreed on the tasks performed most frequently in the labour market. Unsurprisingly, these tasks refer to activities which form part of a daily care routine (tasks 1, 2, 5, 8). Occupational tasks carried out least frequently are those that require compiling information, evaluating it, and balancing options (tasks 9, 10, 12, and 15). In accordance with the relevance ratings, tasks with most distinctive differences between countries are mainly related to aspects of technical/medical care and treatment and nursing intervention (tasks 3, 4, 6, 7, and 9), which reflects differences in the countries’ profiles, as indicated in section 3.4.1 of this report.
Hence, from a comparative point of view, significant tendencies towards agreement on the frequency of occupational tasks are apparent. This is supported by the fact that a high level of concordance was found in the countries’ profiles with regard to occupational task frequency (Kendall’s $W = 0.743^{100}$). Similarities in the occupational tasks’ relevance are obvious, for example the distinctive agreement on tasks rated as highly relevant and referring to basic care activities$^{101}$ (the country means and mean absolute deviations within country means for each country are provided in Annexe 3.4; Tables 3.4-A3, 3.4-A4, 3.4-A5, and 3.4-A6).

---

100 Without items with missing values [items 11, 15, 16, 17, 18, 19].
101 In spite of similar tendencies in the comparative analysis of both relevance and frequency, it has to be kept in mind that there is not necessarily any direct interdependence between relevance of a task and its frequency of performance.
Additional tasks

Various countries suggested amendments. The most outstanding one is that the task of ethical interaction and activating clients/patients is interwoven in care work across the countries. Other occupational tasks suggested are relevant in some countries, but do not fit in with the programmes of other countries, since they are related more to country-specific selected profiles. Most additional tasks have a greater or lesser affinity with the given tasks.

To sum up, the occupational profile in all countries is mainly characterised by its coverage of the areas of basic care, social care as well as public health, but in individual countries medical nursing care, work in hospitals and management activities were not included. Ethical interaction and the task of activating clients/patients is interwoven with care work in all countries.

3.4.3 Comparative analysis of ratings for qualification requirements

Selection procedure and criteria of o*net knowledge, skills and abilities descriptors

The list of qualification requirements was taken from the o*net frame of reference specified above (cf. chapter 3.4.1). As with the selection of the o*net task descriptors, the selection of the o*net knowledge skills and abilities descriptors proceeded in three steps:

1) identical qualification requirements were excluded from the profiles,
2) similar/related qualification requirements were summarised and compressed and
3) the profile was sharpened, qualification requirements regarded as not significant were excluded, and others were added.

Qualification requirements referring to general education were precluded, as they were considered to be less relevant compared to the vocational qualifications selected. Finally, the ratings of qualification requirements for the labour market and discussions and comments in the 1st national workshop were based on 8 qualification requirement...[102]. The set of qualification requirements and the rating results of the first workshop are shown in Figure 3.4-4.

---

Figure 3.4-4: Social and health care: qualification requirements – relevance (country means)

[Diagram showing relevance ratings for various fields such as Medicine, Therapy and Counselling, Public Safety and Security, Customer and Personal Service, Law and Government, Psychology, Sociology and Anthropology, Clerical, and their respective relevance scores on a 5-point scale (1=not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5=extremely relevant).]

[Legend: Denmark, Finland, Germany, Norway, Sweden, Switzerland, Mean of means.]

Question: “How relevant is the qualification requirement for “social and health care workers” to perform successfully on the labour market?” (1=not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5=extremely relevant)

[102] In Sweden, three qualification requirements were added to the research tool by the national expert (cf. Country Report 2.4.3).
Experts from all the countries agreed on the strong relevance of qualification requirements in the areas of therapy and counselling (2), customer and personal service (4) and psychology (6), and sociology and anthropology (7). While requirements pertaining to the field of administration (5 and 8) are generally held to be somewhat less important across countries, they are still relevant to a considerable extent. The experts in the final international workshop noted that they are also to be considered as relevant for all countries, in spite of some differences in the ratings. Differences regarding clerical requirements can be explained by misleading terminology.

Differences regarding the qualification requirement of ‘law and government’ can be explained by the consideration that it is too broad to address the legal knowledge needed (e.g. Swedish national report and minutes of the final international meeting). In accordance with findings on occupational task relevance and with explanations on the differences between the VET programmes in question (see section 3.4.1 of this report), considerable disagreement is only apparent on qualification requirements in the field of medicine (requirement 1). Reflecting the high deviations found across occupational tasks referring to medical/technical nursing, medicine is a core reference in some of the programmes chosen (e.g. Germany). In contrast, it is of minor importance in other programmes (e.g. Switzerland). Consequently, the relevance of qualification requirements in the area of public health and safety (3) is comparatively high in Germany and low in Switzerland.

Comparing the ratings internationally, it becomes obvious that there is a broad common framework of required qualifications in the field of social and health care. The countries’ overall profiles also match to a high extent (Kendall’s W = 0.476). As with the rating of occupational task relevance, there is a tendency towards a high concordance in the ratings for qualification requirements in the participating countries (the country means and mean absolute deviations within country means for each country are provided in Annexe 3.4, Tables 3.4-A7, 3.4-A8).

Additional tasks

Again, the most outstanding amendment agreed on in all the countries is the qualification requirement of ethics, which was not rated in the national workshops, but strongly agreed on by all national experts in the final international meeting. While the addition of social pedagogy was considered, it is not relevant in strongly health related programmes like the Norwegian programme (see the minutes from the final international meeting).

To sum up, the profile of qualification requirements for all countries is mainly characterised by its coverage of the areas of knowledge and skills pertaining to social inter-relations and ethics, while partially deviating in the field of medicine and medicine-related areas. Legal and administrative knowledge will only be relevant in all countries if it is incorporated into day-to-day activities.
3.4.4 Comparative analysis of ratings for evaluation tasks

Compilation of international set of evaluation tasks

Prior to the selection of the evaluation tasks for the international set rated in the 2nd national workshops, the international social and health care expert group agreed on five core areas for the occupational field of social and health care:

1. Client care, service and assistance within the care process
2. Communication and building relationships
3. (Multi)professional cooperation
4. Health and safety
5. Administration and legal framework.

The experts from the countries were asked to propose and send summaries of authentic, national evaluation tasks to be incorporated into the international set. The tasks were to be selected according to the core areas determined beforehand. Based on the tasks obtained from Denmark, Finland, Germany, Slovenia, Sweden and Switzerland, the international social and health care expert group coordinators prepared a preliminary set of 15 evaluation tasks. The selection process for the international set of evaluation tasks was based on the following criteria:

- Does the task represent one of the core areas?
- Is the task considered relevant for the occupational tasks and the qualification requirements for the labour market, as indicated in the research tool from the first national workshops? To meet this criterion, 50% of the evaluation tasks were supposed to be from core areas 1 or 2.
- Is the task independent of specific national features (e.g. national law)?
- Does the task have the form of a case study or a detailed task description, either practical or theoretical?
- Is the length of the task feasible for rating during the second national workshop? To be able to include very complex tasks, participating countries had been asked to submit task summaries no longer than half a page.
- Are tasks from all participating countries included in the selection?

