Feasibility Study VET-LSA

A comparative analysis of occupational profiles and VET programmes in 8 European countries

International report

(Please do not cite or disseminate)

Martin Baethge
Lena Arends
In cooperation with:
Andreas Schelten / Markus Müller
Reinhold Nickolaus / Bernd Geißel
Klaus Breuer / Stefanie Hillen / Esther Winther
Thomas Bals / Eveline Wittmann
Antonia Barke (statistical analysis)

Soziologisches Forschungsinstitut Göttingen

SOFI

Foreword

The final international report summarises the results of the Feasibility Study VET-LSA which was addressed to the question 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.

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 Koefoed, for Finland, Mari Räkköläinen, 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, Esther Winther and Frank Achtenhagen 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 Lorna Unwin and Annie Bouder for their helpful suggestions to improve this report.

After all 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, 10. July, 2009

Martin Baethge
Lena Arends

Table of contents

List of Tables, Figures and Boxes

Figures, Tables and Boxes Chapter 1

Figures and Tables Chapter 2

Figures and Tables Chapter 3

Figures and Tables Chapter 4

CHAPTER 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 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 done in the next project phase. The comparison is focused on a medium level of proficiency, i.e., initial VET programmes at ISCED level 3 and corresponding occupations that need 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:

- carmechatronic,
- electrician,
- business and administration, and
- social and health care

(Baethge, Achtenhagen & Arends, 2008; Baethge, Achtenhagen, Arends, et al., 2007; Baethge, Achtenhagen, Arends, et. al., 2006). Consequently, the Feasibility Study is focused on comparing occupational profiles and learning outcomes in the four selected vocational fields[1].

To understand the meaning and character of the Feasibility Study it seems useful to emphasise the impact of VET-LSA in the context of European VET policy and point out the differences of VET-LSA to recent research initiatives for comparing students and adults competences internationally. This will be done in the subsequent paragraphs (1.1 and 1.2) followed by a presentation of the research design (1.3), the implementation of the Feasibility Study (1.4) and the methods of analysis (1.5).

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

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

The European Commission has put forward 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 Qualification Framework (EQF) and national qualification frameworks, European Credit System for VET (ECVET), (2) European Quality Assurance Framework (EQARF), (3) improving 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 to increase transparency and comparability is the most visible and successful part of the Copenhagen process. The fundamental basis of these instruments is the shift to 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 progress report towards the Lisbon objectives it is emphasised that "internationally comparable large scale assessments 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 general consensus that indicators for measuring quality are key instruments for improving the quality of education and training necessary for the good governance of education systems and structures (e.g., European Commission, 2004). International comparative studies (e.g., PISA[3], IALS[4]) provide standardised and internationally comparable indicators to reveal the differences between the development of competences 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: 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 not specific enough for comparing outcomes of VET[5] (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 cross-country differences in the level and distribution of vocational competences could provide an empirical basis to improve classifications of learning outcomes in classification systems, such as EQF and ISCED.

2 Strategic goal for 2010 set for Europe at the Lisbon European Council – March 2000.
3 Programm for International Student Assessment.
4 International Adult Literacy Survey (IALS)
5 In particular ISCED 3B/3C, 4 and 5B.

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

During its council presidency in 2007, the German Government (Federal Ministry of Education and Research) adapted 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 developed in initial vocational education and training at 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)[6]. The concept was discussed in detail and accepted by national expert and coordinators responsible for the implementation of the Feasibility Study in all eight countries during the first international workshop 3./4. July 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 in Bonn (3.-4. July, 2008):

- 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 educational systems must address at the system level: the development of potentials for individual's occupational mobility, self-regulation and autonomy; the safeguarding of human resources in a society, and the warranty of social participation and equal opportunities. 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 competences in specific vocational areas not on entire VET.

6 To develop the concept for VET-LSA four international workshops were conducted: International Workshop VET-LSA, Berlin, 23.-24. April, 2007; International Workshop PISA-VET, Goettingen, 28.-30. April, 2005; International Workshop PISA-VET, Goettingen, 18.-20. November, 2004; International Workshop VET-LSA, Bonn, 29.-30. October, 2007.

- VET-LSA seeks to assess competences in specific occupations and across domains required for successful participation in the world of work in the in the twenty-first century[7] 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 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 and knowledge about structures of organisations and labour markets, interacting in groups and acting autonomously in work situations (Baethge, Achtenhagen, Arends, 2007)[8].Institutional and individual context factors are fundamental for young adults' competence developments. 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 system-, school-, and instruction characteristics as well as 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 new tests have to be developed[9]. The proposed item format is a realistic task in a computer-simulated work environment[10]. The main advantage of this format is the short testing time (approx. ½ 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[11]. It ensures that the test measures the concept that is intended 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 panel waves (one at the beginning of VET, a second at the end of VET and a third 2 to 4 years after entering the labour market), is considered the "gold standard" for a comparative large-scale assessments 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

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 competences relevant for all vocational areas it should be taken into consideration that some cross-occupational competences are performed domain-specific (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.

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 entering 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[12] was estimated (see Baethge, Achtenhagen, Arends, et al., 2005, p. 105). For the selection of vocational areas the aim was to include the most important industrial/technical, commercial/administrative, and care occupations in the sample, which lead to a first selection: 1) industrial/ technical occupations in industry and trade, 2) commercial and commercial/administrative occupations in commerce and other services, 3) healthcare occupations in the field of individual-related services, and information and communication 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 are 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[13], 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): within 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 real-life context; the PIAAC initiative aims to measure competences among adults with the focus on core adults competences required in the information age: problem solving in technology-rich environments, literacy, numeracy, reading general (Schleicher, 2008; OECD, 2008c). Neither PIAAC nor PISA aims to measure young adults' competences in specific vocational areas[14].

12 The exact sample size in each country based on subsamples of different VET-programs, 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 depends on the method for implementation (household-based cluster survey, number of controlled variables. The model calculation is based on institution-based random sample, including all relevant variable (Kühnel expertise, Annex D in Baethge, Achtenhagen, Arends, et al., 2006).

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; range 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.

Table 1.2.-2: VET-LSA in the context of recent comparative studies in education

PISA	VET-LSA	PIAAC
students (aged 15-16) 4.500-50.000 per country testing time: about 2 h.	young adults (aged 19-30) appr. 1.600-2.000 per country testing time: about ½ day	adults (aged 16-64) 5.000 per country testing time: about 1-1.5 h.
direct assessment of reading, mathematics, science	direct assessment of domain-specific and cross-occupational competences in selected vocational areas	direct assessment of problem-solving in technology-rich environments, literacy, numeracy, reading
optional modules: learning progress over time, instructional aspects, ICT use of technology	direct assessment of basic competences	indirect assessment of skills used at work (JRA)
background questionnaire	background questionnaire	background questionnaire
-> computer-based assessmant in 2012		

Whereas the aforementioned international large-scale assessment programmes are representative for a countries student and/or adult population, the World Skills International[15] is centred on the most excellent VET students in different countries. Test instruments are designed for skill measurement in a competition, not for 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 upon well-grounded research traditions and internationally validated concepts, e.g., standards in education, VET cannot draw upon comparable concepts (Baethge, Achtenhagen & Arends, 2008).

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 possible future VET-LSA, it is not sufficient to compare contents of VET in terms of vocational curricula; the contexts for VET differ markedly and VET operates in multiple ways – even in

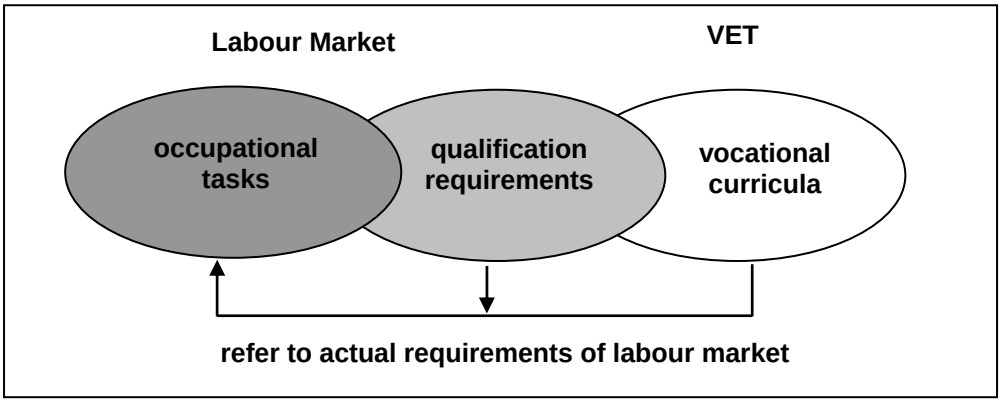
15 http://www.worldskills.org/

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 task 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[16], the corresponding occupational profiles are in some countries broader/narrower than in others. In the less specified vocational fields, 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 to prepare 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 are between occupational profiles and corresponding VET programmes in participating countries is not known.

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

Figure 1.3.-1: **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, are needed for two reasons: first, 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 3 to 4 years after completing VET. Second and more important, 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

16 E.g., it is a difference whether work organisations in firms are rather rooted in the Tayloristic tradition or guided by complex occupational tasks.

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 for 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, e.g. improving the links between VET and the labour market is one of the major objectives in the Bordeaux Communiqué).There are a number of approaches for comparing occupational profiles and educational contents internationally. In the following two paragraphs the most important approaches are discussed against the background of the Feasibility Study.

1.3.2 Approaches for comparative analysis of occupational profiles: ISCO and O*NET

For comparing occupational profiles internationally descriptors are often used in occupational classification systems and wage groups[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 international 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 organized into sub-major, minor and unit groups (ILO, 2008).In the Feasibility Study the updated version ISCO-08[18] was used in a first step for agreement on common jobs. However, for a comparative analysis of occupational profiles in different national contexts ISCO is not elaborated 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 specifics 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 others. 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 within official VET systems in foreign countries (Luomi-Messerer & Markowitsch, 2006; Markowitsch, Becker, Spöttl, 2006). A pilot matrix for “Mechatronics”[20] and

17 e.g., ERA wage agreement in Germany, IG-Metall Bezirk Baden Württemberg (2004).
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 is used in the Feasibility Study.
19 http://www.disco-tools.eu/
20 Drafted in a workshop together with experts from Germany and Austria

"Technician middle management WEI Mechanical engineering constructions and machines"[21] has been developed up to now.

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

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 at identifying 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 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 skill measurement in PIAAC. The principles underlying the Job Requirement Approach (JRA), which is being used for decades for qualitative and quantitative labour requirement analysis, were mainly adapted 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 1.100 occupations and contains linkages that crosswalk occupational titles to eight other classification systems (DOT, MOS, OPM, etc.). The o*net database is being updated on a regularly scheduled basis. These updates occur as a result of the Data Collection Program currently underway. Updated data for the ninth subset of occupations is now included with the 13.0 release. A tenth subset of occupations will be updated as a part of the next major database release, expected in June 2009[22].

For identifying a common basis for comparison in the Feasibility Study, 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. 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 being proposed for PIAAC).

21 Dutch secondary vocational Qualification.

22 The ninth major update from the O*NET Data Collection Program 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 Context 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.

1.3.3 Approaches for comparative analysis of learning outcomes at the end of VET

In addition to occupational tasks and qualification requirements educational contents of VET need 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). The 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. Even though most European countries have either embarked 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[23] 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 contents 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 to shape mathematics curricula in 50 nations[24]. 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[25].

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 major educational outcomes VET, not a collection of possible test items for a possible future VET-LSA[26].

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 years. 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.

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 & Wolfe, 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.

1.4 Implementation of the Feasibility Study

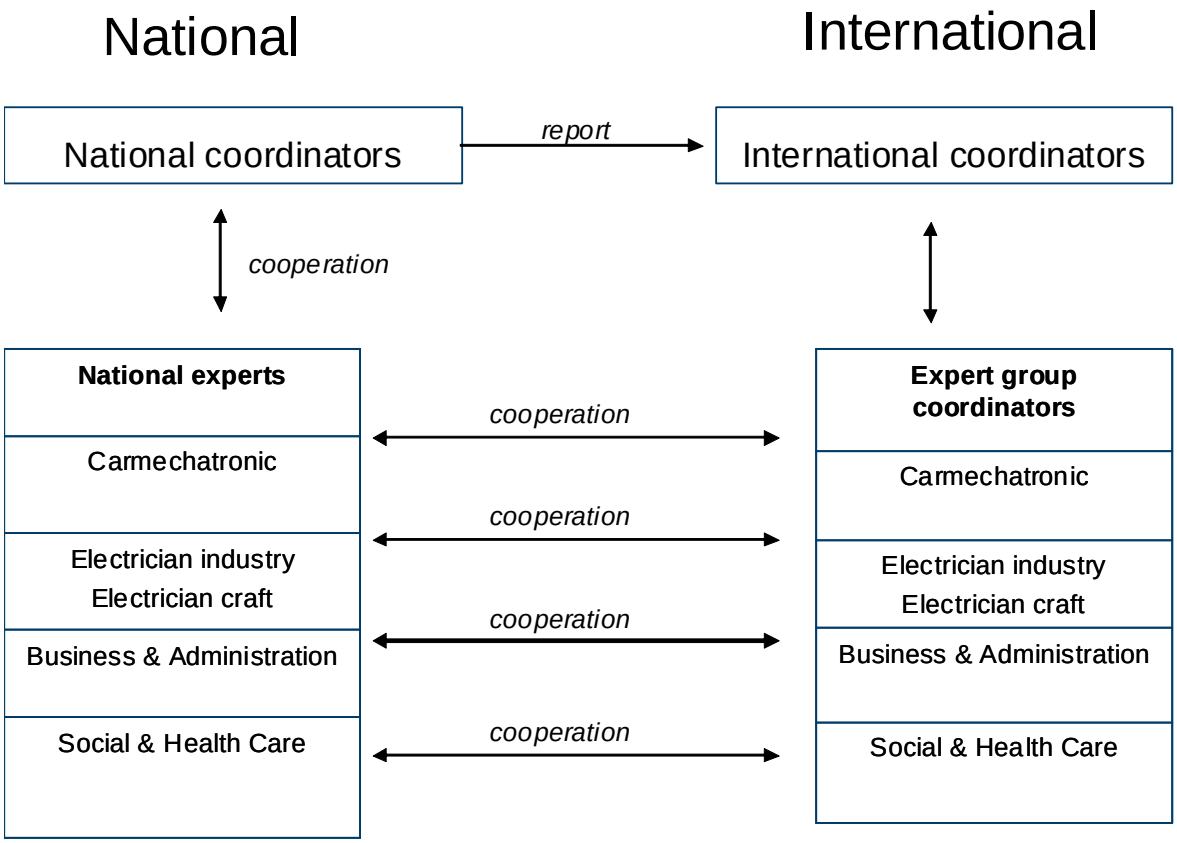
The main objective of the Feasibility Study is to find a common basis for comparison of vocational areas in participating countries. International comparative surveys in education show that implementing qualitative research methods is a challenging task. A balance must be struck between meeting countries 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.

In the following paragraphs the methods for ensuring comparability of procedures across countries in the Feasibility Study are illustrated.

1.4.1 Organisational structure

The organisational structure for implementing the Feasibility Study follows the structures typically applied in international large-scale assessments (e.g., PISA, PIAAC), distinguishing between the international level, in charge for 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.-1).

Figure 1.4.-1: **Organisational structure Feasibility Study**



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[27]. 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[28].

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 3./4. July 2008 in Bonn with all 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 expert in a first national workshop in each vocational area (total of 4 workshops per country). Moreover, selected national evaluation tasks (max 10) will be rated as a basis for selection of an international set of evaluation tasks for rating during the second national workshop.
   - 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 in a follow-up of 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.
2. The second international workshop for national coordinators on 14. October, 2008 was held in Berlin with the objective to discuss and revise the research tools, clarify the procedures for data collection, discuss the structure of the national reports and revise the timetable for the Feasibility Study.
3. The third international workshop for national experts was held on 14. January, 2009 in Berlin. The aim was to compare and discuss the results of the first national workshop and

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 will be available at the VET-LSA homepage: www.vet-lsa.uni-goettingen.de within short time.

to agree on a procedure for selecting the international set of evaluation tasks for the 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 should be submitted in the form of a 1/2 page summary in English to the international expert group coordinator. The proposal for selection of 15-20 tasks by the international expert group coordinator was submitted to the expert group for agreement as follow up via e-mail.

4. The final international workshop on 5.-6. Mai, 2009 in Bonn was 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 recommendations for the Steering Group were confirmed by the participants (for detailed Minutes of each international workshop see Annex 1).

Expert ratings were collected during two national workshops per vocational area in each participating country. The *first workshop* was addressed to actors from the world of work (e.g., professionals, supervisors, trainers in companies), actors in VET (e.g., teachers, school principles) 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* was addressed to 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 power point 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: qualitative approach with quantitative elements

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

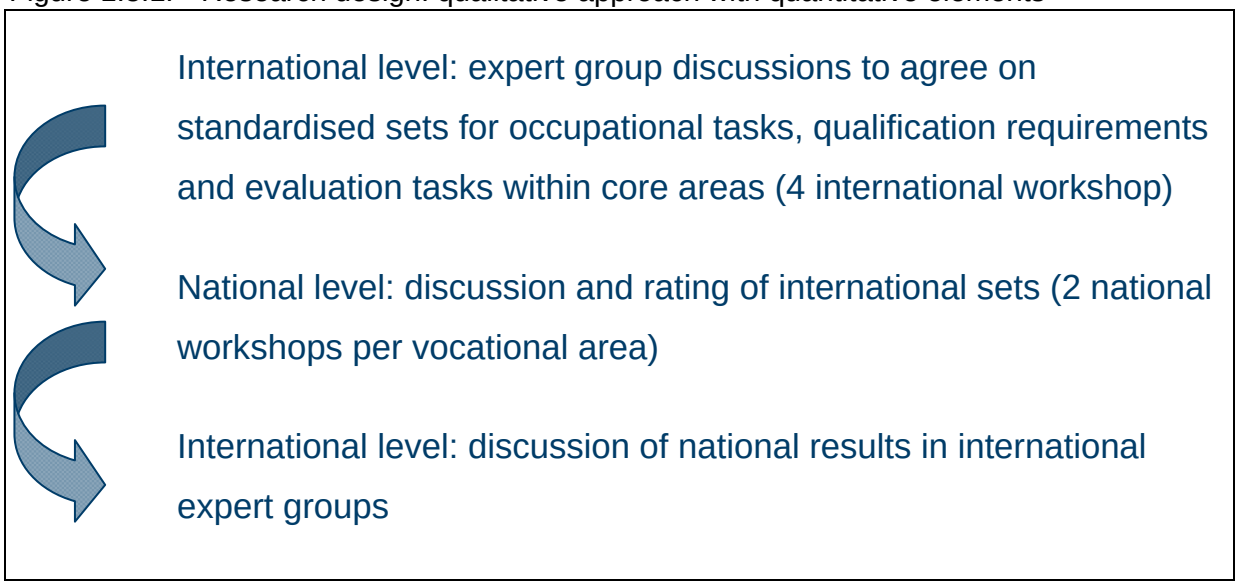
To identify common occupational tasks, qualification requirements and learning outcomes at the end of VET in participating countries a qualitative empirical approach on the ba-

sis of expert ratings was proposed. In addition, quantitative methods were selected to support the results of qualitative analysis. Thus, quantitative data must be interpreted with care.

Due to the size of participating countries and the national specifics in each of the selected vocational field, it was decided among national coordinators to select small samples of national experts for each occupational field (e.g., minimum 7 for the first national workshop)[29]. The selected qualitative approach comprises three steps:

- The international coordinators and expert group coordinators are responsible for all strategic decisions. To ensure international comparability standardised sets of occupational tasks, qualification requirements, and evaluation tasks were identified and agreed upon in each expert group and rated by national experts in each participating country subsequently.
- To incorporate national specifics, 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 upon in each international expert group[30].
- The discussions in expert groups during the three international workshops provided a forum for analysing domain-specific aspects of comparability and national specifics. 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-scales assessments for the development of conceptual frameworks (e.g., PISA, PIAAC) to specify the domain for assessment.

Figure 1.5.1: Research design: qualitative approach with quantitative elements



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.

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.