The proposal for the set of evaluation tasks was sent to the national experts. As a result of the feedback, two tasks were added to the final set of evaluation tasks for the 2nd national workshops (the complete set of evaluation tasks, research tool 2, with the original items shown in full will be provided in the final publication in Annexe 3.4, Table 3.4-A2). In the second national workshop, the final set of assessment tasks was rated with regard to the representation of major educational objectives and levels of complexity.

Table 3.4-2 gives an overview of the selected evaluation tasks and the corresponding core areas.
### Table 3.4-2: International set of evaluation tasks for social and health care (Research Tool 2)

<table>
<thead>
<tr>
<th>Core area</th>
<th>Task heading</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Client care, service and assistance within the care process</strong></td>
<td>Frida Petersen</td>
<td>Complex case of an elderly woman waiting to move into a sheltered accommodation. Task focuses on clinical symptoms, treatment and medication</td>
</tr>
<tr>
<td></td>
<td>Mother has changed</td>
<td>Assess planning, conduct, documentation and evaluation of a care process for an elderly woman disoriented after surgery</td>
</tr>
<tr>
<td></td>
<td>Client’s home</td>
<td>Evaluate emergency situation of an old widower suffering from coronary artery disease, diabetes and restrictions in movement; apply basic care like informing home care team</td>
</tr>
<tr>
<td></td>
<td>Erik</td>
<td>Describe state of an unconscious man (52) suffering from diabetes and sitting in a wheelchair to an emergency call centre</td>
</tr>
<tr>
<td></td>
<td>Psychiatry</td>
<td>Select and examine problems using theory and methods from the area of culture and activity in the creative area of psychiatry</td>
</tr>
<tr>
<td><strong>Communication and building relationships</strong></td>
<td>Serhart, 56</td>
<td>Select and examine problems using culture and activity theory and methods with a migrant worker suffering from brain apoplexy</td>
</tr>
<tr>
<td></td>
<td>Mr. Tebbe needs help</td>
<td>Deal with new inhabitant of residential home</td>
</tr>
<tr>
<td></td>
<td>Mrs. Johansson</td>
<td>Describe features of a good dialogue with an elderly woman with hearing reduction</td>
</tr>
<tr>
<td></td>
<td>Having conversations</td>
<td>Describe alternatives of supportive communication when showering man unable to express himself</td>
</tr>
<tr>
<td><strong>(Multi)-professional cooperation</strong></td>
<td>Ingeborg Sorensen</td>
<td>Discuss and present thoughts concerning work planning and cooperation; determine personal role in case of a patient diagnosed with osteoporosis and arthritis</td>
</tr>
<tr>
<td></td>
<td>School for young students</td>
<td>Plan activities as a member of a team dealing with special needs students</td>
</tr>
<tr>
<td><strong>Health and Safety</strong></td>
<td>Elderly people’s ward</td>
<td>Assist woman suffering from paraplegia</td>
</tr>
<tr>
<td></td>
<td>Using personal protection equipment</td>
<td>Explain functioning of surgical protection equipment</td>
</tr>
<tr>
<td><strong>Administration and legal framework</strong></td>
<td>Mother has changed</td>
<td>Discuss pros and cons of ambulatory/outpatient care of a woman disoriented after surgery</td>
</tr>
<tr>
<td></td>
<td>Anna and Edvin Svensson</td>
<td>Assess governmental support in the case of a married couple with the husband suffering from physical condition after a stroke</td>
</tr>
<tr>
<td></td>
<td>Quality and efficiency</td>
<td>Explain term ‘efficiency’; describe potential consequences of the primacy of efficiency for the field of care</td>
</tr>
<tr>
<td></td>
<td>Data protection and professional discretion</td>
<td>Explain how to handle protected data</td>
</tr>
</tbody>
</table>
Ratings of the international set of evaluation tasks from a comparative international perspective

**Figure 3.4-6: Social and health care: evaluation tasks – educational objectives (country means)**

Question: "The task represents major educational objectives at the end of VET programmes in the field of social and health care" (1= strongly disagree; 2= disagree; 3= agree; 4= strongly agree)
The analysis of the evaluation tasks shows that considerable agreement can be reached on a number of evaluation tasks: two of the four tasks pertaining to core area 2 – communicating and building relationships – are agreed on as being relevant in all countries (tasks 7 and 8). There is also agreement on one task in core area 4 – health and safety – (task 12), and one task in core area 5 – administration and legal framework – (task 15). Since social and health care is directed towards interaction, as was indicated in the sections on occupational task relevance and qualification requirements, core areas 1 and 2 can be considered as most relevant. Therefore, the question of whether, apart from the common ground identified for core area 2, commonality can also be found on core area 1 – client care, service and assistance within the care process – seems vital for this Feasibility Study.

The results of the Feasibility Study strongly indicate that this will be the case if tasks are set up in a way that takes the specific features of countries’ programmes into account. Specifically, task 4 is agreed on by all the countries’ experts, apart from the German one. However, the character central to the case is 52 years old, and so does not belong to an age group dealt with in the field of care for the elderly. Still, German experts rated this item moderately highly.

The final international workshop also came to the conclusion that agreement can be found on tasks in core area 3 – (multi-)professional cooperation. Task 10 is about defining one’s role in relation to other professions and professionals. The relevance of this task was agreed to be of importance in all countries. Differences can be explained by the lack of clarity regarding the link between the case description and the task itself, as well as by the medical orientation of the task. Moreover, task 16 of core area 5 – administration and legal framework – refers to an area which is of major importance in the German curriculum. The low score in the ratings can be explained by a task set up that differs from German standards on task formulation for examinations.

For some tasks, congruence was found neither in the national expert ratings nor in the international experts’ discussion in the final international workshop, either due to the orientation of the programmes, or to the programmes’ target groups. Specifically, the low relevance of task 3 in Switzerland was explained by the fact that checking ‘medication dosage’ is not part of the Swiss programme. The low relevance of task 9 in Finland can be explained by the fact that ‘having conversations’ is not part of the Finnish programme. Experts confirmed that deviations in Germany and Finland on item 11 are due to the target group, with the German and the Finnish programme addressing an older age group. Moreover, the Swiss deviation on item 14 results from the use of the term ‘nurse’ and can therefore be addressed by a change in terminology, but the ambulatory context is also considered problematic by the national expert. Finally, data protection (item 17) is not part of the Slovenian curriculum (cf. minutes of the final international workshop).

While in none of the core areas all the tasks are regarded as relevant by all countries, it is possible to identify evaluation tasks relevant in all the countries in all the core areas. Apart from task 16, which is not related to age, the tasks agreed on share a common content, in that they deal with elderly people and those with disabilities. While they include medical aspects,
they also pertain to the area of social care. They require knowledge in the area of social action as a consequence of health-related incidents, but do not require immediate medical nursing intervention. They also refer to an elderly age group, therefore allowing the German programme of care for the elderly to agree on the evaluation tasks’ relevance. The final international workshop’s recommendation is to pick tasks in the described areas and to select programmes or student subgroups which comply with this programmatic content for a possible future VET-LSA.