For the Feasibility Study, a limited number of experts for each vocational area can be considered sufficient and representativeness[31] 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 methodological premises were confirmed: there was consistently high consensus among the experts in all four occupations[32]. However, to ensure that there is enough coverage in each vocational area, which is a precondition 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

The selection of experts for small samples must be done with particular care. For both national workshops experts were selected according to the following criteria:

- A minimum of 7 experts should do the rating per vocational area in the first national workshop. The number of ratings for the second national workshop should be higher than for the first national workshop to include representatives from the policy and administrative level (including social partners).
- Participants of the first national workshop should consist of professionals in the vocational field including teachers in vocational schools, professionals (e.g., supervisors, trainers) and researchers. In addition to the participants of the first workshop the second workshop should be addressed to 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. This way a relatively homogeneous sample of experts could be provided in all participating countries.

31 E.g., for the selection of the sample, aspects of firm size, sub branches, 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 3.3.4.

Table 1.5.-1: **Sample of experts by job function/institution and vocational area (absolute numbers)**

1st national workshop	**Teachers in vocational schools**	**Professionals in companies**	**Representatives from vocational/further education institutions, examination boards, education committees, social partners, administration, researchers**	Total
Carmechatronic	39	21	23	83
Electrician Craft	22	15	21	58
Electrician Industry	19	15	24	58
Business & Administration	20	18	28	66
Social & Health Care	34	26	17	77
Total	134	95	113	342

2st national workshop	**Teachers in vocational schools**	**Professionals in companies**	**Representatives from vocational/further education institutions, examination boards, education committees, social partners, administration, researchers**	Total
Carmechatronic	24	20	32	76
Electrician Craft	22	16	27	65
Electrician Industry	18	9	27	54
Business & Administration	22	14	34	70
Social & Health Care	20	8	56	84
Total	106	67	176	349

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. Even though the specific composition according to the three groups varies in some countries (Table 1A-5), this is due to national specifics of VET organisations. In total 342 experts participated in the first national workshop and 349 in the second national workshop. Increasing numbers of participants not directly involved in VET were reached in the second national workshop. This was important to ensure qualitative control of ratings from the first workshop. Reaching a minimum of 7 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 pre-condition for successful cooperation across national and institutional borders (e.g., EQF, EQARF). To ensure that all actors involved in the Feasibility Study have a mutual understanding of the basis for comparison, an empirical approach was implemented: in a first step, an agreement was reached in each expert group regarding a common set of occupational tasks and qualification requirements for the labour market, in a second step, an agreement was reached in each expert group regarding a common set of evaluation tasks at the end of national VET programmes at ISCED level 3 according to major core areas; in a third step the 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

As an overarching frame of reference for the identification of comparable occupations and corresponding occupational tasks and qualification requirements, two job classification systems were used: 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.

In each vocational area an agreement on sub-major and minor groups with ISCO 08 was reached in a first step. The selected ISCO codes for each occupation are displayed in Table 1.5.-2:

Table 1.5.-2: **Selected occupations according to ISCO 08**

Vocational area	**ISCO codes and title**
carmechatronics	7231 Motor Vehicle Mechanics and Fitters
electricians industry	3113 Electrical engineering technicians 3114 Electronics engineering technicians
electricians craft	7411 Building and related electricians 7413 Electrical line installers and repairers
business and administration	33 Business and administration associate professionals
social and health care:	53 Personal care workers

As an overarching frame of reference for determining common occupational tasks and qualification requirements on the labour market corresponding to the occupations selected from ISCO, o*net was chosen. 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* gives information on how most people get into the work, how much overall experience, education, and how much on-the-job training people need to do the work. In the Feasibility Study occupations at levels 3 (occupations that need medium preparation) and 4 (occupations that need considerable preparation) were included.
- The *specific vocational preparation* (SVP) range gives details of the amount of lapsed 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-worker situation. This training may be acquired in different environments (e.g., school, work, institutional, vocational)[34]. In the Feasibility Study occupations at SVP ranges 6 and 7, which include over one year up to including four years of specific vocational preparation, are included.

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

33 More details for carmechatronics are provided in Chapter 3

34 It does not include the orientation time required of 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.

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 skill level accessible for VET programmes at ISCED level 3.

To take into account the specifics of the European labour market, the descriptors were adapted in each international expert group (details of agreement process in each vocational area Chapter 3). The basis for the identification of relevant occupational tasks is the data collection with a standardised instrument agreed upon 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 (see 1.4.2). To take into account country specifics workshop participants had the opportunity to add additional occupational tasks/qualification requirements of major importance for the national setting in 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)[35] and “frequency” (1=several times a year; 5=several times daily)[36]; the sets of qualification requirements were rated regarding “relevance”.

Example Carmechtronic:

Selected o*net occupations:

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

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

35 During the second national workshop it was agreed to exchange “importance” with “relevance” to be more precise in meaning.

36 The 7 point scale from O*NET was adapted to a 5-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)**

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

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?").

From the selected o*net occupations the following *qualification requirements* were selected and adapted to the European setting (domains-specific qualification requirements were enriched with examples):

Table 1.5.-4: **Qualification requirements adapted from o*net for carmechatronics (Research Tool 1)**

Nr.	Qualification requirements (O*NET knowledge descriptors)	How relevant is the qualification requirement for carmechatronics to perform successfully on the labor market?					
		not relevant	somewhat relevant	relevant	very relevant	extremely relevant	no answer
1	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 analyzers, leak testing equipment; assembling tools adjustable wrenches, specialty wrenches, pneumatic impact wrenches, pullers, torque wrench, screwdrivers, brake repair kits*						
2	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 emission, 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*						
3	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, regulations 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 und 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 und security systems*						
4	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 und nonverbal communication, rules of communication and negotiation, conflict avoidance*						
5	Mathematics — Knowledge, skills, and abilities of arithmetic, algebra, geometry, calculus, statistics, and their applications.						
6	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.						
7	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.						
8	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.						
9	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.						
Please add qualification requirements of major importance in the national setting not mentioned in the list (maximum 3)!							
1							
2							
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 to perform successfully on 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, were sometimes considered too abstract. A throughout discussion proved that there is one theoretical 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 being updated on a regular basis, is not incidentally but mirrors recent changes in occupational tasks and more importantly of qualification requirements: today's world of work is characterised by increasing knowledge intense work processes which requires in depth knowledge to fulfil these demands. This is being emphasised in a number of papers on 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 overemphasise the theoretical perspective, o*net descriptors were adapted to the Feasibility Study by modifying items and incorporating national specifics of participating countries.
- Moreover, options for adding additional items during national workshops were provided in both research tools[37]. 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

For the selection of national VET programmes ISCED was used as an overarching frame of reference: "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 lead 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 years. To compare educational levels at the end 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. For 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 carmechatronic:

From all participating countries a total of 16 tasks corresponding to five core areas were selected and agreed upon in the international carmechatronics expert group (Figure 1.1.-5). The core areas are:

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

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

Table 1.5.-5: **International set of evaluation tasks for carmechatronics corresponding to major care areas (Research Tool 2)**

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

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

- Is the task a representing one of the core areas?
- Is the task considered relevant for the occupational tasks and qualification requirements (Research Tool 1) in the labour market?
- Are the tasks independent of national specifics (e.g., national law)?
- Is the length of the task feasible for expert ratings during the second national workshop?
- Are tasks from all participating countries included in the selection?

To be able to include different task formats (e.g., students projects) and reduce translation efforts, national experts were asked to provide 1/2 page summary of the task in English. The proposal for selection by the international coordinator was agreed 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 4-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, 4-point scales were applied[38]. The research tools were translation into the national language in almost all countries[39].

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 it was questioned whether the selected core

38 For reasons of confidentiality for some evaluation tasks, research tool 2, with the original items cannot be provided in this pdf document but will be displayed in full length in the Annex of the final publication.

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

areas could cover all major aspects of the selected national VET programmes. This question can be answered empirically and systematically as follows:

- The international set of evaluation tasks was developed empirically in each international expert group: all national experts were asked to submit national evaluation tasks corresponding to the core areas for their selected VET programme. From all national evaliation tasks, the international expert group coordinator selected a set of tasks[40] 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 contents in all national VET programmes.
- From a theoretical point of view, the high coverage of rating for evaluation tasks across countries is not surprising. There is a long-standing international debate in social science whether there is rather a tendency towards 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 tasks profiles and qualification requirements due to the globalisation of markets and ubiquity of technologies in modern societies. This does not imply that national specifics of VET do not play a role any more; there still remain some national specifics concerning types of work organisation within the ubique tendency towards concordance. With regard to a possible future VET-LSA, in particular converging aspects of different VET programmes, which presumably also correspond with major aspects of national VET programmes in participating countries, are of main importance.

1.5.4 Qualitative and quantitative analysis of results

Qualitative analysis

Qualitative analysis was integrated in 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, e.g., resulting in adaptations of items in the research tools.

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

At 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

40 According to the following criteria: is the task representing 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? Is the task independent of national specifics which cannot be applied for other countries?

discussion during the final international workshop was used for agreement on a common interpretation of results.

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

From the raw scores of each country, means and mean absolute deviations for each item were calculated per 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.

From the country means the **mean of country means**[42] and the **mean absolute deviation of country means from the mean of country means** was computed 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 WS2: 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 ordinal scale level. In case of missing country means for individual items the item was omitting 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 tasks complexity.

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 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.

Accordingly, the results for each vocational area are reported in Chapter 3.

Box 1-1: **Glossary of statistical concepts applied in the Feasibility Study**

For each country we calculated individually:

Country means	Arithmetic average of all ratings for each item in one country
Calculation	The sum of all ratings for each item divided by the number of ratings
What does this tell me?	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
Mean absolute deviation within countries:	Average deviation (in absolute values) of the individual ratings for each item in a country from the country mean
Calculation:	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
What does this tell me?	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

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

Mean of country means:	Arithmetic average of the means of all participating countries for each item
Calculation	The sum of all country means for each item divided by the number of countries.
What does this tell me?	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.
Mean absolute deviation of country means from the mean of country means	Average deviation (in absolute values) of the individual country means for each item from the mean of country means
Calculation:	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.
What does this tell me?	The mean absolute deviation of country means from the mean of country means is a measure of how much – on average – the countries disagree with regard to the item. A higher value signals more disagreement between the countries.

Non-Parametric Statistical Methods

Kendall's concordance coefficient W	Measure for concordance between a small number of raters for data on an ordinal scale level. Kendall's W is takes values between 0 and 1. The required ranks were calculated from the means of the individual items for each country.
What does this tell me?	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.
Average Spearmen's correlation	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.

CHAPTER 2

National VET systems of 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 regarding 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
- transitions to the labour market[44].

2.1 VET as part of the national education system

VET systems are embedded in national education systems. Depending on the link with institutions of general education, VET can be rather integrated in the education system or institutionally separated. 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, US), VET is rather based on broad concepts of vocational competences whereas in those countries with VET systems institutionally separated from the system of general education (e.g., Germany, Austria) VET is rather 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 hypothesis of possible outcomes in both systems; in a possible future VET-LSA these hypothesis must be validated empirically.

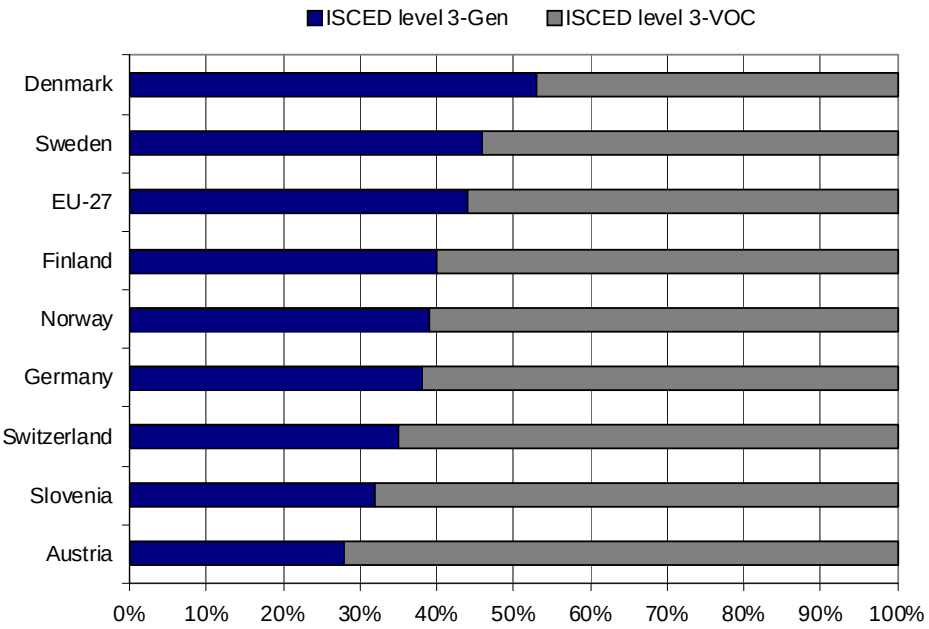
The relationship between VET and general education in participating countries can be characterised according to:

44 For institutional factors of quality and effectiveness in VET see Baethge, Achtenhagen, Arends et al 2005 p. 60 ff.; Lipinska, Schmidt & Tessaring, 2007.

- 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[45], 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 participated in vocational education within upper secondary education.

Figure 2.1.-1: **Participation in general and vocational education at ISCED 3 (percentage of total participation in ISCED 3)**



Source: Eurostat, EU LFS, 2004; CEDEFOP, 2007

Learning arrangements in VET vary to a large extent in participating countries and very often within one country: on the one hand, regarding the division between training at the workplace and learning in vocational schools, on the other hand regarding 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 large periods of practical training in firms)[46]. 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

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.

given, they vary according to specific VET programmes and institutional settings. 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 about 15%, Slovenia max. 24%)[47]. This shows that in a possible future VET-LSA, different organisational/learning arrangements and institutional settings have to be analysed carefully in each of the selected four occupations/occupational fields.

The Swedish and the Finish report state that all national progammes give basic eligibility to higher education after successfully completing the programme, in Slovenia secondary technical education provides possibilities for accessing higher education; 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: e.g., in Germany only 1% of apprentices without entrance qualification for universities access higher education. To create new bridging mechanisms, e.g., 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. After all, there are possibilities for accessing post-secondary education at ISCED level 4 in most countries.

It can be assumed that possibilities for accessing higher education 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.

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**

	Austria	Denmark	Finland	Germany	Norway	Slovenia	Sweden	Switzerland
	apprenticeship dual system (1/3 of students)	apprenticeship pathway in dual system	vocational institutions (combined with learning in the work-place) 82% of all VET-students	apprenticeship in dual system (appr. 70% entrants 2006)	9 VET programmes main model: 2 years at schools followed by 2 years apprenticeship	short cycle vocational education (2 years)	13 national VET oriented programmes organised by schools	apprenticeship in dual system (appr. 84% in 2007)
Strukture of VET upper secondary education ISCED 3*	upper-level full-time VET-colleges (1/3 of students)	school pathway in colleges (5 types: agricultural, commercial, social and health care, technical, combination colleges)	competence-based VET (for adults with previous work experience) 18%	school-based VET, in particular in service occupations (appr. 30%)		secondary vocational education (3 years) vocational technical education (2 years)	apprenticeship (appr. 6.000 apprentices**)	school-based VET (16% in 2007)
	intermediate full-time VET-schools (10%)		alternative-apprenticeship			technical secondary education (4 years)		
Duration (average years)	**3.5 - 4**	**3-4**	**3**	**3-3.5**	**4-4.5**	**2-4**	**3**	**3-4**

* all national VET programmes were classified at ISCED level 3: two at ISCED level 3A/B, three at ISCED 3B and three at ISCED 3C. In the Finish national report it is emphasised that that upper secondary vocational qualification provides "general eligibility for further studies at politechnics (new universities) and universities" (p.6) which would include ISCED level 3A; nevertheless all national VET programmes were classified at ISCED level 3B. In the Swedish report it is stated that all VET programmes give basic eligibility to higher education. Therefore, all Swedisch and Finish programmes ar classified at ISCED level 3A/B in this report.

** pilot work covering education starting 2008-2010 – not a part of the ordinary system. The plan is to introduce apprenticeship education as a regular study path from autumn 2011 (not decided yet)

Table 2.1-2: **Entry rates at tertiary level in participating countries (in 2006)**

County	Tertiary-type A*	Tertiary-type B**
Austria	40	9
Denmark	59	22
Finland	76	- (a)
Germany	35	13
Norway	67	- (n)
Slovenia	46	43
Sweden	76	10
Switzerland	38	15
OECD mean	56	16

Source: OECD, Education at a Glance 2008b, Paris, Tab. A 2-5.

* 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.

A comparison of entry rates at tertiary level type A[49] and B[50] shows that low entrance rates below OECD average (e.g., Austria, Germany, Switzerland) correspond with high shares of dual VET participants within upper vocational education. Whether there is a causal relation between the focus on general education subjects in school-based VET systems and higher entrance rates at 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.

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)[51].

In general, three types of regulation and governance can be distinguished, as the dominant influence may come either from the state, the market or the 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.)[52]. However, the fact that decisions on fundamental structures of VET management (e.g., financing, standards and norms) are driven by governments is not questioned in this

49 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.

50 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.

51 Approaches for evidence-based policy were reported, e.g., by Switzerland.

52 For VET-LSA it is not intended to transfer the Welfare Production Model by Esping-Andersen (1990) to VET since classifying different of states to regime types is not valid enough as in the case of welfare-state regimes (for discussion e.g., Arts & Gelissen, 2002).

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-led systems state governance is limited to framework legislation without participating 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 idealtypes, such as the one of welfare states by Esping Anderson and VET systems by Greinert are too complex or even holistic to represent the governance types of the eight countries participating in the Feasibility Study. They tend to give "a birds 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 with different degrees: Sweden constitutes one pole with the main influence from the 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 in between the two poles. In addition, one has to keep 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 in boards of vocational education and training and very often in implementing and monitoring VET. For example, in Germany, 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 legislation[53]. Strong involvement of social partners in the development and validation of qualifications as well as 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 counterpoint to the corporatist model. For example, in Sweden, 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 coming from the 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

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

with corporatist governance systems there are large differences regarding the level of decentralisation: whereas in Denmark and Finland steering is rather decentralised Germany is characterised by state wide regulations for implementing VET on the basis of centralist traditions – even though decentralised activities within the chambers of industry and commerce or craft exist. In Finland, corporatist decentralisation is demonstrated, e.g., by the fact "that each VET provider has to establish a local board including representatives of working live" (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). Typically in countries with dual VET systems, enterprises are responsible for funding work-based training[54], whereas the school-based part is funded by the government. In the past decade, public financing of work-based training increased and in-company training was subsidised by national governments more often (e.g., Austria, Germany) to get over difficult times.

From a governance point of view, private financing can either refer to single enterprises or collective arrangement among employers, which is the case, e.g., in Denmark or for some VET programmes in Germany (e.g., construction). The majority of private financing is based on individual financing models in enterprises, which subsumes 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 of vocational full-time vocational schools in the majority of countries (e.g., Austria, Denmark, Germany).

There are very few comparable 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 for VET[55], e.g., 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 get estimates for purchasing power and currencies between countries. Nevertheless, proxy figures were provided in some national reports, illustrating remarkable differences of annual costs per student across countries. The highest costs can be reported for dual VET in Germany (total 10.900 EUR per year; for school-based VET 5.800 EUR per year). In Denmark the costs amount to 5.500 for commercial programmes and 8.400 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 EUR[56]. 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.

54 In Norway, subsidies are provided to firms by the government: 500 EUR per month for one student.
55 The difficulties of exact estimations of VET costs are discussed in e.g., in CEDEFOP 2009, p. 50.
56 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 background variable in the project design for a future VET-LSA.

Measures for quality monitoring in participating countries consist of all 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, and measures for improving cooperation between VET providers, reporting and counselling. With regard to a possible future VET-LSA one can assume that quality management closely linked to VET processes will 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 is a major focus in all national reports. The development of standards for VET and assessments of quality in VET is more a focus than 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. Very often, training is 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 is 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 a focus due to the revision of training occupations and the corresponding development of occupation specific standards in the past decades.

After all, approaches for quality assurance in VET in participating countries differ. Therefore, statements must be formulated carefully here. These differences mostly refer to the relation between centralisation by standards with decentral implementation in local institutions. For example, in the Danish report 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. 11).

Implementing quality monitoring within a national framework at the local level is demonstrated in the Finish 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 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[57]. A further approach for improving quality of VET was the introduction of "skills demonstration" into all upper secondary VET qualifications to provide a link between working life and assessment of student's vocational skills. VET providers are requested to publish the main results of evaluations and performance-based financing systems are becoming increasingly prevalent (national report Finland, p. 12-15.)[58].

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

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 the specific economic and policy development path – in particular in the German and the Slovenian report. 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 implemented once by Yugoslavia, is reflected by the current difficulties to increase work-based training. The specifics of VET and employment structures in participating countries are illustrated 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 solid basis for an international large-scale assessment of VET(see Chapter 3)[59].

2.5 Links between VET and the labour market

Improving 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, characterised by increasing insecurity and volatility due to globalisation and structural

57 Methods for self-evaluation are also favoured in Switzerland.
58 References for outcome-orientation was reported, e.g., in the Austrian national report (QIBB programme in full-time schools/colleges).
59 Except for Norway with low numbers of graduates in the VET programme for Electricians industry.

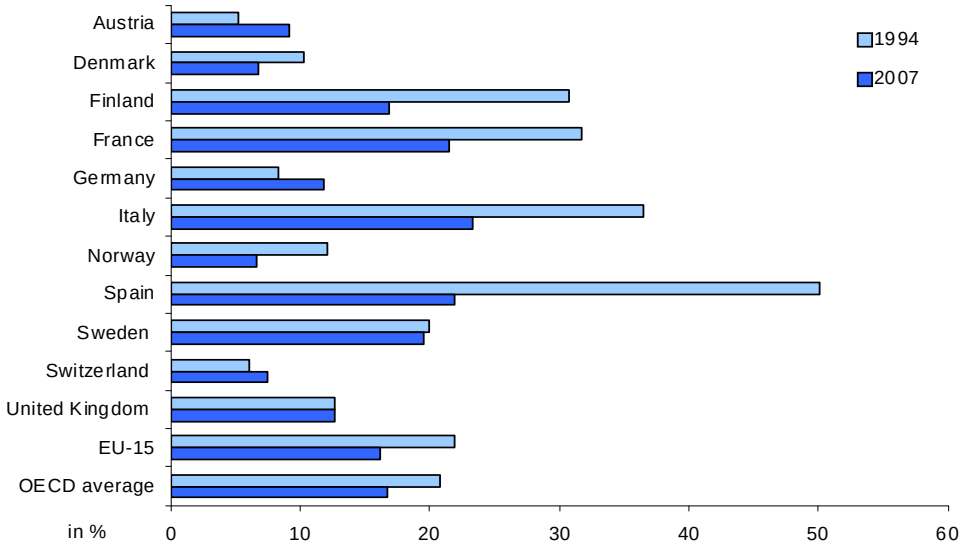
changes in the economy, matching processes have become more difficult in many countries. Therefore, it is not surprising that this issue is discussed directly or indirectly in all national reports.

In international reports of comparative statistics (e.g., OECD, 2008b) youth unemployment rates are typically used as indicators for transitions from education to the labour market. Figure 2.1-2 shows that there are large differences in youth unemployment rates since 1990 in participating countries: whereas in German speaking countries youth unemployment rate increased, decreasing numbers were reported in Scandinavian countries and the EU-25 average during this period[60].

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 support smooth transitions from education to the labour market[61]. On the other hand, high youth unemployment rates in 2007 indicate that the close link between VET and the labour market became looser in dual systems. Opposite tendencies in Scandinavian countries could be explained by organisational aspects of education, better transition systems or general labour market developments.

In a future VET-LSA youth unemployment rates will be an important indicator in a two-fold way: on the one hand, for comparing youth unemployment rates within the vocational areas of comparison, 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 are less attractive to young adults than occupations with lower rates which also impact VET. Dealing with youth unemployment and problems of transition from education to the labour market shapes national VET systems and, requires major attention in VET policy.

Figure 2.1-2: **Youth unemployment rates 1994 and 2007 by selected age groups 15 to 24**



Source: OECD Employment Outlook 2008, p. 345 ff. own modifications

60 Except Sweden which remained the same.

61 Concerning 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 the youth unemployment rates to a certain extent. For the interpretation of youth unemployment rates in countries with traditional dual VET systems this must be taken into account.

In the national reports, 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 the Slovenian report. Measures for reducing the mismatch between VET and the labour market are, 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). Whether decreasing youth unemployment rates in those countries can be attributed to these measures cannot be answered here. In a possible future VET-LSA transition management in VET systems must be included as 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/B, 3B, 3C) and the corresponding VET programmes and occupational profiles are considered 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 for explaining differences competence measurement results.

Indirect background factors mainly subsume different governance structures, e.g., the extent and type of participation of social and economic groups or the relation between central and decentral steering, the type of financing with regard to amount and expenditure of resources. Moreover, indirect factors include permeability to higher education and links to the labour market. They 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 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. Supposed, quality monitoring has a major impact on VET outcomes, participating countries could learn a lot from one another.

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 coverage in terms of formal requirement 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[62] from Austria, Denmark, Finland, Germany, Norway, Slovenia and Sweden[63].

3.1.1 Specifics of national VET programmes for Carmechatronics

The participating countries provided information about their VET programmes for carmechatronics illustrated in Table 3.1-1. On a whole, the selected programmes are meeting the determined profiles of reference. The total durations of the VET programmes range from 3 to 4 years. All programmes are classified at ISCED level 3 (two at 3A/B, two at 3B, three at 3C)... Thus, all selected programmes provide access to at least ISCED levels 3A/B or 5A (e.g., craftsman's master education or technical college) or higher (e.g., polytechnics). To access carmechatronics programmes at least completed compulsory school education is required.

The number of graduates varies between 500 (Slovenia and Norway) / 732 (Denmark) and about 18.000 (Germany)[64]. Thus, as regard to a possible future VET-LSA it would be feasible to draw a sample of 400 for carmechatronics from each of the selected national VET programmes. Regarding the organisation of the programmes (respectively programme periods), different types can be distinguished[65]:

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

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

63 Switzerland did not take part in the field of Carmechatronics in the feasibility study: "Unfortunately the Swiss Automotive Association (AGVS) did not take part in the feasibility study. Managers responsible for AGVS's VET programmes nevertheless expressed interest in the study. They feel that the content of the VET programmes for mechatronics engineers is not so different from that of equivalent VET programmes in Germany. This statement was confirmed in bilateral meetings. Therefore, the results of the feasibility study from Germany can be applied to a certain degree to Switzerland.

64 Estimated number.

65 Leaving apart competence-based programmes in Finland.

Table 3.1-1: General information on VET programmes – Carmechatronics

	Austria	Denmark	Finland	Germany	Norway	Slovenia	Sweden	Switzerland
Title of VET programme	KFZ-Techniker/in	Mechanic: cars / trucks	Vehicle Technology (Autoalan perustutkinto)	Kfz-Mechatroniker/-in	Car mechatronics: light/small vehicles (lette kjøretøy)	Car mechatronic (Avtoserviser)	The Vehicle Program	Automobil-Mechatroniker/in EFZ
Total duration (years)	3,5 years	4 years	3 years	3,5 years	4 years	3 years	3 years	3 years
Number of graduates	in 2007: 1.976	in 2007: 787	in 2007: 1.292 (curriculum-based education)	in 2006: 17.880****	in 2007/08: 500	in 2007/08: 1.317	in 2007/08: 3.799	not yet any graduates in 2007 new job profile
ISCED level	3B	3C**	3A/B	3B	3C**	3C	3A/B	3B
Entry requirements	completion of compulsory school	completed compulsory education	basic (compulsory) school certificate; no entry requirements for c* and ap*	completed compulsory education	completion of compulsory education	successful completion of primary school (9 years) or lower vocation education programme (2 two years after general education)	completion of compulsory school	Successful completion of lower secondary level (i.e. 9 years of compulsory education)
Access to next level of education/training* **	a) craftsman's master education; b) with additional examination entry to higher (university) education (vocational route); c) with supplementary exams entry to polytechnic universities (ISCED 5B)	ISCED 4	eligibility for higher education in politechnics and universities	advanced VET programmes at ISCED 5A or education programmes at ISCED 4A-C	Technical College (4B) or university level (5A) after one year supplementary general study	continue schooling in the Carmechatronic Technician programme (2 years) providing access to ISCED 4A	basic eligibility to higher education	prepares for entry into specific occupations or direct access to higher education
Organisation/learning arrangements:								
work-based learning % school-based learning %	w: 80% / s: 20%	w: 75% / s: 25%	w: 17%c / 70%ap / 70%cp* s: 83%c / 30%ap / 30%cp	w: 75% / s: 25%	w: 60% / s: 40%	w: 24% / s: 76%	w: 15% / s: 85%	w: 75% / s: 25%
alternating programme / periods of training	in rural areas: longer periods of training in school, remaining time at the workplace; in urban areas: 1 day a week in school, 4 days at the workplace	basic part: 20 weeks in vocational school; main part: alternating periods between school and apprenticeship	apprenticeshop-based and competence-based education can be alterning or consist of longer periods of training in school and at the workplace	dual system: alternating training in vocational schools and in firms	2 years at school; 2 years apprenticeship	practical training is realised in employers organisations	full-time school-based with at least 15 weeks of workplace training	dual system: alternating training in vocational schools and in firms

* 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

The basis for the identification of relevant occupational tasks is the data collection with a standardised instrument agreed upon 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.*

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[66],
- discussion of first draft during first international expert workshop[67], and
- adaption of tasks to European context if necessary.

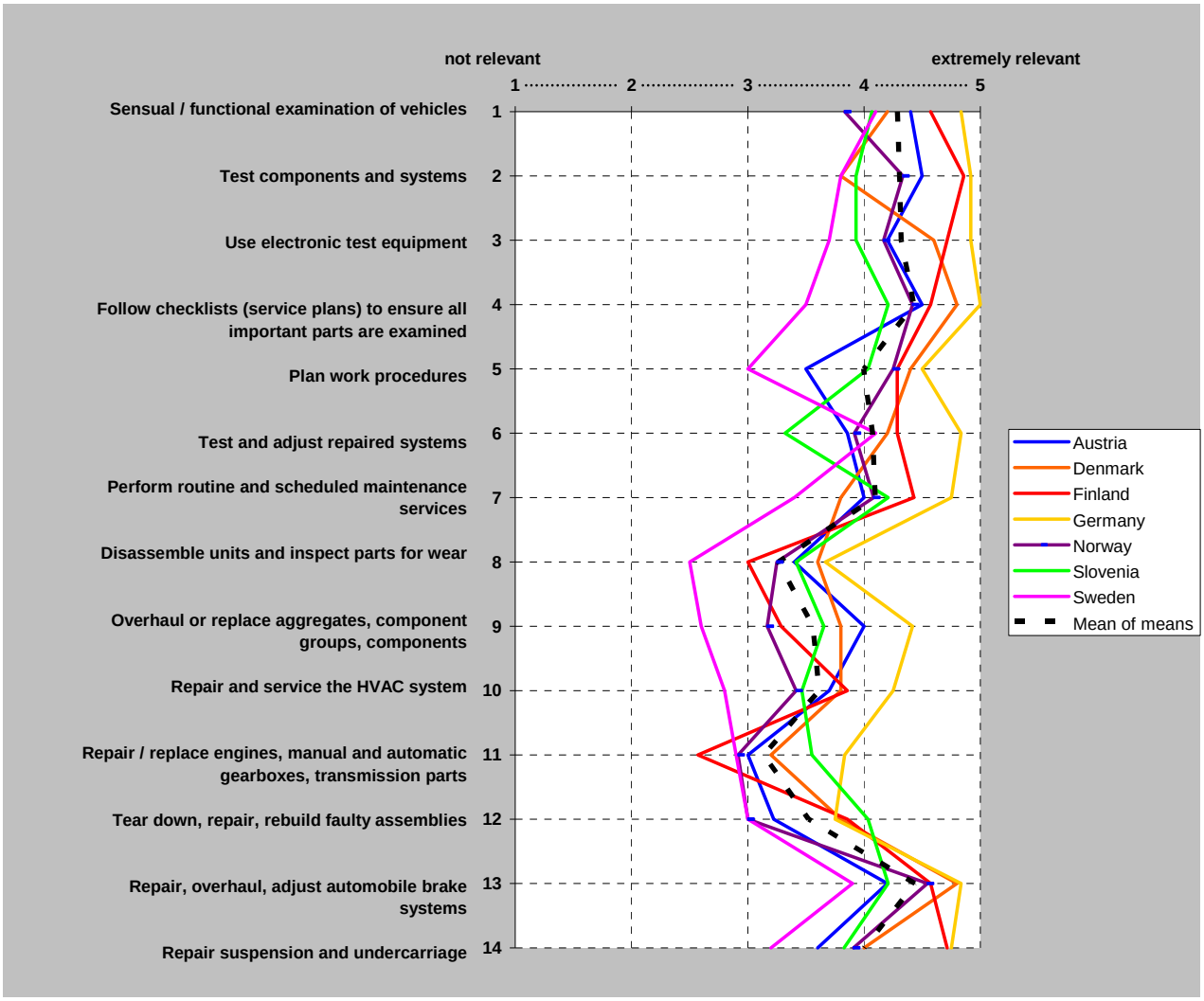
The proposal was agreed with all carmechatronic experts from participating countries via e-mail. The final set consisted of 14 occupational tasks considered relevant for all countries (research tool 1 with the original items displayed in full length is provided in Annex 3.1; Table 3.1-A1).). The research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

The following diagram illustrates the set of occupational tasks and gives an overview of the results of expert ratings for 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?”)

66 O*net shows grade of relevance of tasks concerning certain occupations; here the selected occupations are automotive master mechanic and automotive speciality technician.

67 International expert meeting in Bonn on 4th of July 2008.

Figure 3.3-1: **Carmechatronics: occupational tasks-relevance (country means)**

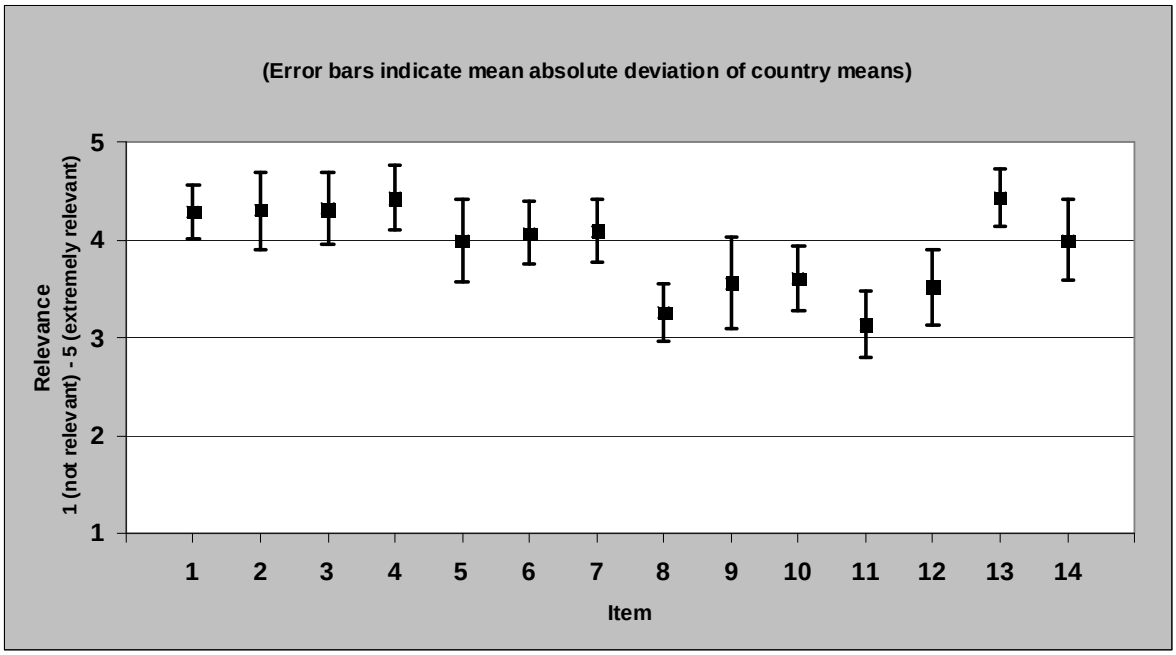


Question: "How relevant is the task on average to the performance of Carmechatronics?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

Figure 3.1.-1 shows that there is broad coverage in terms of "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; except the ratings in Sweden and one item in Finland, all mean values of rating in the countries are on levels `relevant´ up to `extremely relevant´. The lowest means in the countries and thus the lowest mean of means can be 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 for repairing parts of vehicles which lately became less important for carmechatronics. Tasks referring to "examination", "testing" and "using electronic equipment for diagnosis" were rated very high (e.g., tasks 1 to 4: very relevant to extremely relevant) by all experts. These items mainly refer to tasks concerning diagnosis and trouble shooting or checking cars.

The following diagram illustrates 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: **Carmechatronics: occupational tasks – relevance (mean across countries)**



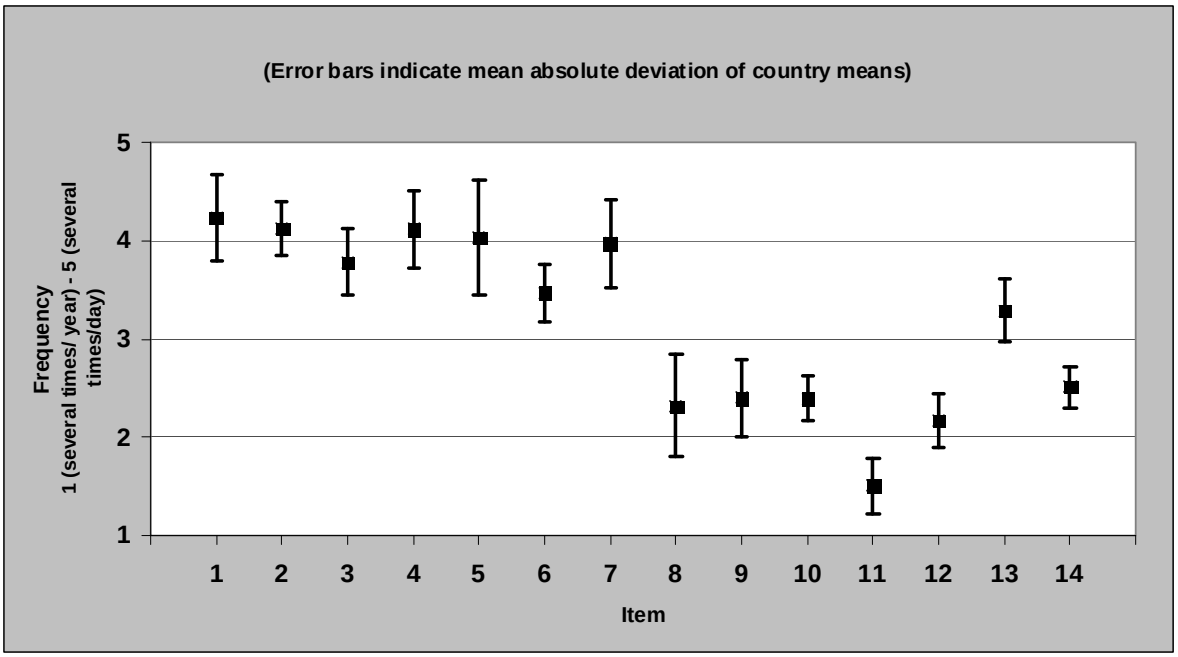
Question: "How relevant is the task on average to the performance of Carmechatronics?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

Figure 3.1-2 shows that a) all tasks have been 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 coverage in terms of "relevance" of the selected tasks. Thus, the occupational profiles for carmechatronics can be considered very homogeneous across countries. Taking into consideration that the focus of acting in occupational contexts, namely the "cars", should be equal in all countries, this is not surprising and national specifics[68] obviously do not play a major role.

The results for items 1-7 point out the predominant relevance of tasks concerning diagnosis and trouble shooting. On the other hand, items 8-12 show lower ratings indicating that mechanical tasks tend to loose relevance in the occupational profile. Item 13 differs from the remaining items: whereas in the past, brake systems have been mainly mechanical/ hydraulic systems, they are recently combined with electronic systems like ABS, ESP, down hill brake control, brake assistant or automatic parking brakes. Thus, mechanical tasks of repairing brake system have been extended by diagnosis duties. Certainly, mechanical tasks have not become complete irrelevant, but they shifted from repairing to replacing parts. For the description of occupational tasks relevant for the performance of carmechatronics, this should be taken into consideration in future steps in addition to the fact of a general shift within the occupational field of carmechatronics more or less simultaneous in all participating countries. The Kendall's-W confirmed the congruency in the ratings for occupational tasks with the value of W = .701. The following diagram refers to Figure 3.1-2 and illustrates the ratings for the same occupational tasks regarding the "frequency" (how often an occupational task is performed):

68 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 with comfort or security systems, different climate situations in northern and southern countries, different law regulations about technical checking or pollutant emission.