Kendall’s coefficient of concordance indicates significant agreement in the overall profile of the countries’ ratings (Kendall’s $W = 0.278^{103}$) and reflects the impression of considerable commonality between the countries’ ratings for the set of evaluation tasks, despite their programmatic differences.

While the tasks differ in the level of complexity experts attribute to them, the countries’ experts tend to strongly agree in their judgements on the levels of complexity. High levels of complexity are attributed to tasks entailing case studies based on complex constructions (tasks 1, 2, 5, 7, 10, and 11) or requiring

---

103 Without items with missing values (items 14, 18, 19).

---

Figure 3.4-8: Social and health care: evaluation tasks – complexity (country means)
theoretical analysis to define and solve a problem (e.g. tasks 6 and 7). Evaluation tasks considered as moderately relevant either focus on procedural aspects of knowledge (tasks 3, 4, 8, 9, 11, 12) or tend to require an argument based on a reference to the content of a case description.

Since countries differ considerably in their modality of assessing educational objectives at the end of VET, ranging from practical to pencil and paper, from complex case studies containing ill-defined problems through to multiple choice tasks, which is probably due to specific cultures of learning and assessing, the level of agreement across countries is surprising. The result of Kendall’s concordance test reveals a conformant high level of concordance (Kendall’s W = 0.518), indicating a similar profile of complexity ratings across countries. This is also significant for the Feasibility Study, since it shows that it should be feasible to agree on task complexity in a VET-LSA study. The country means and mean absolute deviations within country means for each country are provided in Annexe 3.4 (Tables 3.4-A9, 3.4-A10, 3.4-A11, and 3.4-A12).

To sum up, the profile of evaluation tasks corresponding to the core areas in all countries is mainly characterised by dealing with elderly people and those with disabilities who require social action as a consequence of health-related incidents, but no immediate medical nursing interventions.

3.4.5 Summary

The field of social and health care comprises several VET programmes with different focuses. Some of the selected programmes focus more on social care (e.g. Switzerland), and others more on health care (e.g. ‘Nursing and Care’ in Finland). The broad occupational field of social and health care differs from the two industrial occupations (carmechatronics and electricians). With regard to a possible future VET-LSA, it would be most feasible to get a common and comparable framework for social and health care if the field were specified in more detail for the groups of the elderly and the disabled (cf. minutes of the final international workshop) at the interface of social care and health care. To clarify the basis for comparison in the area of social and health care, three aspects were focused on in the Feasibility Study: occupational tasks, qualification requirements and evaluation tasks.

Occupational tasks

The results indicate the high relevance of most occupational tasks and considerable commonality across the countries in terms of tasks relevant for jobs in the field of social and health care. In particular, basic care activities and certain social care activities can be considered as providing a common framework for occupational tasks in the field of social and health care. Administration and quality assurance appears to be sufficiently relevant as long it is related to the level of the focussed group’s work. Differences in the relevance of occupational tasks involving technical care (nursing skills) generally refer to different focal points of the selected VET programmes.
The occupational profile in all the countries is mainly characterised by its coverage in the areas of basic care, social care and public health, but in individual countries medical nursing care, work in hospitals and management activities are excluded. Ethical interaction and the task of activating clients/patients are interwoven with care work in all countries.

Qualification requirements

Apart from medicine, where there is disagreement due to programmatic differences between countries, all the qualification requirement areas were confirmed as relevant, with strong agreement on most of the areas, especially on requirements related to the social sphere such as therapy and counselling, customer and personal service, and psychology. Qualifications pertaining to the fields of law and administration are considered to be somewhat less relevant. All in all, this points to a high relevance of qualification requirements and strong commonalities for all countries in the areas of personalised, non-medical care.

The profile of qualification requirements for all countries is mainly characterised by congruence in the areas of knowledge and skills pertaining to social interrelations and ethics, while partially deviating in the field of medicine and medicine-related areas. Legal and administrative knowledge will only be relevant in all countries if it is incorporated into day-to-day activities.

Evaluation tasks

Common agreement among countries was found for tasks in each of the core areas agreed on beforehand, ranging from ‘client care, service and assistance’ with the care process to ‘administration and legal framework’. Agreement across the countries was found on tasks which were based on medical incidents, but required knowledge from the area of social action as a consequence of health related incidents, and not immediate medical nursing intervention. They also refer to an elderly age group, therefore including the German programme of care for the elderly in agreement on the evaluation tasks’ relevance.

While tasks pertaining to procedural knowledge or with little reference to a case description were regarded as moderately or less complex, some tasks were held to be highly complex by the experts, specifically, those tasks requiring reflection on complex case study descriptions for their solution. In general, very high levels of agreement across countries are apparent.

To sum up the results of the three content-related approaches, the following can be concluded:

- occupational tasks in areas such as basic care (unrelated to clinical fields), social care, but also in the protection of health and environment, are predominantly relevant across the countries, and activating patients and interacting in an ethical manner is regarded as important in carrying out care-related tasks in all countries;
- there is a high level of agreement in qualification requirements in the social and interpersonal field and ethics across the countries, but applied areas of law and administration are also needed in all VET programmes, while medicine is very relevant in some countries and less so in others;
- evaluation tasks represent major educational objectives in all countries if they reflect the profiles outlined for occupational tasks and qualification requirements, requiring social action while being based on health-related incidents;
- the countries share common educational objectives in the areas of client care, service and assistance with the care process, communicating and building relationships, (multi-)professional cooperation, (public) health and safety as well as in terms of administration and legal frameworks;
- it is recommended that further evaluation tasks in the five core areas be checked. Evaluation tasks of high importance in all participating countries and additional occupational tasks and qualification requirements should be taken into account in doing so;
- attention has to be paid to specific national features of the VET programmes, particularly regarding the client/patient population they are related to;
- in selecting the VET programmes in a possible future VET-LSA, clear criteria for inclusion and exclusion need to be defined;
- the selection of programmes for VET-LSA should preferably relate to the interface of social and health care.

The field of Social and Health Care can be recommended as suitable for an international large-scale assessment in vocational education and training (VET-LSA).
4. Conclusions and recommendations for the Steering Group

4.1. Objectives and implementation of the Feasibility Study

The aim of the Feasibility Study was to find out whether there is a common basis for comparison in four (pre)selected occupations/occupational fields (carmechatronic, electrician industry/craft, business and administration, social and health care) in different European countries. The following eight countries participated in the Feasibility Study: Austria, Denmark, Finland, Germany, Norway, Slovenia, Sweden, and Switzerland.

A common basis for comparison is an indispensable precondition for a subsequent large-scale assessment of vocational education and training (VET-LSA). Therefore, the focus of the Feasibility Study is on identifying comparable occupational profiles and respective VET programmes in all participating countries. The development of test items for competence measurement will be the task of a possible VET-LSA in the next project phase. At best, the results of the Feasibility Study may provide a basis for the identification of measurement dimensions for subsequent test development.