Figure 3.1-3: **Carmechatronics: occupational tasks-frequency (mean across countries)**



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)

In terms of frequency the findings confirm the results: whereas the very relevant tasks (1-7 and 13) are very frequently preformed, the less relevant tasks (8-12) are less often demanded. The findings underline the interpretation above: high rated items tend to be related to diagnosis and trouble shooting or car checking. Even though the mean absolute deviation is little larger for a few items, there is high concordance in ratings for the task frequency (how often an occupational task is performed in jobs for carmechatronics). 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 Annex 3.1; Tables 3.1-A3, 3.1-A4, 3.1-A5, and 3.1-A6).

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 by the research team in the column "remarks". A recommendation for any extension of the list of occupational tasks will be given below.

Table 3.1-2: **Additional occupational tasks of importance in the national setting in participating countries**

Occupational task description	Country	Remarks
Diagnosis of electronically BUS systems (CAN-BUS)	Germany	Raising importance recently and in near future; refers to tasks no. 2 and 3
Preparing vehicles for technical inspection ordered by law or pollutant emission test / quality, function and road safety	Germany Sweden Slovenia	Refers to tasks no. 4 and 6
Expanding of additional systems (e.g. independent vehicle heater, trailer tow hitch, LPG systems, audio systems, comfort systems)	Germany Austria	
Identifying vehicles and parts in data bases	Germany	Refers to tasks no. 2 and 3
Checking possibility of deliverance of spare parts in data bases	Germany	Refers to task no. 5
Test, service and repairing of security and comfort systems (e.g. ABS, AC)	Germany, Austria	Included in tasks no. 10 and 13
Repairing windscreens	Germany	Mostly specialists task and less frequent
Communication with customers	Germany Finland Sweden	Refers to qualification requirement no. 4
Automotive, technical language / speak an other language	Sweden Denmark	Refers to qualification requirements no. 8 and 9
Confer with customers ot obtain descriptions of vehicle problems and to discuss work to be performed and future repair requirements	Finland	refers to qualification requirement no. 4
Act according to safety, environmental and quality requirements and law regulations Act according to safety, environmental and quality requirements and law regulations	Denmark Norway	Refers to qualification requirements no. 4 and 7; concerns more attitudes than tasks or requirements

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 for 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 strongly related or redundant to the already selected tasks or qualification requirements (see Chapter 3.1.3). After all, two additional aspects have to be taken into consideration: first, the increasing importance of BUS-technology which should be emphasised more in tasks such as no. 2 and 3 (testing components and using electronically equipment) and second, the after sales expanding of vehicles with additional systems.

To summarise, the results of expert ratings reveal high concordance for occupational tasks in jobs for carmechatronics in all participation countries. The common occupational profile is mainly characterised by an increasing relevance of tasks concerning diagnosis/ troubleshooting and maintenance; on the other hand, tasks concerning repairing parts of cars 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.

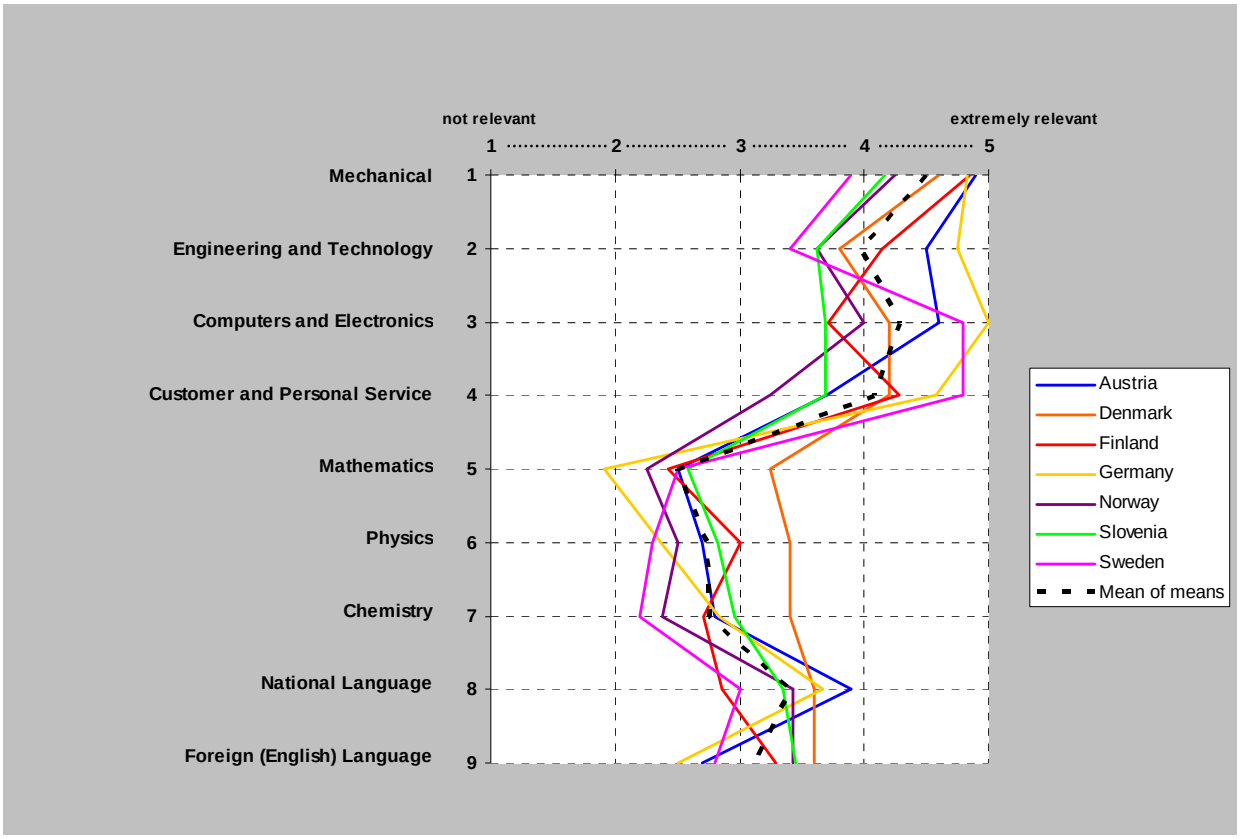
3.1.3 Comparative analysis of ratings for qualification requirements

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

- first: a 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[69] 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 set of qualification requirements with national experts as a basis for the rating in the first national workshop.

The results of expert ratings for qualification requirements are depicted in Figure 3.1-4. The diagram illustrates 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?”)

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



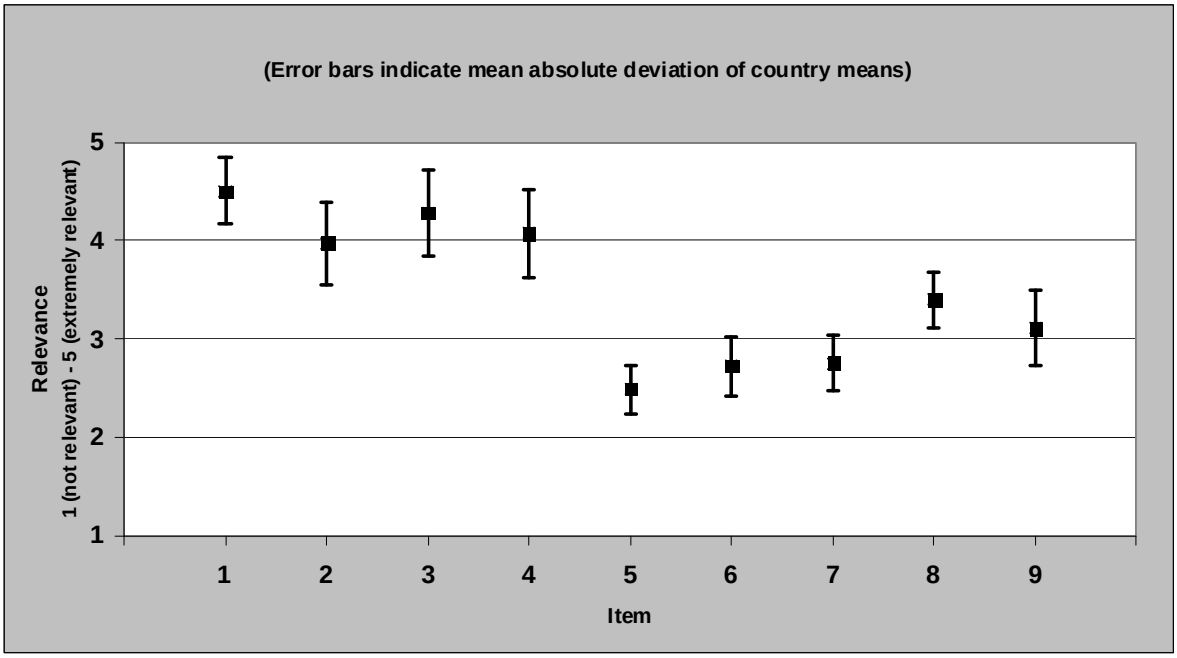
Question: “How relevant is the qualification requirement for Carmechatronics to perform successfully on the labour market?” (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

69 International meeting in Berlin on 14th of October 2008

Within the set of qualification requirements two subgroups can be distinguished: 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 higher than general qualification requirements in all participating countries. Within the general qualifications higher rating can be reported for national and foreign language than for the natural sciences. Whereas technical / vocational qualification 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 to low relevance. In most countries, vocational curricula do not directly refer to the relevance of natural science qualification; they are rather integrated within descriptions of learning outcomes[70]. In some countries national science qualifications are contained in the curricula in the first years of education.

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

Figure 3.1-5: **Carmechatronics: qualification requirements – relevance (mean across countries)**



Question: "How relevant is the qualification requirement for Carmechatronics to perform successfully on the labour market?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

Figure 3.1-5 shows high concordance in the ratings for qualification requirements. In particular the technical/vocational qualifications (items 1-4) are ranked very relevant. With regard to the general qualification requirements, national experts emphasised during the final international workshop that they are relevant and mostly integrated in 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

70 Denmark is an exception: the mean values concerning the natural sciences are the only ones higher than M=3.0.

deviations within country means for each country are provided in Annex 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: **Additional qualification requirements of importance in the national setting**

Qualification requirement description	Country	Remarks
Social competences / communication with colleagues	Austria Norway Denmark	Refers to qualification requirement no. 4
Knowledge of and ability to read domain specific technical language	Austria Norway Sweden Denmark Germany	Refers to qualification requirement no. 8

The short list of additional qualification requirements indicates that the selected set covers a broad range of qualification requirements relevant for carmechatronics. Moreover, it can be assumed that the formulations are concrete and detailed enough to get 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, general qualification requirement are integrated in vocational aspects.

3.1.4 Comparative analysis of ratings for evaluation tasks

Compilation of international set of evaluation tasks

The carmechatronic 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 system (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 with 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 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, will be 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.

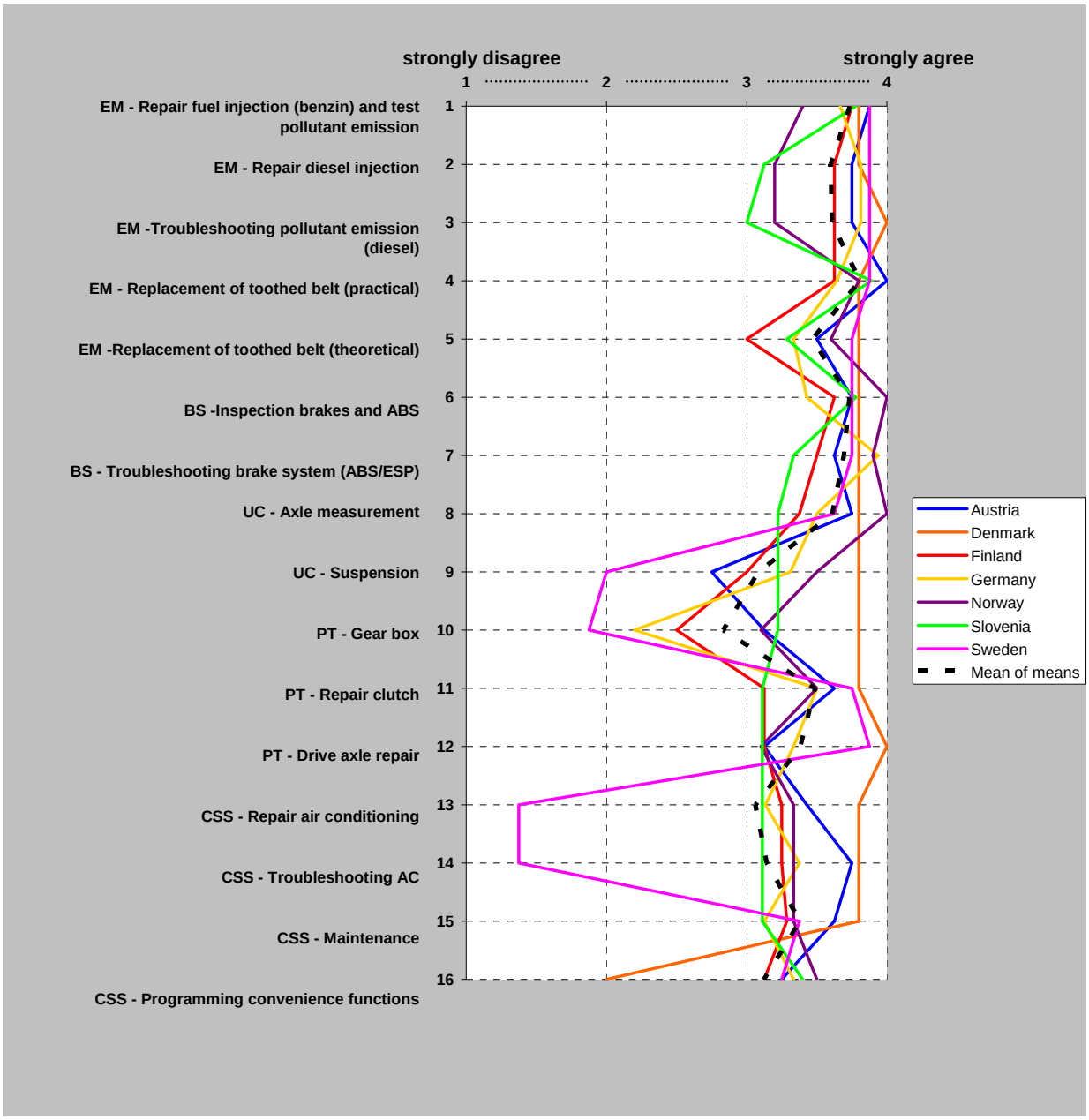
Table 3.1-4: **International set of evaluation tasks for carmechatronics**

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

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

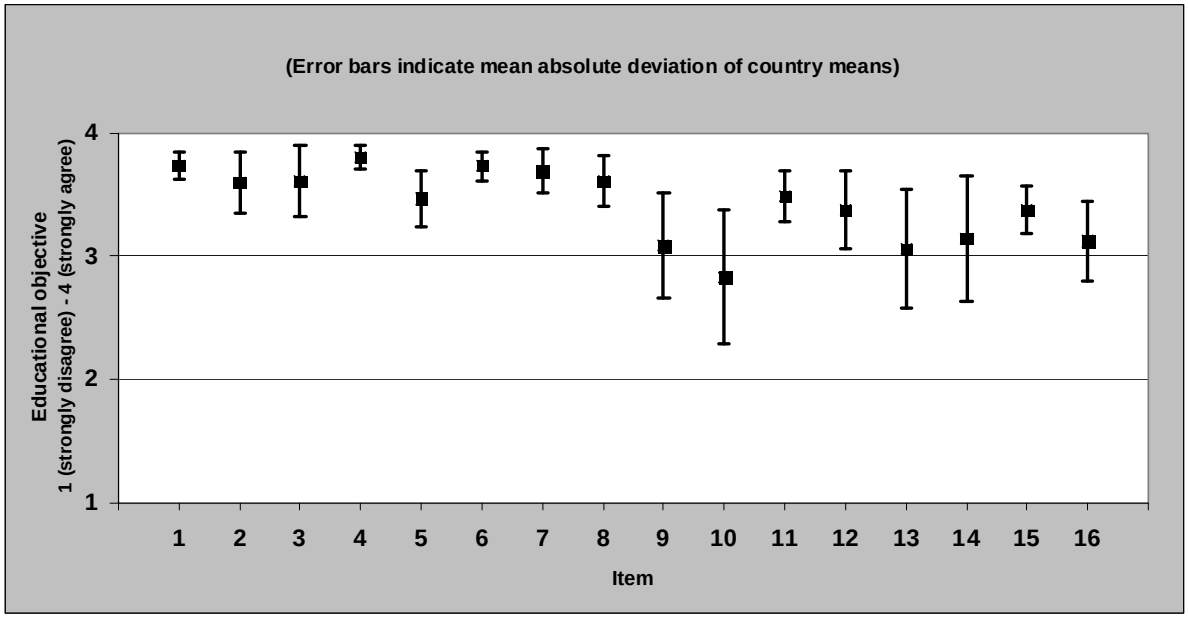
Ratings of the international set of evaluation tasks from a comparative international perspective

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



Question: “The task is representing major educational objectives at the end of VET programmes Carmechatronics” (1= strongly disagree; 2= disagree; 3=agree; 4=strongly agree; for rating results of Sweden concerning items 13 and 14 see commentary below)

Figure 3.1-7: **Carmechatronics: evaluation tasks – educational objectives (mean across countries)**



Question: "The task is representing major educational objectives at the end of VET programmes Carmechatronics" (1= strongly disagree; 2= disagree; 3=agree; 4=strongly agree)

The results of the second national workshop in all participating countries show strong agreement and high coherence with restrictions on items 9 (suspension), 10 (gear box), 13 (repair air-conditioning) and 14 (troubleshooting air-conditioning).

During the final international workshop Sweden emphasised for task 13 (repair air-conditioning) and 14 (troubleshooting air-conditioning) that working on vehicles air condition is not included in their VET programme but supplemented as further qualification for working on vehicles air condition. 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 low mean absolute deviation across all countries. Item 15 (maintenance air conditioning) also refers to tasks relating to vehicles air condition but is rated high by Swedish experts. This suggests that the core area comfort and security systems (CSS) itself are 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 national specifics.

The mean value and high mean absolute deviation of task 10 (gear box) results from the low ratings in Sweden, Germany and Finland. The Swedish rating is surprising: within the first national rating concerning a national set of evaluation tasks the core area of power transmission (PT) got the highest rating values (M=4.0) of all concerning 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 rather refers to higher skill levels than average service station workers. In addition, gearboxes were no more opened and repaired in service stations but are replaced by new aggregates today. Task 11 (repair clutch) refers to similar work procedures than task 10 (disassembling and assembling gear box) with high rating values. Thus, task 10 can not be recommended for further steps. Nevertheless, high relevance of the core area power transmission (PT) can be 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 Undercarriage (UC) can be considered highly relevant for all countries.