The empirical approach

The method for comparison in the Feasibility Study was confronted with two challenges: first, to come to an agreement on occupational profiles corresponding to the four occupations/occupational fields and to clarify which qualification requirements are needed to successfully master different occupational tasks in the world of work; and second, to identify students’ learning outcomes at the end of VET on the basis of evaluation tasks corresponding to major core areas in all VET programmes.

To identify common occupational tasks and qualification requirements and learning outcomes at the end of VET in participating countries, a qualitative empirical approach on the basis of expert ratings was proposed. Quantitative methods were also selected to support the results of the qualitative analysis and the quantitative data must be interpreted as outcomes of previous qualitative agreements on rating tools.

Due to the different objectives for defining occupational tasks in the labour market and competence development in educational contexts, a continuing mismatch between labour market demands and VET outcomes can be observed in most European countries. Therefore, the comparative analysis was focused on the one hand on learning outcomes in VET and on the other on occupational tasks and qualification require-

ments in the labour market in two independent approaches. The selected qualitative approach comprises two steps:

- To ensure international comparability, standardised sets of occupational tasks, qualification requirements, and evaluation tasks were identified and adapted to the European setting in each expert group internationally and subsequently rated by national experts in each participating country.

- To incorporate specific national features, the results of expert discussions during national workshops were analysed and interpreted in the international report on the basis of national reports. Two national workshops were implemented for each vocational area. During the workshops, problems of comparability from national perspectives were discussed on the basis of the international sets of occupational tasks, qualification requirements and evaluation tasks.

During the three international workshops, the discussions in the expert groups provided a forum for analysing domain-specific aspects of comparability and specific national features. In this way, quantitative results of national ratings could be validated again. The combination of national expert ratings and international expert discussions follows procedures typically applied in large-scale assessments for the development of conceptual frameworks (e.g. PISA, PIAAC) to specify the domain for assessment. For the Feasibility Study, a limited number of experts for each vocational area can be considered sufficient and representativeness is not a necessary condition. This assumption was verified empirically and confirmed by the results of expert ratings.

Finally, it must be taken into consideration that the aim of the Feasibility Study was not to reach total agreement on all aspects but a certain degree of congruence in terms of occupational tasks, qualification requirements and assessment tasks, which is the precondition for a future VET-LSA.
4.2 Main results of the Feasibility Study

4.2.1 Institutional aspects of VET programmes

Regarding the formal aspects of the selected national VET programmes, there are no substantial differences in terms of duration, ISCED level and entry requirements. In all selected national VET programmes, the duration varies from 3 to 4.5 years (most programmes have a duration of 3 years). The minimum requirement for entry to the programmes is completed compulsory school education. The typical entrance qualification for level 3 is nine years of full-time education and completion of ISCED level 2 and the typical entrance age is 15 or 16. All the programmes are classified at ISCED level 3 (3A, 3B or 3C).

Learning arrangements vary in participating countries and very often within countries. The coexistence of different VET programmes makes it very difficult to specify the ratio between work-based and school-based learning/training in each country. In countries with mostly dual systems (Austria, Denmark, Germany, Switzerland) the amount of work-based training ranges between 55% and 80%, whereas in school-based VET system, the percentage of work-based training is much lower (Sweden at least 15%, Slovenia max. 24%)\(^\text{105}\). Very little information about actual transition from VET to higher education was reported by the countries. There are possibilities for accessing post-secondary education at ISCED level 4 and 5 after the completion of most VET programmes.

Governance structures in participating countries were classified in a continuum according to the impact of the government and the social partners. Of the participating countries, Sweden constitutes one pole, with the main influence coming from the government and less influence coming from the social partners. The other pole is constituted by countries with corporatist governance. VET in Austria, Denmark, Germany and Switzerland is mainly steered by social partners in terms of VET standards and control. Norway, Finland and Slovenia are located somewhere in between the two poles. There are different forms of funding in participating countries: public funding, e.g. in Sweden, Slovenia and Finland, mixed public and private funding, e.g. in Austria, Denmark, Germany and Norway.

In almost all national reports the development of standards for evaluating quality in VET is a top priority. Problems of transition from VET to the labour market are discussed directly and indirectly in the context of recent reforms of VET. In countries with traditional dual systems, building on the close link between VET and the labour market, this is less the case. Problems of transition from VET to the labour market are mostly emphasised in the Swedish and Slovenian reports.

In a future VET-LSA, these differences must be analysed in detail to be included as background variables for explaining differences in competence measurement results. Indirect background factors mainly assume different governance structures, e.g. the extent and type of participation of social and economic groups, the relation between central and decentralised steering, and the type of financing with regard to the amount and expenditure of resources. Moreover, indirect factors refer to the permeability to higher education and links to the labour market. These must be analysed carefully because it is likely that they have an impact on the perceived attractiveness of VET and students’ motivation to learn. Direct background variables consist of all factors impacting VET processes, such as the professionalism of teachers and trainers, standards and norms for shaping VET processes, and methods for quality assurance – for the latter, ongoing changes are reported in most countries. Quality monitoring should have a high impact on VET outcomes, so participating countries could learn a lot from one another.

4.2.2 Results of expert ratings in the four occupational fields

The results of the Feasibility Study show that there is sufficient congruence in nearly all the selected indicators for occupational profiles and VET programmes. The comparative analysis of expert ratings shows that all results are significant\(^\text{107}\). As expected, the degree of congruence varies depending on the vocational area. For the two craft and industrial occupations (carmechatronics, electricians), there is a higher level of congruence due to the clear definition of the occupation, whereas for the two service occupations (social and health care, business and administration) the level of congruence is lower due to the breadth of the field. However, taking into consideration the fact that qualifications for service occupations in Europe are increasingly converging, the service occupations are judged to be just as comparable as the industrial occupations. With regard to the subsequent steps of framework construction for test item development, the service occupation fields in particular should be specified further.

\(^{105}\) All numbers are based on the national reports provided by the countries.

\(^{106}\) Some countries did not participate in all four occupations (see Chapter 3).

\(^{107}\) Except for one aspect of evaluation tasks business and administration.
In terms of the statistical analysis, it must be kept in mind that the ratings are based on international expert group discussions prior to the national workshop and were discussed, commented and supplemented during these workshops. So far, the ratings can be considered as outcomes of qualitative procedures.

The high level of congruence of expert ratings in all the countries is shown in the diagrams and graphs in Chapter 3. The congruence becomes even more apparent when numeric values for each country are compared. For very few countries and items, the mean values differ by more than 10% from the country means (Annexe Chapter 3). High concordances of ratings between individual countries, tested with Kendall’s concordance coefficient W and the equivalent average Spearman’s correlation are shown in Table 4.2-1.

All ratings, except for business & administration evaluation tasks and electricians industry, nearly reaching 5%, are highly significant (Table 4.2-1). The high ratings for the “frequency” of occupational tasks in addition to “relevance” confirm that the selected items represent daily working life in each vocational area very well.