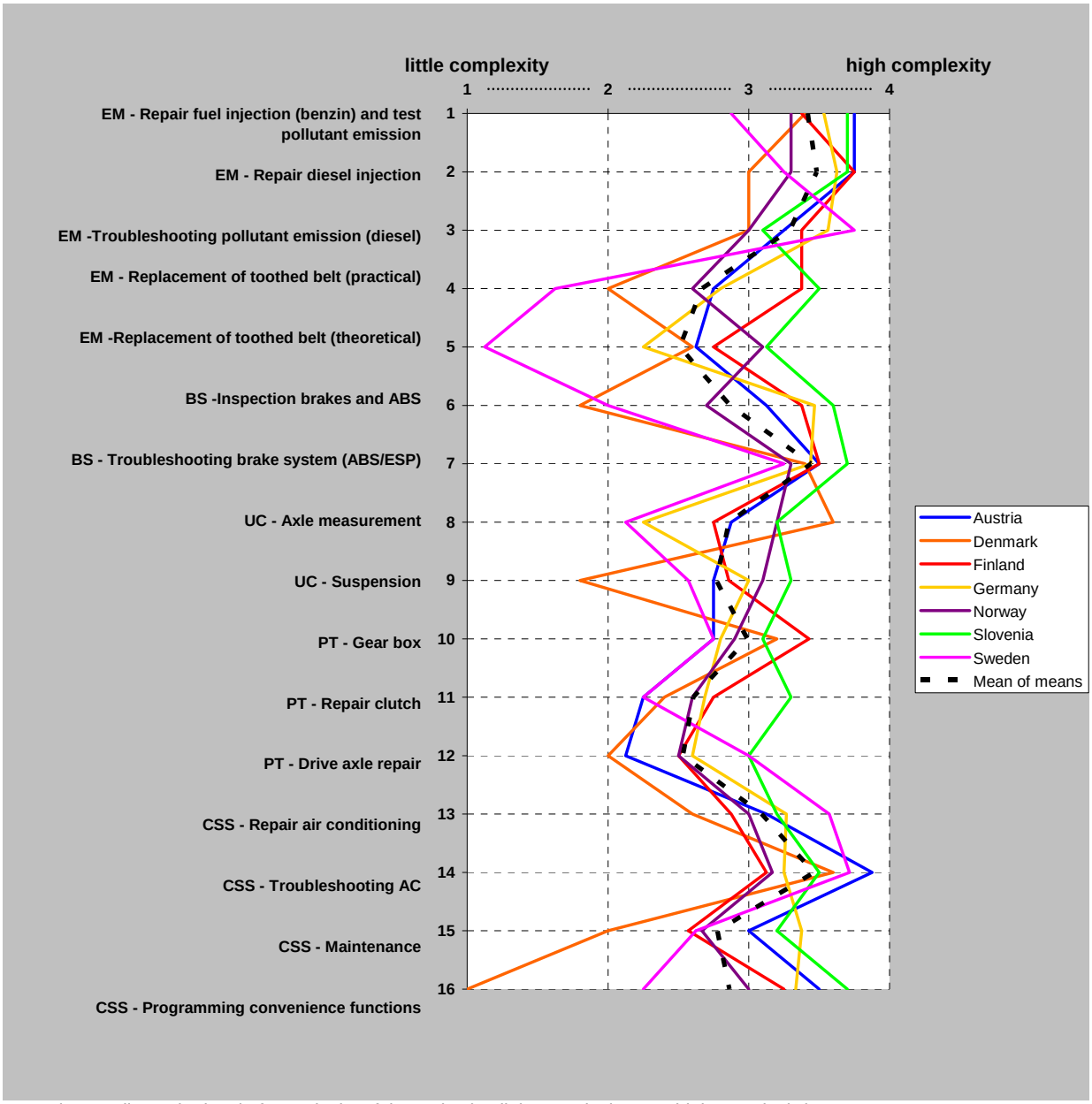
For the ratings of evaluation tasks there have been some general remarks concerning the level of complexity in a number of national reports. It was emphasised that the quality of information about the tasks and conditions of assessment differs. Indeed, the deepness and length of information about the tasks varied from few lines of description on relatively high level of abstraction up to several pages of detailed information in form of concrete assignments of tasks. For some tasks few experts pointed out the duration.

In an overarching view some experts tend to see the rating process as a kind of acclamation about specific evaluation tasks. However, this was not the purpose evaluation tasks; the aim was an affirmation of core areas and a comparison of educational contents at different level 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 mirrors the impression of considerable commonality between the countries' ratings for 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 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 displayed in Figures 3.1-8 and 3.1-9.

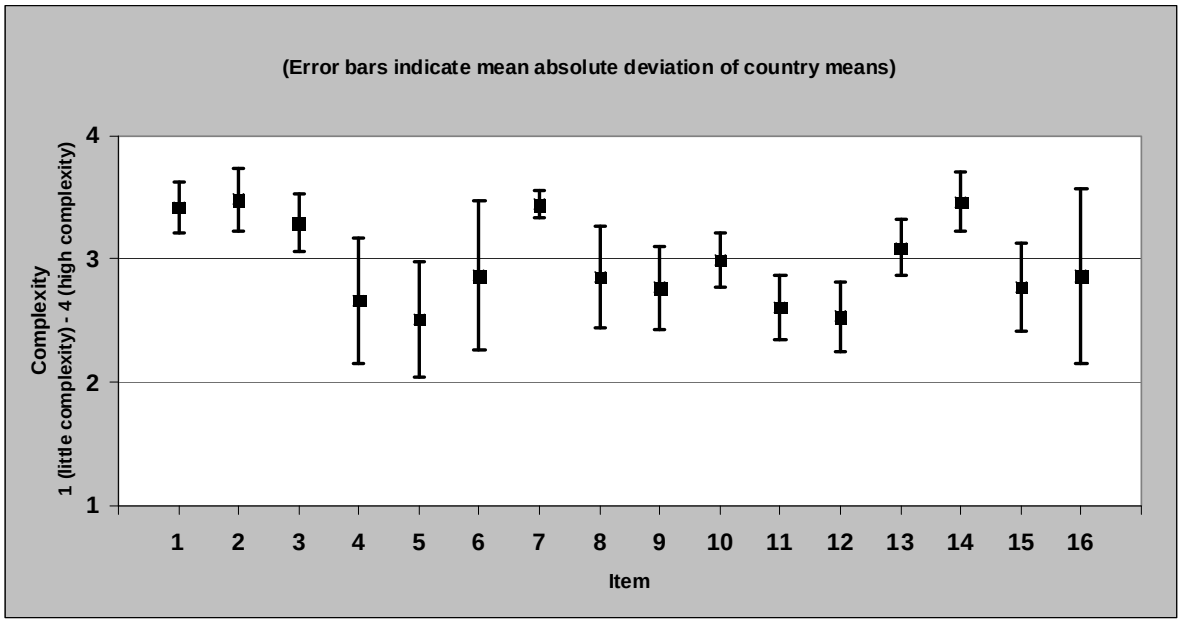
Figure 3.1-8: **Carmechatronics: evaluation tasks – complexity (country means)**



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

The results for “task complexity” show relatively broad variance between the countries for some items. The rankings of tasks concerning more mechanical procedures of repairing or replacing show more diversity across countries than for tasks of diagnosis and trouble-shooting. The more mechanical tasks were rated less complex, witch 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. Reasons for this might be different individual perceptions on 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 3.1-9: **Carmechatronics: evaluation tasks – complexity (mean across countries)**



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 refers to the ratings 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 the other countries. The concordance in ratings about 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 Annex 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 the other countries.

Additional evaluation tasks

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

Assessment task description	Country	Remarks
Data Systems (CAN-Most)	Germany	Refers mainly to core areas EM and CSS
Security systems (airbag/SRS and belt pretensioner)	Germany Sweden	Refers to core area CSS
Electrical systems (starter, generator, accumulator)	Germany	
Workshop environment, work safety	Sweden	Somehow included in the provided tasks
Laws and regulations	Sweden	Somehow included in the provided tasks (e.g. pollutant emission regulations)
Communication in network	Sweden	Somehow included in the provided tasks

To conclude, the coverage of ratings of evaluation tasks within the five core areas in terms of representativeness of major educational objectives can be evaluated as very good. In

particular, the tasks in core areas engine management (EM; tasks 1-5) and brake system (BS; tasks 6-7) indicate high agreement across countries. Despite the impact of national specifics, in particular for tasks within core area comfort and security systems (CSS; tasks 13-16) high agreement could be confirmed. Within the core areas undercarriage (UC) and power transmission (PT) the level of agreement depends 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 evaluation tasks corresponding to the core areas in all countries is mainly characterised by strong agreement all over the countries. Diverging ratings can be explained by national specifics in VET which were discussed in the carmechatronics group in the final international workshop. For tasks concerning diagnosis and troubleshooting high ratings for relevance and complexity can be reported, whereas mechanical oriented tasks tend to be less complex. For future steps, 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.

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 for 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 concerning the eligibility of carmechatronics for VET-LSA will be provided.

The formal descriptions for national VET programmes of carmechatronics show high similarities. ISCED level, entry requirements, duration and access to next level of education can be considered nearly equal in all participating countries. The relative number of students varies between approximately 0.5 and 1.5 per 1.000 inhabitants; a minimum of 400 graduates could be confirmed by each country. Differences can be reported in the percentage of work-based and school-based training parts. The proportion reaches from 80% work-based in Austria to 85% school-based in Sweden.

The following table gives an overview about the results for each aspect of comparative analysis:

Table 3.1-5: **Main findings carmechatronics**

Ratings 1st & 2nd national workshop	**Concordance (Kendal's W)**	**Comment to rating results**
Occupational tasks relevance	,701	relevant or very relevant
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

Occupational tasks

In general, all occupational tasks were rated as relevant or very relevant. In particular tasks concerning diagnosis and troubleshooting appear to be very relevant for jobs in the field of carmechatronics. There has been a shift from traditional tasks of repairing or replacing parts to tasks of diagnosis using electronically equipment. High concordance for ratings of "relevance" and very high concordance for ratings of "frequency" can be reported.

The results for frequency differ between the tasks. However, the ratings match very well across countries. There is a tendency that tasks with lower ratings for relevance 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 all over the participating countries. They point to a high relevance for the predominant part of the selected occupational tasks and thus, provide a promising set for further steps towards a VET-LSA.

Qualification requirements

Very high concordance appears concerning the ratings for relevance of qualification requirements Two types of qualification requirements were differentiated: 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) with medium relevance. This confirms higher relevance for qualification requirements strongly related to the core areas in VET than 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 concerning the ratings of representativeness and complexity of evaluation tasks appears as medium high. However, the rating results as such mainly show strong agreement and comparable levels of complexity. Only few disagreements to certain evaluation tasks because of specific regulations in VET programmes were reported. In particular the core areas engine management, brake system and comfort and security systems appear very relevant for representing major educational objectives at the end of

VET programmes for carmechatronics. Within the core areas the types of tasks can be differed 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 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 for subsequent steps in the next project phase:

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

In an overarching view to the three content oriented approaches the following can be concluded:

- a predominant relevance of diagnosis and troubleshooting oriented tasks can be confirmed for occupational tasks,
- technical and vocational oriented qualification requirements can be considered very relevant for successful performance in the labour market (general qualifications in natural sciences were rated low in relevance),
- the selected evaluation tasks could be 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 national specifics, and
- different approaches consistently confirm that there is a solid basis for further steps towards a possible future VET-LSA for Carmechatronics.

In all 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 relevance, representativeness and feasibility with regards to a possible future VET-LSA in the field of carmechatronics; only few inferior restrictions became 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 the Feasibility Study electricians are divided into two sectors: craft and industry. A decision whether to take the craft or the industrial sector in 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[71] 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 learning outcomes at the end of VET. Taking into account that experts from each country have different professional backgrounds this result is very surprising. This also suggests that already within the rating of one country clear variances should be expected. In the following paragraphs a detailed analysis of results regarding each aspect, including overview diagrams and interpretations, is provided. Aspects relevant for both sectors will be addressed first, followed by specific aspects a) for the crafts sector and b) for the industrial sector.

3.2.1 Specifics of national VET programmes for electricians craft and industry

Electricians – craft sector

The titles for national VET programmes vary across participating countries. The international electricians group agreed to select VET programmes with titles such as “electrical installation technology”, “electronics technician for building technology”, “electrician” or “trade/craft sector”. The duration of the selected VET programmes varies between 3 years (Finland, Sweden) and 4.5 years (Norway). All programmes are classified at ISCED level 3 (3A/B, 3B or 3C). The number of graduates reaches 1.000 in all selected programmes. In terms of entry requirements, completed lower secondary school is required to enter VET in all countries[72]. All selected programmes provide access to continuing (vocational) education at different levels: several countries offer continuing pathways for master craftsmen or comparable programmes (at ISCED levels 4 or 5B) and possibilities for entering higher education; in some countries practical work experience is required for accessing further educational programmes.

The organisation of training programmes varies (see Table 3.2-1). In countries with dual systems (Austria, Denmark[73], 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.

71 In addition, the minutes of each national workshop and the Excel Tools 1&2 were analysed.
72 Some countries have specific entry requirements (e.g., in Germany regulation of the federal state).
73 In Denmark, longer periods in vocational schools are included

Table 3.2-1: **General information of VET programmes – electrician craft sector**

	Austria	Denmark	Finland	Germany	Norway	Sweden	Switzerland
Title of VET programme	Electrical installations engineering Elektroinstallationstechnik	Electrician Installation technology (craft)	Electrical Engineering: Electrical Engineering and Energy Technology, Electrician	Electronics technician for energy and building technology	The electrician trade Elektrikerfaget	Electricity programme: Electrical engineering	Electrician Elekroinstallateur
Total duration (years)	a) 3.5 years (dual) b) 4 years (school-based)	4 years	3 years	3.5 years	4.5 years	3 years	4 years
Number of graduates	a) in 2007: 1.612 (dual), 297 (school-based)	in 2007: 1.129	2) in 2006: 962 (curriculum-based education)	in 2006: 7.966*****	1.100 - 1.200	in 2008/09*** 2.000	not yet any graduates in 2007 as this is anew job profile
ISCED level	3B	3C**	3A/B	3B	3C	3A/B	3B
Entry requirements	completion of 9 years compulsory schooling (dual); successful completion of lower secondary schooling, in some cases additional tests required (school-based)	completed compulsory education	basic (compulsory) school certificate	none / compulsory education	lower secondary school	completion of compulsory school	successful completion of compulsory school
Access to next level of education/training**	external exam for accessing higher education, Higher Education Entrance Examination; master craftsperson course, foreperson course (ISCED 5B); bridge course (apprenticeship) or add-on course for college of engineering (ISCED 4A); University of applied sciences (ISCED 5A), additional tests required	academic profession degree in Installation Technology; academic profession degree in IT or Electrotechnics Engineering; access to Bachelor of Architectural Technology and Construction Management	general eligibility for higher education on politechnics and universities	with two years work experience acces to master or technician schools (Techniker- / Meisterschule), after examen access to higher education; Access to technical high school (Berufsoberschule), after examen access to university (partly depends on regulation of the federal states)	Technical College (4B); university level (5A) after one year supplementary general study	basic eligibility to higher education	with Federal Vocational Baccalaureate access to University of applied sciences (entrance examination without); with professional experience possibility to take tertiary-level national professional examination, first to obtain a Federal PET Diploma, then to obtain an Advanced Federal PET Diploma
Organisation/learning arrangements: **work-based learning %** **school-based learning %** **alternating programme / periods of training**	a) dual: w. 75% s: 25% b) school-based: w: 0% s: 100% apprenticeshop training: alternating school and work; longer periods or seasonnally	w: 75 %/ s: 25% basic part consists of 20 weeks in vocational school, main part alternates between periods of school based training and practical training in companies	w: 17%c / 70%ap /70%cp* s: 83%c /30%ap /30%cp apprenticeshop-based and competence-based education can be alterning or consist of longer periods of training in school and at the workplace	w: 75% / s: 25% dual system: training in vocational schools and at the workplace are alternating	w: 60% / s: 40% 2 years in school, 2.5 years in apprenticeship	w: 15 % / s: 85% full-time school-based with at least 15 weeks workplace training	w: 80% / s: 20% Dual system: appr. 1 day per week at vocational school; apprenticeship at host company: approx. 80%

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

Source: investigated in 2008

Electricians – industrial sector

As for the craft sector, the titles for national VET programmes vary across participating countries. The international electricians group agreed to select VET programmes with titles such as “automation”, “automatization”, “electrical engineering” or “industry sector” in their countries. As for the craft sector, the duration of the selected VET programmes varies between 3 (Finland, Sweden) and 4.5 years (Norway); all programmes are classified at ISCED levels 3 (3A/B, 3B or 3C), the number of graduates reaches 400 in all selected programmes[74]. As for electricians craft, at least completed lower secondary school is required to enter 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.

74 Except Norway, where only 250 students are reported; this might be problematic for the sample in a future VET-LSA.

Table 3.2-2: **General information of VET programmes – electrician industrial sector**

	Finland	Germany	Norway	Slovenia	Sweden	Switzerland
Title of VET programme	Electrical Engineering: Automation Technology and Maintenance, Automation Assembler	Electronics technician for automation technology	Automatization trade (Automatiseringsfaget)	Electric engineering – technician (Elektrotehnik)	Electricity programme - automation	Automatiker/in EFZ
Total duration (years)	3 years	3.5 years	4.5 years	4 years	3 years	4 years
Number of graduates	in 2006: 615 students (curriculum-based education)	in 2006: 1.514	in 2007: 250	new programme no numbers available yet (appr. 400 students in 2012)	in 2008/09: appr. 2.000	In 2007: 628
ISCED level	3A/B	3B	3C	3B	3A/B	3B
Entry requirements	basic (compulsory) school certificate	none / compulsory education	lower secondary school (compulsory, comprehensive)	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)	completion of compulsory school	completion of compulsory school
Access to next level of education/training* **	general eligibility for higher education on politechnics and universities	with two years work experience acces to master or technician schools (Techniker-/ Meisterschule), after exame access: in some state access to higher education; access to Technical high school (Berufsoberschule), after examen access to university.	Technical College (4B) or university level (5A) after one year supplementary general study	higher vocational education (VIŠ), higher professional education (VIS), higher academic education (UNI)	basic eligibility to higher education	eligibility for university of applied sciences (FH); with additional examination for ETH (Eidgenössische Hochschule)
Organisation/learning arrangements:						
work-based learning % **school-based learning %**	w: 17%c / 70%ap / 70%cp* s: 83%c / 30%ap / 30%cp	w: 75% / s: 25%	w: 50% / s: 50%	w: 2,6% / 97,4%	w: 15% / 85 %	w: 75% / s: 25%
alternating programme / periods of training	apprenticeshop-based and competence-based education can be alterning or consist of longer periods of training in school and at the workplace	dual system: training in vocational schools and at the workplace are alternating	3 years in school; 1.5 years in apprenticeship	full-time schooling; practical training in employers` organisation	full-time school-based with at least 15 weeks of workshplace training	dual system: without professional maturity: 4 days work, 1 day school; with professional maturity: 3 days work, 2 days school

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

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 upon in the electricians group at the first international workshop (Minutes Annex 1-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 within 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 industrial sector were selected within 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 from 6<7.

The proposal was validated with national experts in both sectors via e-mail and by phone. For some occupational tasks changes and/or eliminations of parts of the sentences were decided. One task (electricians – industrial sector: task no. 4) was taken from the o*net occupation *Computer Programmers* (15-1021.00) and integrated in 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 to it their national experts for the rating in the first national workshop.

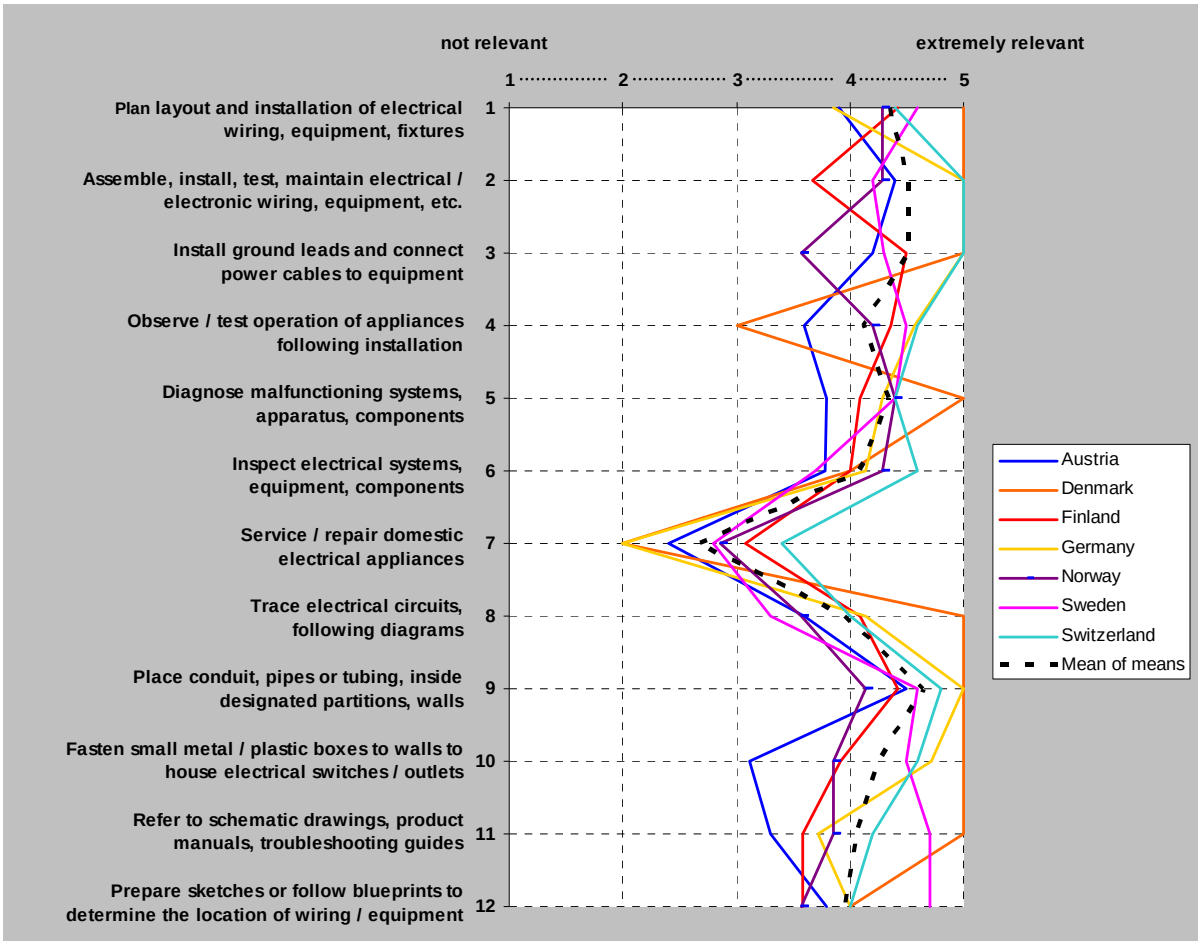
The final set agreed upon in the group consisted of 11 tasks for the craft sector and 12 tasks for the industrial sector (research tool 1 with the original items displayed in full length is provided in Annex 3.2.1 and 3.2.2; Tables 3.2.1-A1, 3.2.2-A1). The translation of the Research Tool into the national language was recommended. The ratings in the German speaking countries (Austria, Germany, Switzerland), were based on a common translated version.

The set of occupational tasks were rated in individual national workshops (both sectors) in all participating countries. Critical statements of 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 could be solved in the electricians group in the final international workshops by an agreement on consistent interpretations of tasks descriptors.

Electricians – craft sector

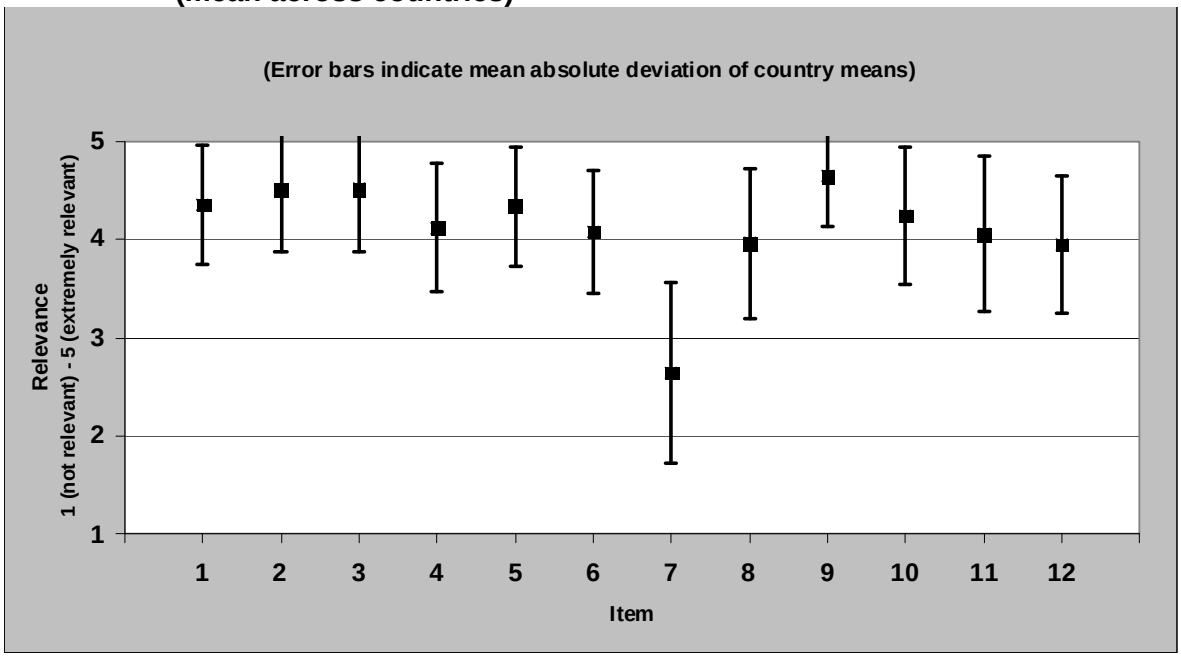
The following diagram illustrates the set of occupational tasks for the craft sector and gives an overview of the results of expert ratings for occupational tasks (mean values for expert ratings in the countries in terms of “relevance”: “How relevant is the task on average to the performance of Electricians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

Figure 3.2-1: **Electricians – craft sector: occupational tasks – relevance (country means)**



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



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.)

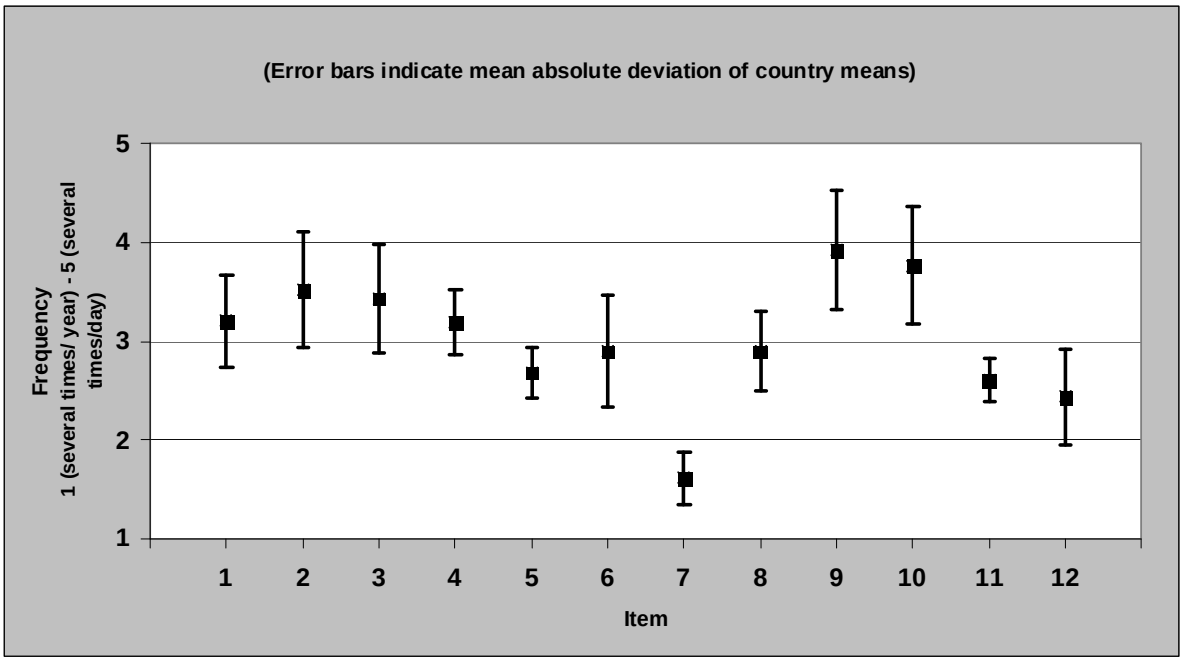
Figure 3.2-1 shows that the lines follow a very uniform course and when looking at the results of all countries the mean values constantly lies at least within the relevant area. With exception of item 7 all tasks were considered “relevant” or “extremely relevant”, none of the tasks was considered “not relevant”[75]. Item 7 was evaluated consistently less important by all countries; none of the tasks was considered irrelevant.

Figure 3.2-2 displays the average level of tasks’ relevance, including information regarding the scope of coverage or diversity across countries. For the craft sector, very high agreement can be reported for all tasks, indicating homogeneity across all participating countries. In particular, tasks included in the core areas installation technology, troubleshooting, and maintenance (Chapter 3.2.4) show very high concordance.

After all, the results of 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=.45 (p=.000).

The rating for task frequency (how often a task is performed) shows that all occupational tasks, except task no 7, are performed several times per month or more often. The ratings across countries show a high degree of concordance for all tasks; the negative rating for task 7 was confirmed in all countries. The Kendall-W value is .63 (p=.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).

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



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)

75 In Denmark a consensual rating method was used, therefore, the mean values cannot be directly related to those of the other countries.

Additional tasks

To incorporate national specifics, additional tasks were suggested by the participant of some national workshops (national reports). All tasks were discussed in the international electricians group during the third international workshop (January 2009, Berlin). There was agreement that it is not possible to include all (national specific) entries in an additional rating process for all countries. Even though all 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):

Table 3.2-3: **Additional occupational tasks of importance for electricians – craft sector**

Occupational task description
Implementation and testing of bus systems for building automation (e.g. EIB/KNX, centralised systems…)
Installation, testing and documentation of electrical safety measures according to standards, rules and regulations

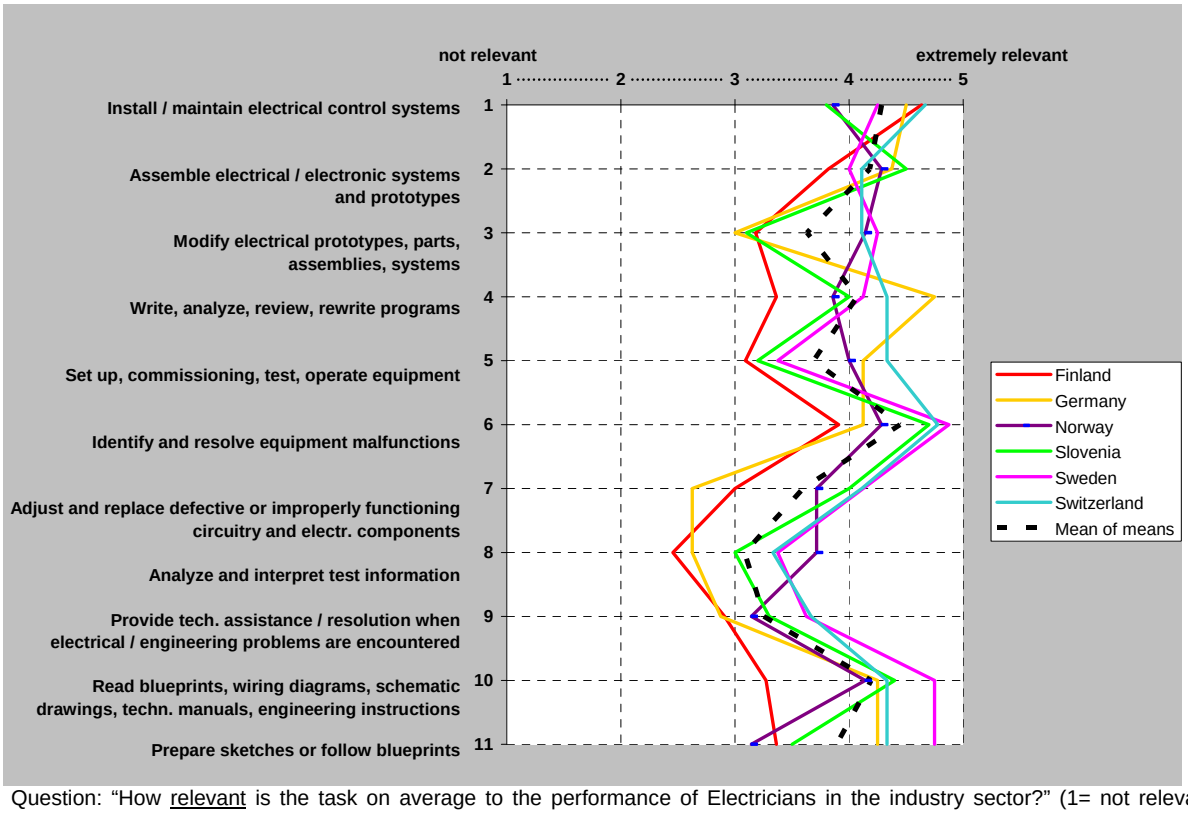
During the final international workshop all national experts for electricians craft confirmed that both tasks are relevant in their countries and should be taken into consideration in future steps. Moreover, the electricians group agreed that the remaining additional tasks should not be included since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

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

Electricians – industrial sector

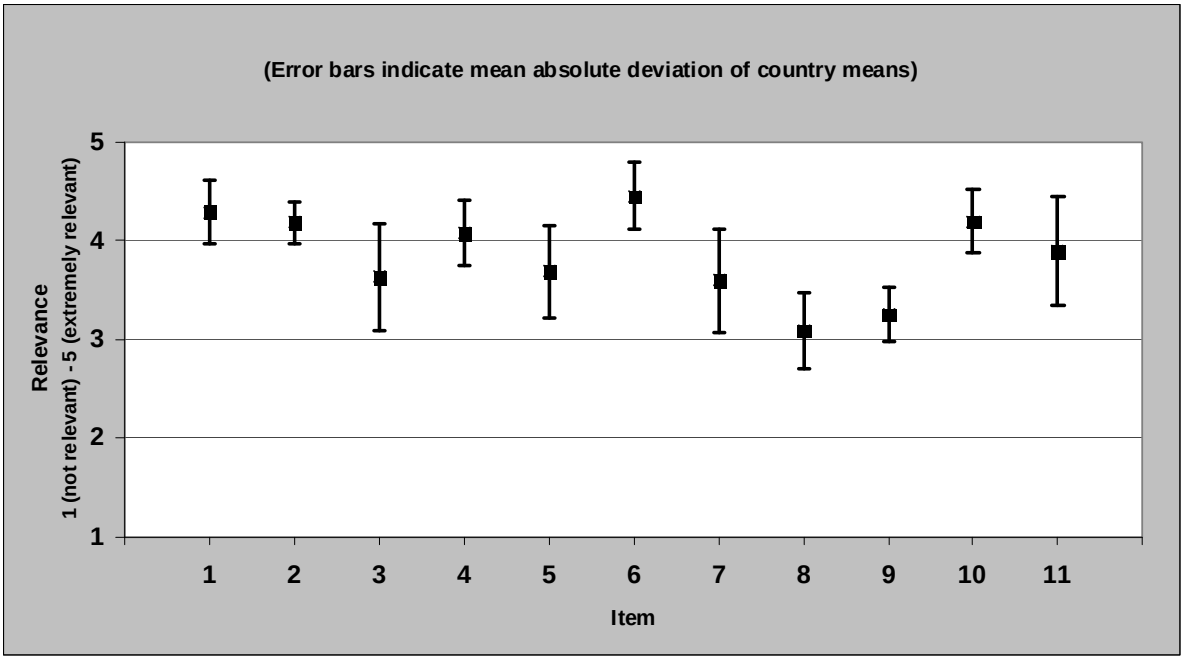
The following diagram illustrates the set of occupational tasks for the industrial sector and gives an overview of the ratings in all participating countries (mean values for expert ratings in the countries in terms of "relevance": "How relevant is the task on average to the performance of Electricians in the craft sector?").

Figure 3.2-4: **Electricians – industrial sector: occupational tasks – relevance (country means)**



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)

Figure 3.2-5: **Electricians – industrial sector: occupational tasks – relevance (mean across countries)**



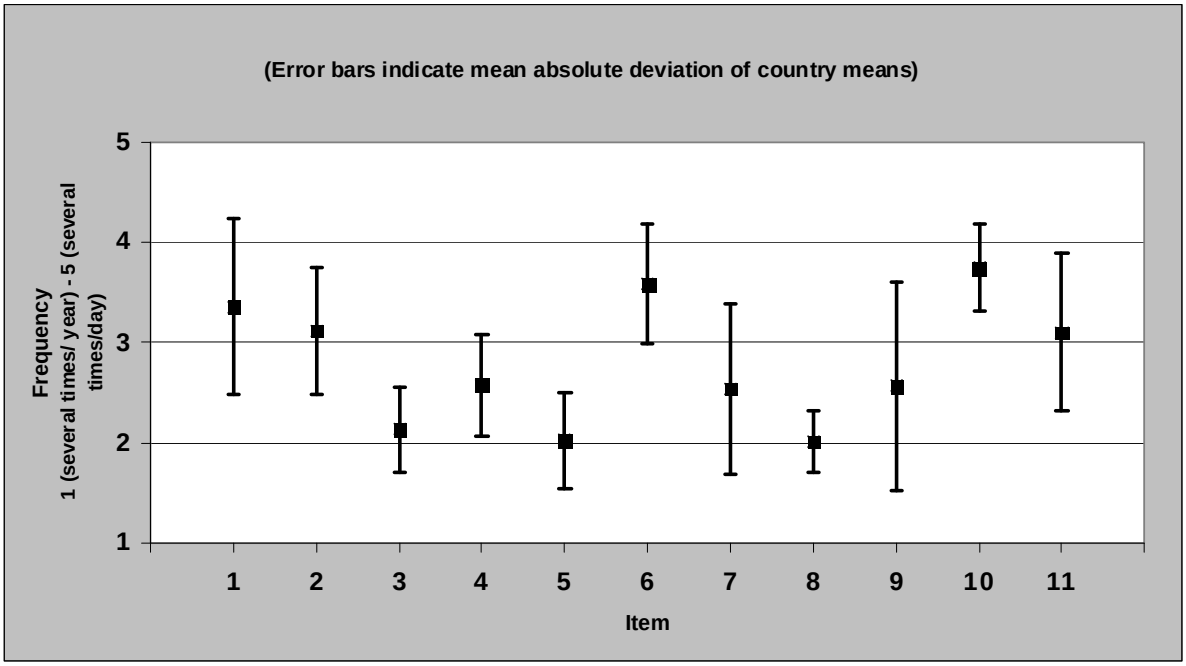
Question: "How relevant is the task on average to the performance of Electricians in the industry sector?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

As for the craft sector, the lines follow a uniform course (Figure 3.2-5). This shows that all tasks were considered relevant. The medium rating values confirm that all tasks are relevant for each particular job description. Therefore, they can be considered comparable in all

countries. This is also the case for task 7 (rated less important in Germany) and task 8 (considered less important in Germany and Finland). Within the limits of the mean deviation the participating countries appear to be very close to each other.

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

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



Question: "How <u>often</u> 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)

As for ratings in the 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 range 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, in particular items 3, 5, 8, 9 are, at least partly, related to technical redevelopment and constructions, which is probably less frequently performed in production process in general. However, due to the fact that 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).

Additional tasks

As for the craft sector, additional tasks were suggested by the participants of some national workshops and discussed in the international Electricians group during the third international

workshop. It was also agreed that it is not possible to include all additional tasks in an additional rating process. Two additional tasks that are relevant in all countries were selected[76]. As in the craft sector, both tasks should be taken into consideration in future steps). Both additional tasks are displayed in Table 3.2-4:

Table 3.2-4: **Additional occupational tasks of importance for electricians – industrial sector**

Occupational task description
Implementing, parameterising and testing of bus systems (e.g. PROFIBUS (or other field bus systems); Industrial Ethernet)
Installation, testing and documentation of electrical safety measures according to standards, rules and regulations

In conclusion, the common occupational profile for electricians in the industrial sector mainly includes: assembling, installation and commissioning of electric and electronic control and regulation systems, other electric equipment or systems and electric loads; programming and handling of bus technologies also plays a major role. Diagnosis of malfunctions (troubleshooting), problem solving and putting systems back to operation is certainly included in all tasks. Moreover, electricians in the industrial sector perform tasks of advising to solve electric problems supported by technical documents (e.g., wiring diagrams, blueprints, and engineering instructions) in all countries. As for the craft sector, aspects of security and safety of electric installations and equipment according to national regulation, 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 upon in a similar procedure for both sectors. Based on the previous discussions in the electricians group, 9 qualification requirements were selected for electricians craft and 9 for electricians industry. Five of 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 a possible significance for both sectors. This will become apparent in the following.