The main results for the two industrial occupations (carmechatronics, electricians) and the two service occupations (business and administration, social and health care) will be summarised below. Due to the differences between the four areas of comparison, the main results will be summarised separately: firstly, for occupational tasks and qualification requirements in the labour market and secondly, for evaluation tasks corresponding to major core areas in VET108.

4.2.2.1 Carmechatronics

Among the four occupations selected, the ratings for carmechatronics show the highest concordance. Seven countries participated in the field of carmechatronics: Austria, Denmark, Finland, Germany, Norway, Slovenia and Sweden. The selected occupational tasks and qualification requirements for jobs in the fields of carmechatronics and the evaluation tasks corresponding to major core areas in VET programmes for carmechatronics are apparently very similar in all participating countries.

Occupational tasks and qualification requirements in the labour market

In general, all the occupational tasks were rated as relevant or very relevant. In particular, tasks involving diagnosis and troubleshooting appear to be very relevant for jobs in the field of carmechatronics. There has been a shift away from traditional tasks of repairing or replacing parts towards more diagnostic tasks using electronic equipment. The results for frequency differ between the tasks and there is a tendency for tasks with lower ratings for relevance to correlate with a lower frequency.

Very high concordance appears in the ratings for the relevance of qualification requirements. Higher relevance for qualification requirements related to the domain than for qualification requirements of general education was confirmed.

In this first approach to the occupational profiles of carmechatronics, the ratings appear to be very consistent across all the participating countries. They indicate a high degree of relevance for most of the selected occupational tasks and qualification requirements, and thus a promising set for further steps towards a VET-LSA.

Evaluation tasks at the end of VET programmes

The concordance in the ratings for evaluation tasks seems to be moderately high. However, the rating results as such mainly show strong agreement and comparable levels of complexity. In particular, the core areas of engine management, brake systems and comfort and security systems seem to be very relevant for major educational objectives at the end of VET programmes for carmechatronics. Within the core areas, the types of tasks can be differentiated according to diagnosis/troubleshooting, repair/replace or maintenance. In particular, the diagnosis/troubleshooting-related tasks indicate higher levels of complexity and could be very important for subsequent steps of investigation. This corresponds with the results for the occupational tasks. It is recommended that the five core areas representing relevant educational objectives in all national VET programmes be taken into consideration in subsequent steps in the next project phase:

1. Engine management and pollutant emission (EM)
2. Brake systems (BS)
3. Undercarriage (UC)
4. Power transmission (PT)
5. Comfort and security systems (CSS).

108 The sets of occupational tasks were rated on basis of five-point rating scales in terms of “relevance” and “frequency”; the sets of qualification requirements were rated regarding “relevance”; evaluation tasks were rated in terms of educational objectives ("The task represents major educational objectives at the end of VET for carmechatronics") and complexity ("Indicate the level of complexity!").
<table>
<thead>
<tr>
<th>Vocational Area</th>
<th>Work-shop</th>
<th>Set of Items</th>
<th>N*</th>
<th>Kendall's W</th>
<th>Chi²</th>
<th>df</th>
<th>p</th>
<th>Average Spearman correlation</th>
<th>Omitted items 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business and administration</strong></td>
<td>1</td>
<td>Occ Task Relevance</td>
<td>6</td>
<td>0.630</td>
<td>30.248</td>
<td>8</td>
<td>0.000</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Occ Task Frequency</td>
<td>6</td>
<td>0.634</td>
<td>26.625</td>
<td>7</td>
<td>0.000</td>
<td>0.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Qualification requirement Relevance Qualification</td>
<td>6</td>
<td>0.591</td>
<td>42.567</td>
<td>12</td>
<td>0.000</td>
<td>0.51</td>
<td>item 4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Major Educational Objective</td>
<td>6</td>
<td>0.204</td>
<td>15.898</td>
<td>13</td>
<td>n.s.</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Complexity</td>
<td>6</td>
<td>0.692</td>
<td>53.960</td>
<td>13</td>
<td>0.000</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Carmechatronics</strong></td>
<td>1</td>
<td>Occ Task Relevance</td>
<td>7</td>
<td>0.701</td>
<td>63.809</td>
<td>13</td>
<td>0.000</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Occ Task Frequency</td>
<td>7</td>
<td>0.852</td>
<td>77.495</td>
<td>13</td>
<td>0.000</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Qualification requirement Relevance Qualification</td>
<td>7</td>
<td>0.864</td>
<td>48.394</td>
<td>8</td>
<td>0.000</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Major Educational Objective</td>
<td>7</td>
<td>0.411</td>
<td>43.145</td>
<td>15</td>
<td>0.000</td>
<td>0.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Complexity</td>
<td>7</td>
<td>0.517</td>
<td>54.289</td>
<td>15</td>
<td>0.000</td>
<td>0.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electricians (craft)</strong></td>
<td>1</td>
<td>Occ Task Relevance</td>
<td>7</td>
<td>0.450</td>
<td>34.648</td>
<td>11</td>
<td>0.000</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Occ Task Frequency</td>
<td>7</td>
<td>0.431</td>
<td>30.154</td>
<td>10</td>
<td>0.001</td>
<td>0.34</td>
<td>item 7</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Qualification requirement Relevance Qualification</td>
<td>7</td>
<td>0.570</td>
<td>31.903</td>
<td>8</td>
<td>0.000</td>
<td>0.50</td>
<td>item 7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Major Educational Objective</td>
<td>6</td>
<td>0.318</td>
<td>22.918</td>
<td>12</td>
<td>0.028</td>
<td>0.18</td>
<td>item 7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Complexity</td>
<td>7</td>
<td>0.788</td>
<td>51.990</td>
<td>11</td>
<td>0.000</td>
<td>0.75</td>
<td>items 6, 7</td>
<td></td>
</tr>
<tr>
<td><strong>Electricians (industry)</strong></td>
<td>1</td>
<td>Occ Task Relevance</td>
<td>6</td>
<td>0.615</td>
<td>36.881</td>
<td>10</td>
<td>0.000</td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Occ Task Frequency</td>
<td>6</td>
<td>0.574</td>
<td>34.416</td>
<td>10</td>
<td>0.000</td>
<td>0.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Qualification requirement Relevance Qualification</td>
<td>6</td>
<td>0.505</td>
<td>24.259</td>
<td>8</td>
<td>0.002</td>
<td>0.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Major Educational Objective</td>
<td>6</td>
<td>0.301</td>
<td>18.080</td>
<td>10</td>
<td>0.054</td>
<td>0.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Complexity</td>
<td>6</td>
<td>0.655</td>
<td>39.274</td>
<td>10</td>
<td>0.000</td>
<td>0.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social and health care</strong></td>
<td>1</td>
<td>Occ Task Relevance</td>
<td>7</td>
<td>0.479</td>
<td>60.356</td>
<td>18</td>
<td>0.000</td>
<td>0.39</td>
<td>items 11, 15, 16, 17, 18, 19</td>
</tr>
<tr>
<td>1</td>
<td>Occ Task Frequency</td>
<td>7</td>
<td>0.743</td>
<td>62.399</td>
<td>12</td>
<td>0.000</td>
<td>0.70</td>
<td>items 11, 15, 16, 17, 18, 19</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Qualification requirement Relevance Qualification</td>
<td>7</td>
<td>0.476</td>
<td>23.325</td>
<td>7</td>
<td>0.001</td>
<td>0.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Major Educational Objective</td>
<td>7</td>
<td>0.278</td>
<td>29.193</td>
<td>15</td>
<td>0.015</td>
<td>0.16</td>
<td>items 14</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Eval Task Complexity</td>
<td>7</td>
<td>0.530</td>
<td>51.951</td>
<td>14</td>
<td>0.000</td>
<td>0.45</td>
<td>items 14, 16</td>
<td></td>
</tr>
</tbody>
</table>

* N = number of countries

1 In case of missing country means for individual items, the item was omitted from the analysis rather than the country.
In an overarching view of the three content-oriented approaches, the following can be concluded:

- a predominant relevance of diagnosis and troubleshooting-oriented tasks was confirmed for occupational tasks,
- technically and vocationally oriented qualification requirements can be regarded as very relevant for successful performance in the labour market (general qualifications in natural sciences were rated as being low in relevance),
- the selected evaluation tasks were confirmed as representing major educational objectives in all five core areas, in particular for engine management, brake systems and comfort and security systems, and
- attention must be paid to some country-specific regulations.

The different approaches consistently confirm that there is a solid basis for further steps towards a possible future VET-LSA for carmechatronics.

4.2.2.2 Electricians (craft & industry)

In the field of electricians, two sectors were compared in the Feasibility Study: electricians in the craft sector and electricians in the industrial sector. The following seven countries participated in the craft sector: Austria, Denmark, Finland, Germany, Norway, Sweden and Switzerland. In the industrial sector, six countries were involved: Finland, Germany, Norway, Slovenia, Sweden and Switzerland. The congruence of expert ratings in all participating countries was mostly high, in particular for the ratings in the craft sector. For electricians industry, specific national features play a major role and must be taken into consideration in the next project phase. The results for both sectors will be summarised separately.

Electricians craft

Occupational tasks and qualification requirements in the labour market

The results for the ratings of occupational tasks show widespread agreement across countries, with most of the tasks rated as relevant. Two additional tasks were considered as being of high importance by the electricians’ expert group (“implementation and testing of bus systems for building automation” and “installation, testing and documentation of electrical safety measures according to standards, rules and regulations”). It is recommended that these tasks be checked in detail in future steps. The expert ratings for task frequency match very well, taking into consideration the fact that most occupational tasks are performed several times a month.

The occupational profile for electricians in the craft sector in all countries is mainly characterised by installation of diverse types of electrical equipment. In detail, this includes work scheduling, installation of wiring and connecting of electrical equipment. Moreover, the common profile includes troubleshooting in case of malfunctions, correcting the problem and inspecting electrical equipment or systems using technical documents. All these operations are performed in accordance with applicable national regulations, standards and technical norms. The aspect of the security and safety of electric installations and equipment also play an important role in all countries.

For qualification requirements, three areas can be identified as highly significant. All other areas show a slightly lower degree of relevance. Qualification requirements directly related to occupational aspects were rated particularly highly, whereas qualification requirements relating to rather general aspects, such as mathematics, physics or English, were rated somewhat lower (it must be taken into consideration that basics in mathematics and physics are highly important for the development of occupational competences).

The common profile of qualification requirements for electricians in the craft sector is mainly characterised by the domain-specific aspects of “building and construction”, e.g. installation technologies, work organisation, functional checks, troubleshooting and the compliance of electrical systems with local norms, standards and regulations; “telecommunications”, e.g. call systems, telecommunications equipment and telephone systems, and “engineering and technology”. The profile is also more characterised by the general requirements of the “English language” and “customer and personal service” (e.g. providing customer and personal services, which also includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction).

Evaluation tasks at the end of VET programmes

The ratings for evaluation tasks for the craft sector showed high levels of concordance in the core areas. It is recommended that seven core areas representing relevant educational objectives in all national VET programmes be taken into consideration for subsequent steps in the next project phase:

1. Classic installation technology
2. Intelligent building automation: Bussystems
3. Illumination (Calculation)
4. Drive technology
5. Measurement technology
6. Building control equipment (basics): Programming Logic Controller
7. Service and maintenance
**Electricians industry**

**Occupational tasks and qualification requirements in the labour market**

The congruence in ratings of occupational tasks for the industrial sector can be evaluated as good. Most of the tasks were regarded as relevant for all countries; only two tasks were rated as less important. Two additional tasks were considered as being of major importance by the electricians group (“implementing, parameterising and testing of bus systems” and “installation, testing and documentation of electrical safety measures according to standards, rules and regulations”). It is recommended that these be analysed in future steps. There are also high levels of agreement in terms of task frequency. In summary, a high concordance of ratings of task relevance and frequency can be reported for electricians in the industrial sector. The common occupational profile for electricians in the industrial sector mainly includes assembling, installing and commissioning electric and electronic control and regulation systems, other electric equipment or systems and electric components, while the programming and handling of bus technologies also plays a major role. Diagnosis of malfunctions (troubleshooting), problem solving and putting systems back into operation is certainly included in all tasks. Moreover, electricians in the industrial sector also provide advice on solutions to electric problems, supported by technical documents, in all countries. As for the craft sector, aspects of the security and safety of electric installations and equipment in compliance with national regulations, standards and norms, play an important role in all countries.

For qualification requirements, three areas of major importance for all countries were identified: “engineering and technology”, “computers and electronics”, and “the English language”; all other requirements were considered less relevant. The common profile of qualification requirements for electricians in the industry sector is mainly characterised by the domain-specific aspects of “engineering and technology”, e.g. knowledge, skills and abilities in applying direct, alternating and three-phase technology and hardwired programme controllers or programmable logic controllers, “computers and electronics”, e.g. electronic components such as power electronics, electronic components and computer or control software, and the more general requirement of “the English language”.

**Evaluation tasks at the end of VET programmes**

There is less homogeneity of ratings for evaluation tasks for the industrial sector than for the craft sector. However, the findings show that sufficient concordances can be reached for all areas. All the national experts agreed that ratings would have been higher if more practice-oriented tasks had been selected. Diverging ratings within core areas (e.g. measurement technology) confirm the significance of these areas and indicate that the selected tasks do not fulfil all the requirements yet.

According to these results, a possibility of comparison was confirmed for Sweden, Slovenia, Norway and Germany and there are also wide areas of concordance in Finland. It is recommended that the issue of whether modifications of tasks would result in higher concordance for the remaining areas be analysed in subsequent steps. The discussions in the expert group during the final international workshop indicated that this is very likely. It is recommended that the following four core areas representing relevant educational objectives in all national VET programmes be taken into consideration for subsequent steps in the next project phase:

1. Building control equipment
2. Drive technology
3. Measurement technology
4. Troubleshooting and maintenance

**4.2.2.3 Business and administration**

In contrast to the two industrial occupations, business and administration is a broader occupational field encompassing a variety of occupational profiles and VET programmes. Finding a common ground for comparison proved to be a more challenging task than for the industrial occupations. The selection of occupations based on o*net demonstrates the diversity of the business and administration area as well as the different facets of the occupational integration of merchants and economists into the labour market. However, given the diversity of occupational profiles and VET programmes in participating countries, the congruence of expert ratings is better than expected. The comparative analysis of occupational tasks, qualification requirements and evaluation tasks is based on national reports from six countries: Austria, Denmark, Finland, Germany, Slovenia and Switzerland.