During the discussions of qualification requirements in the electrician group, experts often criticized the level of abstraction and that the requirements are formulated occupational unspecific. To overcome this challenge there was an agreement with all national coordinators that parts of the selected qualification requirements were reformulated with 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 preferring knowledge aspects instead of a broad concept of VET, qualification requirements were reformulated in terms of “knowledge, skills and abilities of ….”. The changes were

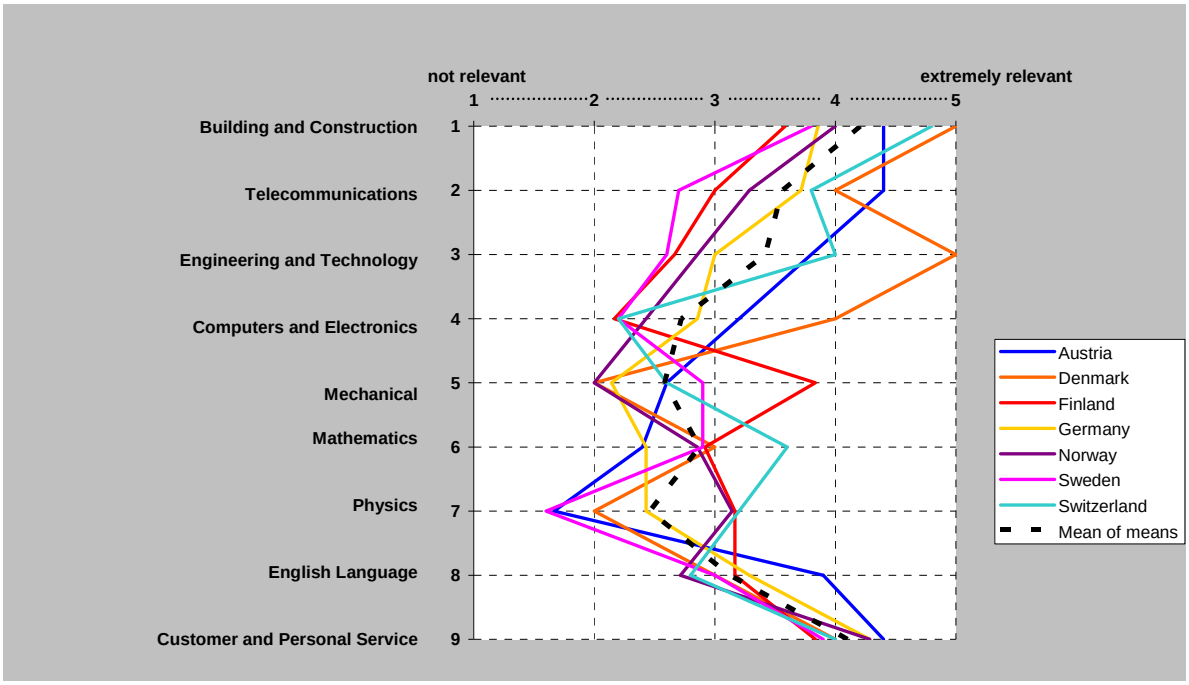
76 Even though all national experts agreed to rate the two additional tasks in a second step, a detailed description of the results cannot be given in this international report because some countries’ data is missing (for national results see National reports).

subsequently confirmed by all national experts and confirmed for the final set of qualification requirements.

Electricians – craft sector

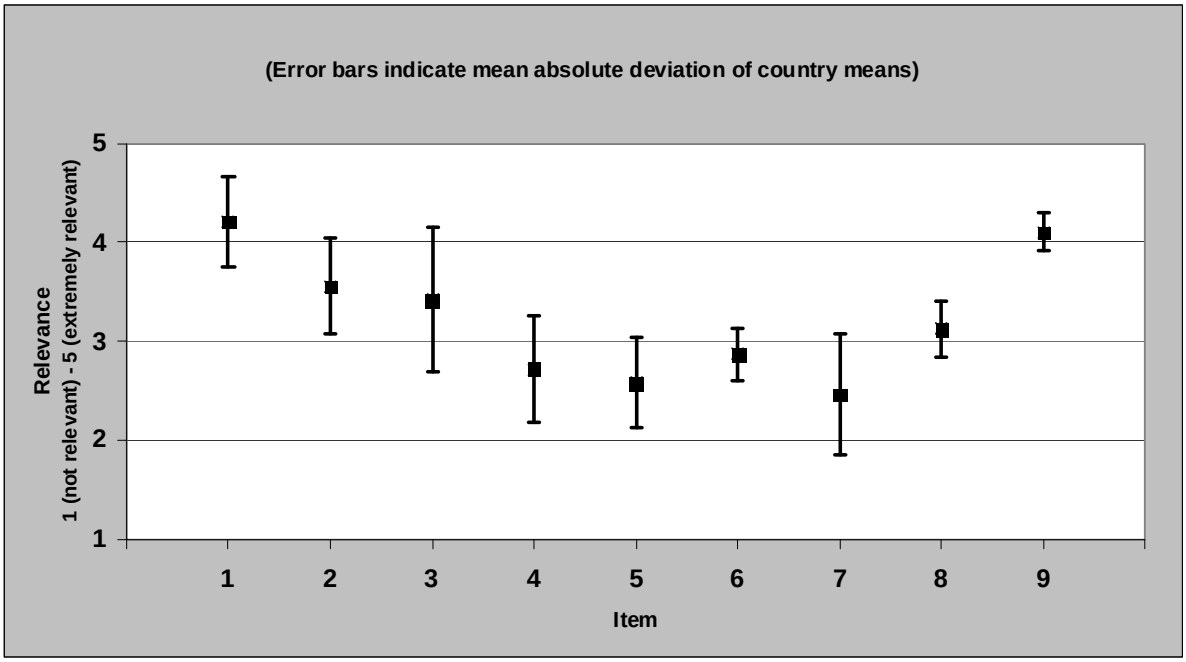
The following diagrams (Figure 3.2-7 and 3.2-8) illustrate the set of qualification requirements and give an overview of the results of expert ratings for qualification requirements rated in the first national workshop (mean values for expert ratings in the countries in terms of "relevance": "How relevant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

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 on 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 on the labour market?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

Experts from all countries agreed that the core areas *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 of high importance. The highest mean values were reported for *building and construction*. This confirms the high importance of, e.g., installation technology, functional check, troubleshooting and technical norms for all countries.

As a result, three areas can be identified as of very high significance (all other areas show a slightly lower degree of relevance): qualification requirements directly related to occupational aspects were rated particularly high (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 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; none qualification requirement was rated irrelevant.

The comparison of ratings in participating countries shows that there is a broad common frame of required qualifications for Electricians in the craft sector. Except for item 3 (engineering and technology 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).

Additional qualification requirements

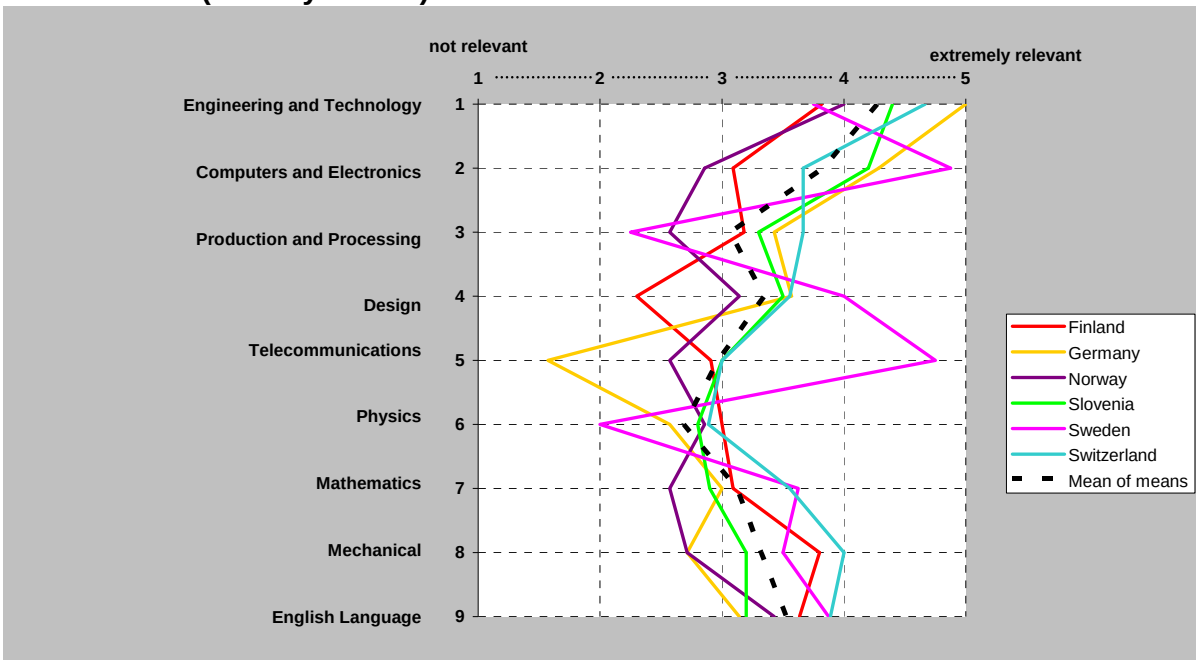
To include national specifics, some countries added further qualification requirements. All additional qualification requirements were discussed in the Electricians group during the third national workshops. The group agreed not to include any additional qualification requirements to the set for the same reason as for additional occupational tasks.

To conclude, the common profile of qualification requirements for electrician in the craft sector is mainly characterised by domain-specific aspects of building and construction, e.g. installation technologies (cable routeing, usage und connection of various types of electrical equipments, bus technology), work organization, functional check, troubleshooting and the accordance of the electrical systems to local norms, standards and regulations; telecommunication, e.g., call systems or equipment of telecommunication and telephone systems; 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 characterised by rather general requirements of English language, 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).

Electricians – industrial sector

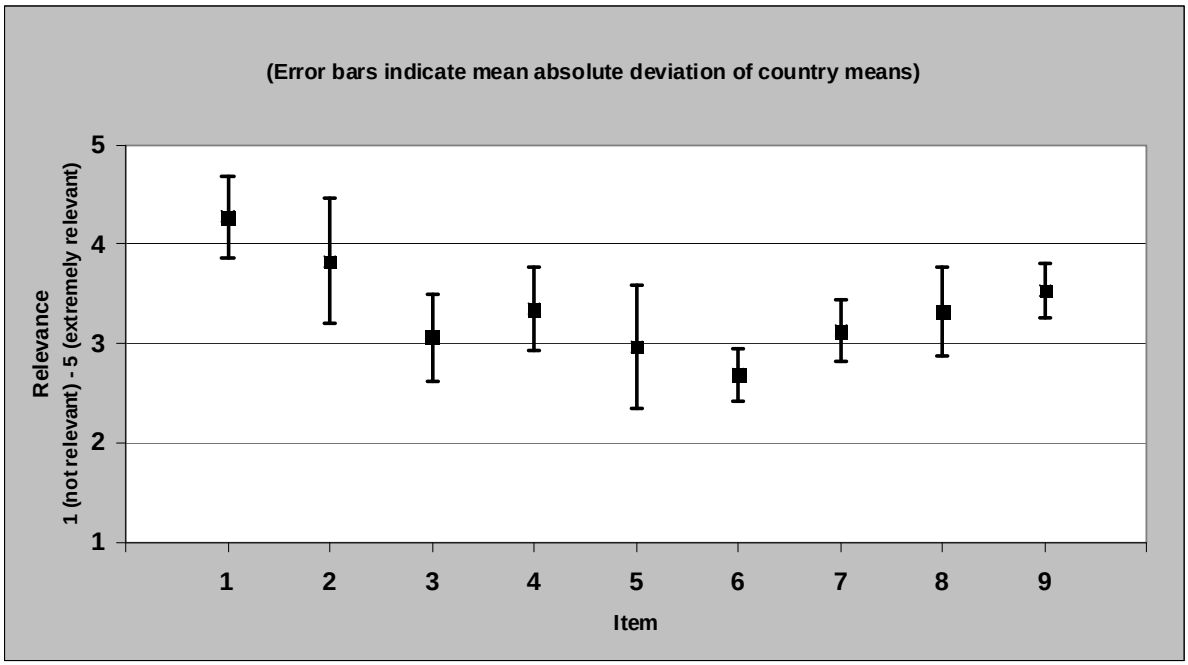
The following diagrams (Figure 3.2-9 and 3.2-10) illustrate the set of qualification requirements and give an overview of the results of expert ratings for qualification requirements in the first national workshop across countries (mean values for expert ratings in the countries in terms of “relevance”: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

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 on 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 on the labour market?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

High ratings can be reported for the more general qualification requirements: 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 telecommunication (no. 5) with diverging ratings from Sweden and Germany, there is widespread agreement between qualification requirements across countries.

The concordance in rating 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).

Additional qualification requirements

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

To conclude, the common profile of qualification requirements for electrician in the industry sector is mainly characterised by the domain-specific aspects engineering and technology, e.g., knowledge, skills and abilities for applying direct, alternating and three-phase technology and hardwired programm controller or programmable logic controller into account, including drive technology concerning the various electric motor types, the possibilities of their control (regulate 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 switch, line safety switch, electronic fuses), computers and electronics, e.g., electronic components like power electronics (e.g., transistors, thyrstors and so on) and computer or control software and the more general requirements English language.

3.2.4 Comparative analysis of ratings for the set of evaluation tasks

The rating of evaluation tasks was implemented to get first insights 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 international valid test items is the task of the next project phase. It was agreed to select a limited number of national evaluation tasks from participating countries and rate them subsequently with regard to content relevance and level of complexity in each country. All experts were confronted with different types of evaluation tasks depending on the 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[77]. For the *craft sector* seven core areas were identified:

1. Classic Installation technology
2. Intelligent Building automation: Bussystems (e.g. EIB, KNX, centralized 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 program controller
7. Service 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)**

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

77 In a small number of cases 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 program 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.

Table 3.2-6: **International set of evaluation tasks for electricians industry (Research Tool 2)**

No	Core areas	Task heading
1	Control Technology	Control Technology – automatic gate control
2	Control Technology	Control Technology – flow control
3	Control Technology	Control Technology – PROFIBUS
4	Control Technology	Control Technology – rotation reversing connection
5	Control Technology	Control Technology –electric drive
6	Drive Technology	Drive Technology
7	Control Technology	Control Technology – frequency converter for motor
8	Measurement Technology	Measurement Technology – measurement method
9	Measurement Technology	Measurement Technology – ultrasonic sensor
10	Maintenance	Maintenance
11	Troubleshooting	Troubleshooting

The method of comparing evaluation tasks, in some cases led to uncertainties und critics within the electricians group. The collection of tasks was misinterpreted as preparatory work for the development of test instruments which will be a substantial part in a possible future VET-LSA. It was repeatedly stressed by the expert group coordinator that the selected evaluation tasks were “only” used as instrument for identifying concordance between major educational objectives of the occupations and for getting 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 verbal descriptions. However, interpretations in the national reports show that misinterpretations still exist.

The group agreed to select about 10 evaluation tasks for each sector and submit them to the expert group coordinator. Countries were free to provide practical and theoretical orientated evaluation tasks. To set a limit to the translation efforts, the tasks should not exceed one written page in English language (without 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 tasks was uploaded at the VET-LSA homepage, a detailed version was send via e-mail on demand.

The pre-selection of evaluation tasks was agreed by all participating countries; slight changes were based on the results of the discussion. 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 displayed in full length will be provided in the final publication 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 criticized in some national reports mostly because of misinterpretations in national workshops. This resulted in confusions about the task design. Other difficulties were caused by the diversity of country-specific technical regulations and norms.[78] Most of the critique, 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 of some countries provided references to their national core industries such as the oil or the wood-working industry; other countries considered the general level of the requirements as too high. After all, diverse critiques and discussions during national workshops give first insights into the challenges to be expected in a possible future VET-LSA, in particular 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 automatization) seems too small for a LSA-project. The internal differentiation in terms of the technological profile is also a problem to be considered. After all, against the background of ratings of occupational tasks and evaluation tasks, the comparability seems acceptable on a general level. As for the craft sector, the profile of occupational tasks and qualification requirements also seems comparable on a general level. 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.[79].

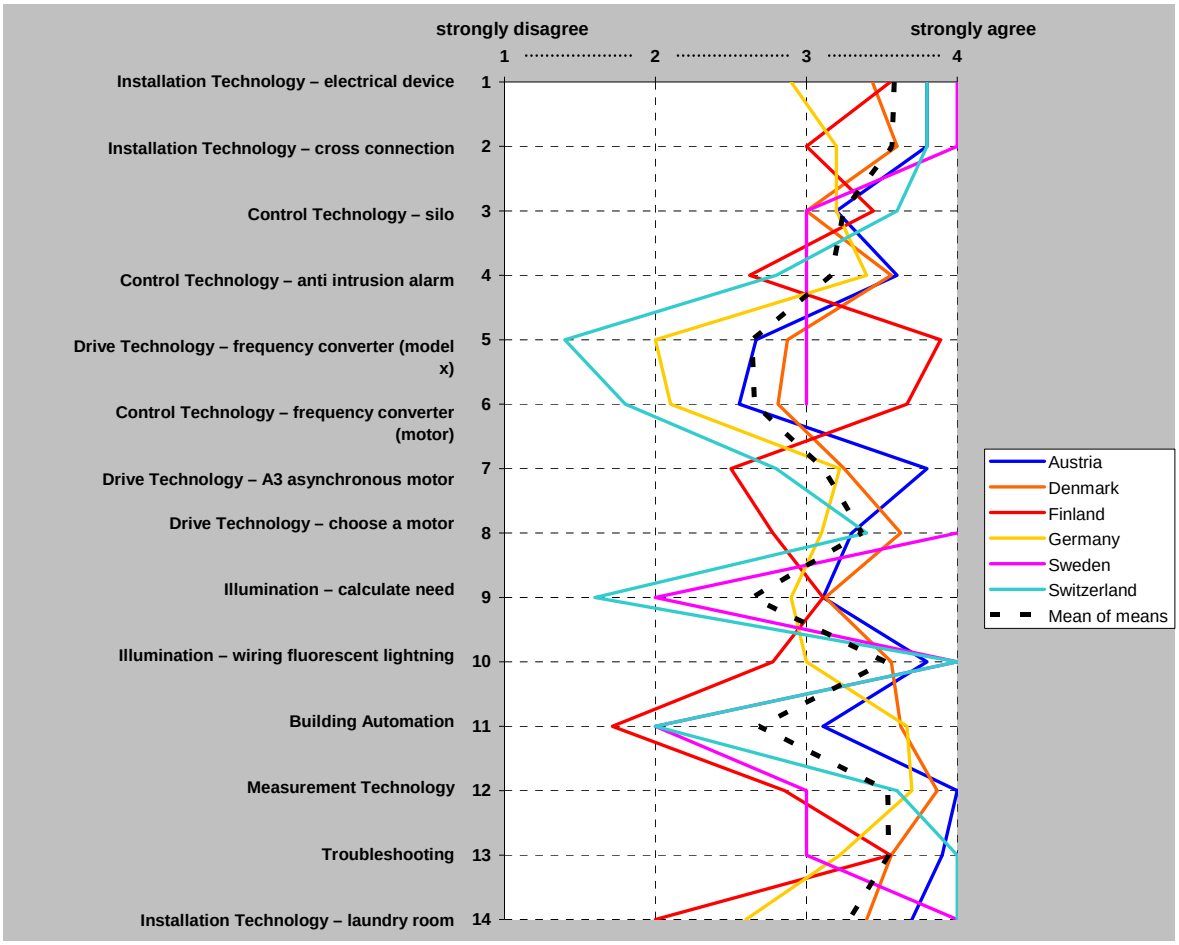
Electricians – craft sector

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

78 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.

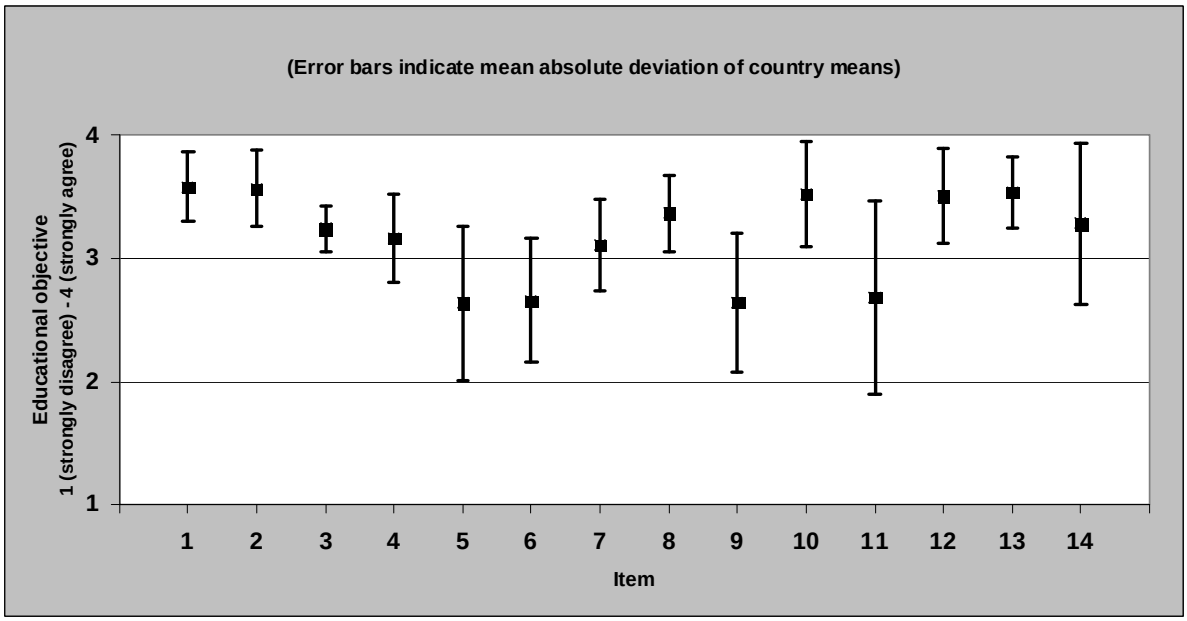
79 National coordinator Norway.