**Occupational tasks and qualification requirements in the labour market**

Occupational tasks in this field are characterised in all participating countries by typical activities of employees such as dealing with sales records, financial statements and invoices and organising customers’ and suppliers’ inquiries. The congruence in the relevance of occupational tasks can be evaluated as good. Only one task was rated as not very important across almost all the countries, while the ratings of four tasks indicate high agreement across all the countries. These tasks are significantly relevant for the description of both job and workplace-related activities in the field of business and administration. The ratings for task frequency are underlined in the findings, with day-to-day activities in contrast to periodical working activities defined. It is recommended that the proposals and suggestions made by the expert group be adopted, namely that the additionally named items be included and the critical items mentioned...
be made more precise to reduce uncertainty and hence variability in the ratings.

The experts reached agreement on the qualification requirements of major importance. Qualification requirements range from strictly occupational requirements necessary in the performance of merchants’ and economists’ jobs, such as clerical, economic and accounting skills, through to generic requirements necessary in life, such as mathematics, English and computer literacy. Moreover, qualification requirements that correspond to different company areas such as administration and management and sales and marketing on the one hand, through to operational functions such as production and processing and customer and personal services on the other, were regarded as important in all countries.

The congruence in the relevance of qualification requirements can be evaluated as good. Three qualification requirements were judged to be highly relevant for all the participating countries: “clerical qualifications”, “English”, and “customer and personal service”. It is recommended that these requirements be interpreted as the baseline for qualifications in the field of business and administration. It is recommended that the international expert group’s proposals that communication be added and the critical items be made more precise in order to reduce variability in the ratings be taken into consideration in the next project phase.

### Evaluation tasks at the end of VET programmes

The congruence in the relevance of the “relevance” of the selected evaluation tasks is much lower than the results for complexity. This indicates that the selected VET programmes correspond to similar educational levels but most likely comprise more core areas than covered by the selected evaluation tasks for the rating. The more participating countries agree on the different complexity levels, the easier it will be to develop test items in a future VET-LSA.

Some of the selected national VET programmes are rather broad, covering a number of aspects, whereas others are rather specialised. Broad VET programmes were selected in Slovenia, Germany, Switzerland and Austria, whereas more specialised programmes were focused on in Finland (focus sales/marketing/customer service) and Denmark (focus: organisational activities).

Since the selected set of evaluation tasks for rating during the second national workshop was not broad enough to cover the core areas in all VET programmes, the business and administration group agreed during the final international workshop on the following six core areas relating to general aspects of learning outcomes relevant for all national VET programmes as a common basis for further steps in a possible VET-LSA:

- Purchasing,
- Sales & Marketing,
- Stock keeping (basic level),
- Financials/Accounting (basic level),
- Customer service, and
- Organisational activities.

Communication, as defined by the business and administration group, is integrated into all six core areas.

Starting from the six core areas each country specified, the major focuses of their national VET programme were as follows; Denmark: customer service organisational activities; Finland: sales & marketing, customer service; Slovenia: all; Switzerland: customer service, organisational activities; Austria: all (less sales) and Germany: customer service, sales and marketing, organisational activities, purchasing.

For future steps it might be reasonable to focus on the core areas relating to general aspects in all the national programmes and to add two modules: one with a focus on sales/marketing and customer service, and one centred on organisational activities.

#### 4.2.2.4 Social and health care

The selected area of comparison, social and health care, is a broad field covering a number of different occupational profiles and VET programmes, which reflects recent developments in the field of personal services during the past decade. Seven countries participated in the field: Denmark, Finland, Germany, Norway, Slovenia, Sweden and Switzerland. VET programmes in Norway, Sweden and Slovenia tend to be rather health-related, whereas the Swiss programme tends more towards the social area. The Finnish, German and Danish programmes are placed at the intersection of both areas. The findings show that all selected VET programmes meet the given framework of occupational profiles, but it is recommended that certain specific national features be taken into account for sampling and data acquisition in a possible future VET-LSA. In particular, the country-specific organisation of programmes and the proportions of theoretical and practical learning must be taken into consideration. Against this background, it is very surprising that there is widespread agreement between the ratings in all countries.

---

109 Communication aspect – internal and external related to customers and business using technological communication-tools. Attend company meetings and coordinate work activities with other departments. Collaborate with other departments to solve business-related problems, coordinate tasks, meet customer requirements and take advantage of sales opportunities or, in case of shortages, to minimise negative impact on a business.
Occupational tasks and qualification requirements in the labour market

The occupational profile for social and health care in all countries is mainly characterised by its coverage of the areas of basic care, social care and public health. Some countries exclude medical nursing care, work in hospitals and management activities. Ethical interaction and activating clients/patients is integrated into care work in all countries.

The results for occupational tasks indicate the high relevance of most occupational tasks and considerable commonality regarding the tasks relevant for jobs in the field of social and health care. Basic care activities and certain social care activities can particularly be considered as providing a common framework for occupational tasks in the field of social and health care. Administration and quality assurance appears to be sufficiently relevant as long it is related to the level of the focussed group’s work. Differences in the relevance of occupational tasks concerning technical care (nursing skills) generally refer to different focal points in the selected VET programmes.

The findings for qualification requirements confirm that apart from medicine, where there is disagreement due to programmatic differences between countries, all the qualification requirement areas are relevant, with strong agreement on most of the areas, especially on requirements related to the social sphere, such as therapy and counselling, customer and personal service, and psychology. Qualifications pertaining to the fields of law and administration are considered somewhat less relevant, yet sufficiently relevant for comparison. All in all, this indicates a high degree of relevance of qualification requirements and strong commonalities for all countries in the areas of personalised, non-medical care.

The profile of qualification requirements for all countries is mainly characterised by its coverage of the areas of knowledge and skills pertaining to social interrelations and ethics, while partially deviating in the field of medicine and medicine related areas. Legal and administrative knowledge would only be relevant in all countries if it was incorporated into day-to-day activities.

Evaluation tasks at the end of VET programmes

Agreement among countries was found for tasks in each of the six core areas agreed on beforehand:

- client care,
- service and assistance within the care process,
- communication and building relationships,
- (multi)professional cooperation,
- health and safety, and
- administration and legal framework.

Agreement across countries was found for tasks based on medical incidents, requiring knowledge in the area of social action as a consequence of health related incidents but no immediate medical nursing interventions. While tasks pertaining to procedural knowledge or with little reference to a case description were considered to be moderately or less complex, some tasks were held to be highly complex by the experts, in particular those tasks requiring reflection on complex case study descriptions for their solution. High levels of agreement for the selected evaluation tasks were generally apparent across countries.

To sum up, based on the results of the three content-related approaches, the following can be concluded:

- occupational tasks in areas such as basic care (unrelated to clinical fields), social care, but also in the protection of health and environment, are predominantly relevant across countries, and activating patients and interacting in an ethical manner is considered to be important in carrying out care related tasks in all countries;

- qualification requirements in the social and interpersonal field and ethics are very relevant across the countries. Applied areas of law and administration are also needed in all VET programmes and medicine is relevant in some countries;

- evaluation tasks represent major educational objectives in all the countries if they reflect the profiles outlined for occupational tasks and qualification requirements, hence requiring social action based on health-related incidents;

- the countries share common educational objectives in the areas of client care, service and assistance with the care process, communicating and building relationships, (multi-)professional cooperation, (public) health and safety and administration and legal frameworks;

- it is recommended that further evaluation tasks in the five core areas be checked in subsequent steps, taking into consideration evaluation tasks of high importance in all participating countries, as well as additional occupational tasks and qualification requirements;

- it is recommended that attention be paid to the specific national features of the VET programmes in subsequent steps, in particular to the client/patient population they are related to and to administrative and legal aspects;

- clear criteria for inclusion and exclusion need to be defined in selecting the VET programmes in a possible future VET-LSA; the selection of programmes should preferably relate to the interface of social and health care.
4.3 Recommendations for the Steering Group

The recommendations are formulated on the basis of the main research question in the Feasibility Study, namely whether there is sufficient congruence in the selected VET programmes and occupational profiles in all the participating countries to serve as a basis for an international large-scale assessment of VET (VET-LSA). This question was answered in the affirmative in terms of the general aspects of the selected VET programmes, occupational profiles and evaluation tasks corresponding to major core areas, however, it will apply in different ways and with additional conditions for some vocational areas. This will be specified in the following.

**Carmechatronics**

In all the participating countries, there are VET programmes corresponding very closely in the field of carmechatronics at comparable levels and with similar educational objectives. The different approaches applied in the Feasibility Study indicate high levels of relevance, representativeness and feasibility with regards to a possible future VET-LSA in the field of carmechatronics. Only a few insignificant restrictions became evident and it is recommended that these be analysed in more detailed in the next project phase.

**Electricians**

Against the background of the results presented above, the comparability of both occupations was confirmed. We recommend including both occupations in VET-LSA, since the students that choose one or the other can be expected to have clearly different cognitive preconditions. This would provide additional possibilities for statements about different educational levels within the same occupational field. Moreover, the inclusion of both occupations would allow for the participation of all eight countries.

**Business and administration**

For the broader occupational field of analysis, we come to the conclusion that despite the great diversity of national VET programmes and occupational profiles, business and administration can be recommended for an international large-scale assessment of VET (VET-LSA) with respect to the general aspects of VET programmes, occupational tasks, and qualification requirements. More information on national VET programmes and national educational targets is required in selecting representative evaluation tasks. The significant concordance of judgements on complexity is indicative of the acceptable fit of task standards. The international experts group in the final workshop agreed on six broad core areas: purchasing, sales/marketing, stock keeping, financials/accounting, customer service and organisational activities. It is also recommended that evaluation tasks in the six core areas be checked in subsequent steps, taking into consideration the evaluation tasks, occupational tasks and qualification requirements of high importance in further specifying the field.

**Social and health care**

Despite the breadth of the field, social and health care can be recommended for an international large-scale assessment of VET. The approaches consistently confirm that there is a solid basis for further steps in a possible future VET-LSA. There are suitable VET programmes corresponding closely in the occupational field of social and health care at comparable levels and with considerable congruence of educational objectives in all participating countries. It is recommended that programmes including social and health care be concentrated on and further evaluation tasks in the five core areas be checked, taking into consideration the evaluation tasks, occupational tasks and qualification requirements of high importance in further specifying the field.

**Outlook and further steps**

The comparative analysis in the Feasibility Study was focused on the one hand on comparable occupational tasks and qualification requirements for the labour market and, on the other hand, on evaluation tasks corresponding to major content areas in VET. For each occupation/occupational area common sets for each aspect were identified and provide the basis for subsequent steps in the next project phase.

The following steps are recommended on the basis of the results of the Feasibility Study for the next planning phase to prepare an international large-scale assessment of VET (VET-LSA):
It is recommended that a framework for item construction in each occupation/occupational field be developed. The frameworks should be based on the sets of occupational tasks, qualification requirements and core areas (Figure 4.3-1; inclusion of those items having reached at least threshold 3 in terms of “relevance”).

Further specification of the identified common ground (occupational, tasks, qualification requirements and core areas), in particular for the broader fields of business and administration and social and health care, is also recommended. The specification could be based on the following procedures:

- further specification of the educational level in each core area;
- checking possibilities for including modules (e.g. business and administration: core areas sales/marketing and organisational activities);
- checking further evaluation tasks in each core area;
- and others.

In addition, a number of helpful suggestions for a future VET-LSA were made in the national reports, which were confirmed during the final international workshop by all country representatives. It is recommended that the following aspects be taken into consideration in subsequent steps:

- For the measurement of domain-specific competences in VET, practical aspects are of major importance and should be included in the development of test items.
- For the implementation of VET-LSA, it is recommended that national coordinators be involved in the research process as early as possible. This should be included in the organisational structure of the project.

Given the tight timeframe of the Feasibility Study, we have all learned something about what is important for a future large-scale assessment of VET (VET-LSA), as pointed out convincingly in the Swedish Report (p. 58):

"Now when we are at the end of the road of this Feasibility Study, we all have learned a great deal and this is probably one important outcome. Now we are better acquainted with the “how, why and what questions” so that we can prepare and continue this important “assessment work”. We have also had the opportunity to discuss the meaning of important key concepts internationally and become aware that we interpret (of course) in different ways. In order to proceed with the VET-LSA, it is important that participating countries are given plenty of time for joint preparation. A well prepared study saves resources in the end. We have seen among workshop participants a strong interest in pursuing VET-LSA, not least to develop vocational education and to obtain transparency in VET systems. The project is also valuable considering the increasingly mobile labour market.”
References


Bulgarelli, A. (Ed.): Initial vocational education and training (IVET) In Europe-Review.


This publication is distributed free of charge by the Federal Ministry of Education and Research as part of its public relations work. It is not intended for commercial sale. It may not be used by political parties, candidates or electoral assistants during an election campaign. This applies to parliamentary, state assembly and local government elections as well as to elections to the European Parliament.

Improper use includes in particular the distribution of this publication at election events and at the information stands of political parties, as well as the insertion, printing or affixing of party political information. The distribution of this publication to third parties as a form of campaign publicity is also prohibited.

Regardless of how recipients came into possession of this publication and how many copies of it they may have, it may not be used in a manner that could be construed as showing partisanship on the part of the Federal Government in favour of individual political groups, even if not within the context of an upcoming election.