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



Question: "The task is representing major educational objectives at the end of VET programmes Electrician Craft" (1= strongly disagree; 2= disagree; 3=agree; 4=strongly agree)

Figure 3.2-12: **Electricians – craft sector: evaluation tasks – educational objectives (mean across countries)**



Question: "The task is representing major educational objectives at the end of VET programmes Electrician Craft" (1= strongly disagree; 2= disagree; 3=agree; 4=strongly agree; N varies from 8 to 16 in the countries)

The rating values for evaluation tasks show strong agreement and high concordance across countries. For tasks 1 to 4 as well as tasks 7, 8, 10, 12, 13 expert-ratings across all countries show clear acceptance for educational objectives represented by the selected evaluation tasks[80]. The tasks showing high 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.

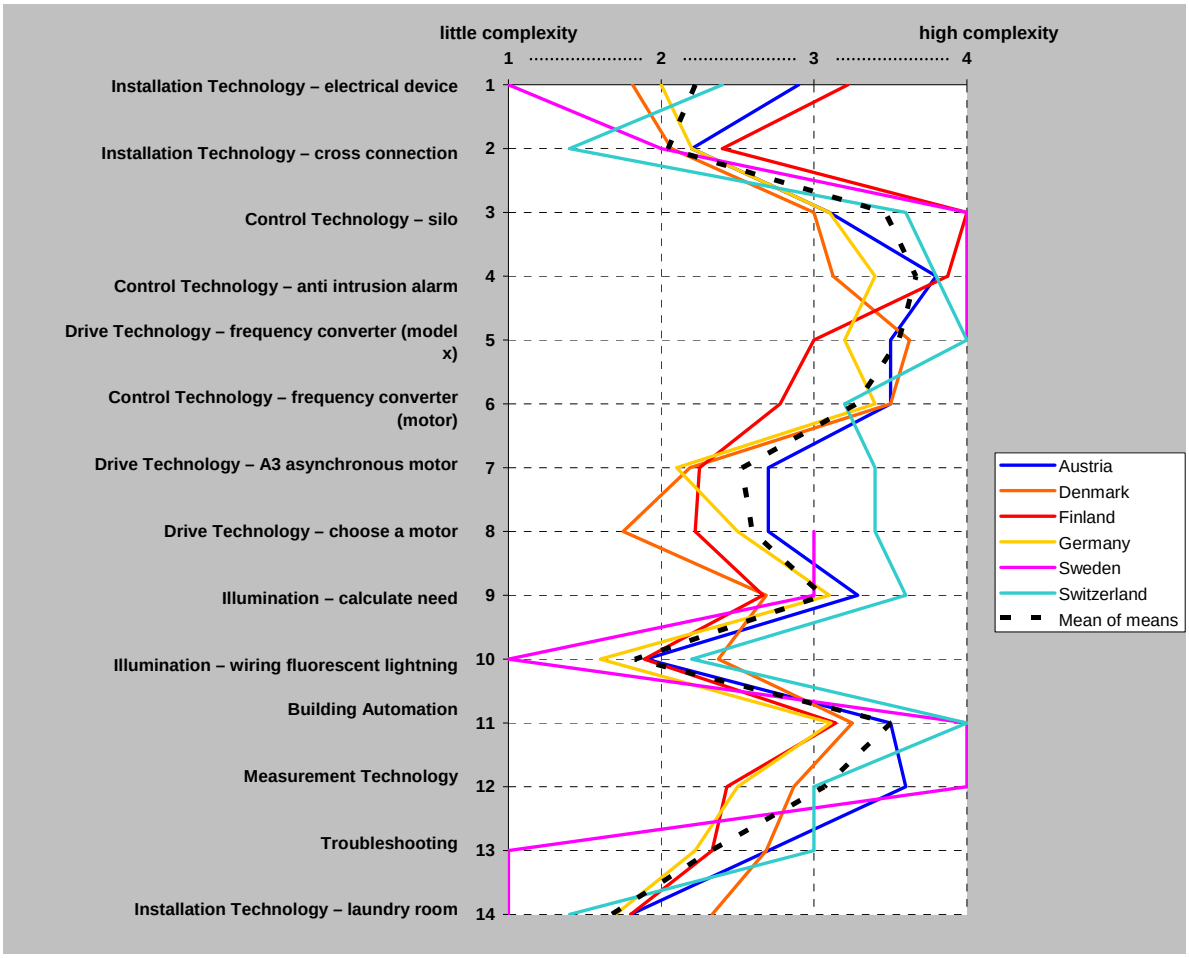
The results show that differences can be found within one core area regarding the significance of educational objectives. Therefore, it is important to check comparability in detail. For example, within the core area “drive technology”, tasks 5 is rather rejected by Switzerland and Germany but there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

This shows that not the entire core areas drive technology, illumination technology or control technology is rejected because some of the tasks within the same field are approved. Against this background it can be expected that it is possible to create adequate solutions also for those areas that are only represented by one task. This might even be the case when 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 is recommended to check additional tasks within this core area. However, during the final international workshop, the national expert confirmed that it would be possible to identify evaluation tasks also in this core area if the task were described without relations to specific firms, manufacturers or enterprises (which were the reason for lower ratings in some countries).

Finally, Kendall’s W points to significant agreement in the overall profiles of countries ratings with the value W=.32 (p=.028) indicating comparability despite the restrictions illustrated above. The results for ratings of “task complexity” are displayed in Figures 3.2.-13 and 3.2.-14:

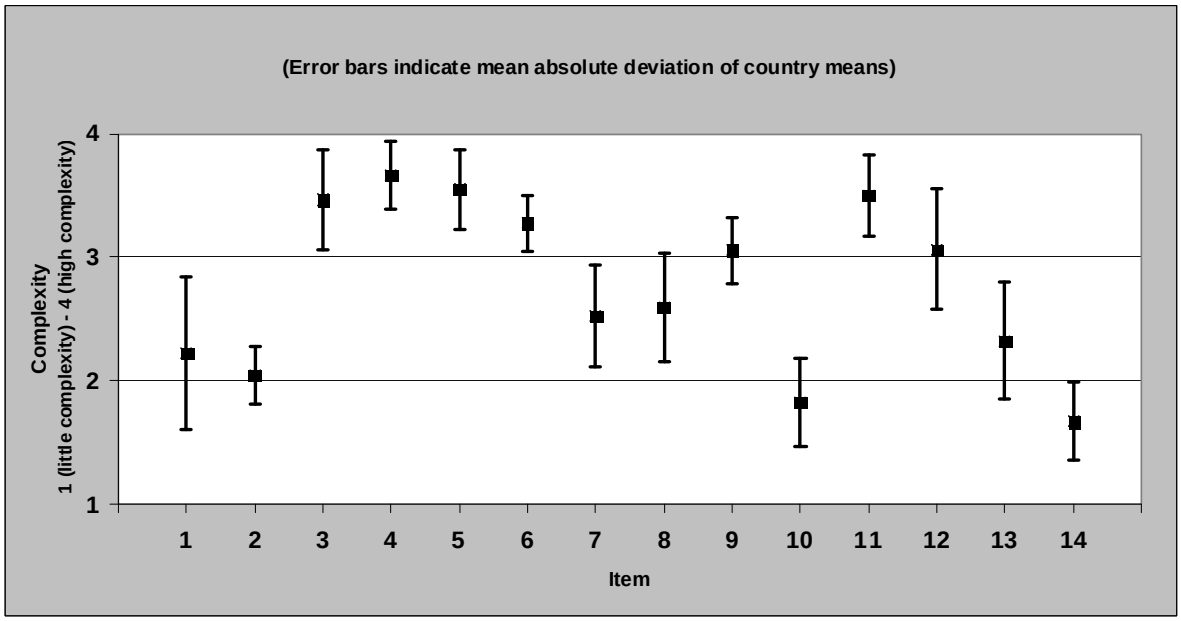
80 The Swedish experts didn`t rate task no 7 (Swedish report, p.36)

Figure 3.2-13: **Electricians – craft sector: evaluation tasks – complexity (country means)**



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

The findings show that the selected evaluation tasks cover different levels of complexity. Tasks 2 to 6, 9, 10, 11 and 14 were rated comparable across countries independently of the core areas and different levels of task requirements could be identified reflecting different levels of complexity in all participating countries[81]. Within the core area control technology the level of complexity for all selected tasks (3, 4, 6) was considered „high“ up to „very high”. Diverging ratings were reported only for one task within the core area installation technology. Thus, high 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 Annex 3.2.1;Tables 3.2.1-A9, 3.2.1-A10, 3.2.1-A11, and 3.2.1-A12).

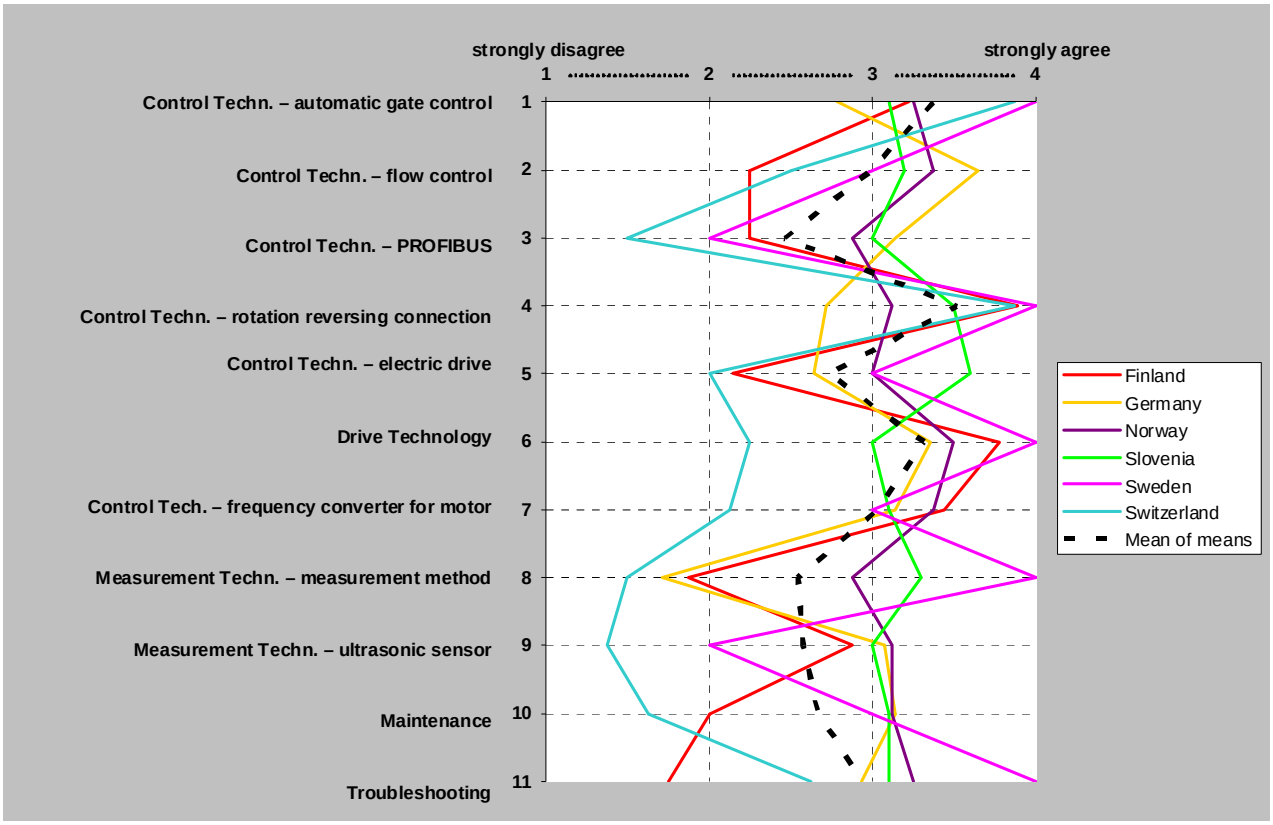
To sum up, the profile of evaluation tasks corresponding to the core areas for the craft sector in all countries is mainly characterised by: cable routeing and connecting diverse electric loads (e.g., electric motors and equipments, sockets, illuminant, switches); using technical documents (e.g., wiring diagrams, manuals, blueprints); installations of electric circuits (e.g., cross connections, motion sensors, illuminant, sockets) not only for (apartment) buildings but also for workplaces and enterprises; installations of electric machines and basic control and regulation systems by using hardwired program controllers or simple programmable logic controllers; selecting adequate technical equipments according to specific technical requirements or customer inquiries (e.g., selecting an appropriate electric motor). Also common objectives exist within the core area measurement technology (e.g., measuring the loop resistance, insulation resistance and earth electrode, 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 finally correcting it.
The core area “building automation” was considered very relevant for the craft sector by all national experts and should be taken into consideration in future steps.

Electricians – industrial sector

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

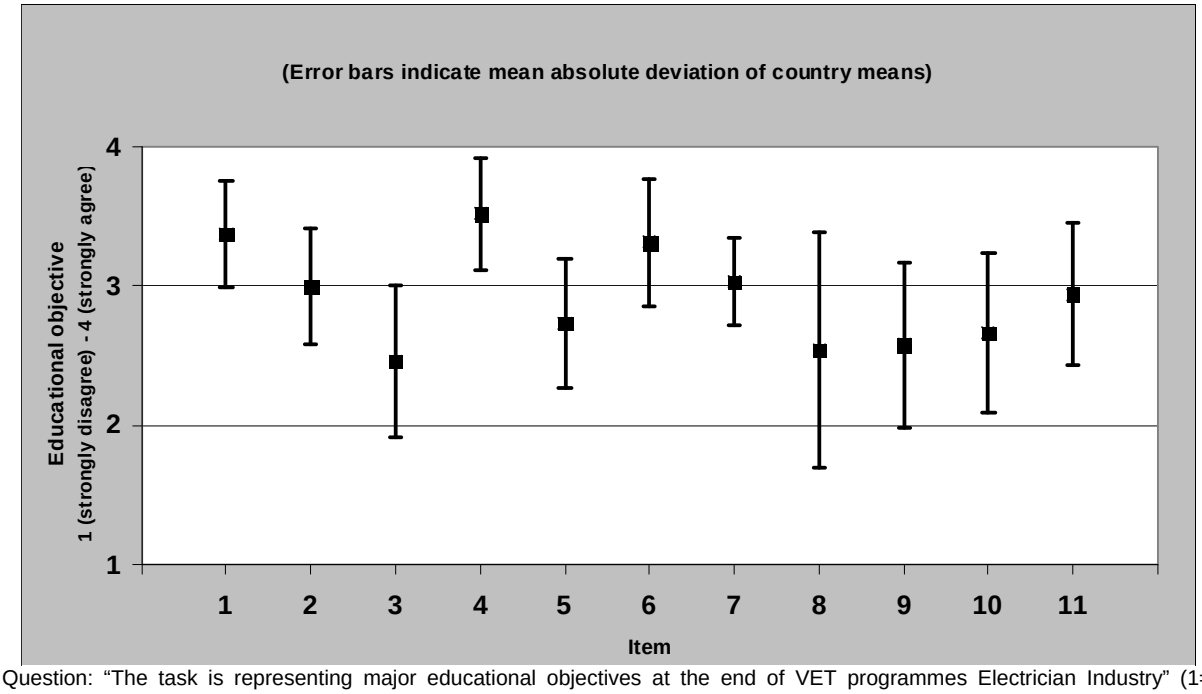
81 The Swedish experts didn`t rate tasks No 6 and 7 (Swedish report, p.36)

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



Question: "The task is representing major educational objectives at the end of VET programmes Electrician Industry" (1= strongly disagree; 2= disagree; 3=agree; 4=strongly agree)

Figure 3.2-16: **Electricians – industrial sector: evaluation tasks – educational objectives (mean across countries)**



Question: "The task is representing major educational objectives at the end of VET programmes Electrician Industry" (1= strongly disagree; 2= disagree; 3=agree; 4=strongly agree)

Whereas good agreement could be reaches for occupational tasks, diverging ratings were reported for evaluation tasks. The reason for these differences is (partly) due to specific

normative conceptions of how evaluation tasks should be arranged or designed in the national contexts. In particular, critical results were handed in by Switzerland whose experts considered only four tasks as generally acceptable (task 1, 2, 4 and 11)[82].

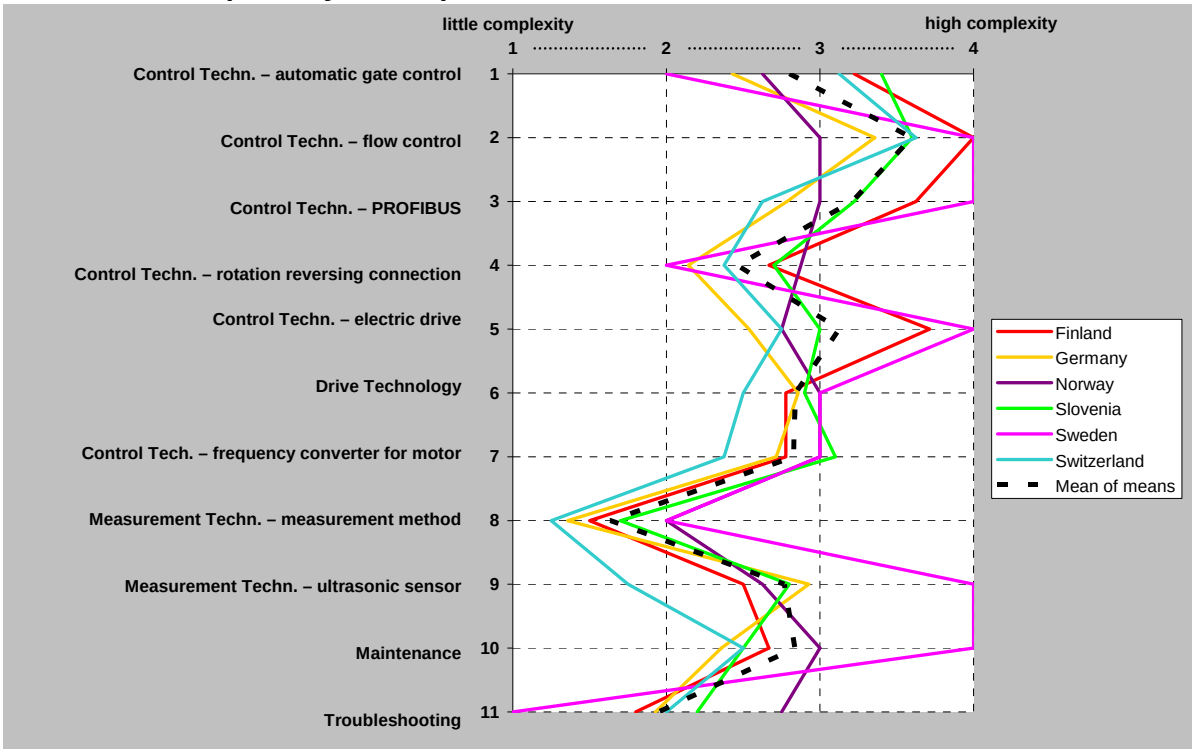
In the case of "control technology" the ratings from Switzerland and Finland show that the specific task is critically evaluated and not the overall subject control technology. It can be assumed that drive technology, measurement technology and maintenance are core subjects from this occupation also in Switzerland. In the national reports it is emphasized 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 will be 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 were 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 the requirements.

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

The Finnish experts consider 6 out of 11 tasks as acceptable. They also emphasise that only the tasks which were handed in by them meet their absolute requirements. Kendall's W is at the limit of significance with W=.30 (p=.054; the country means and mean 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).

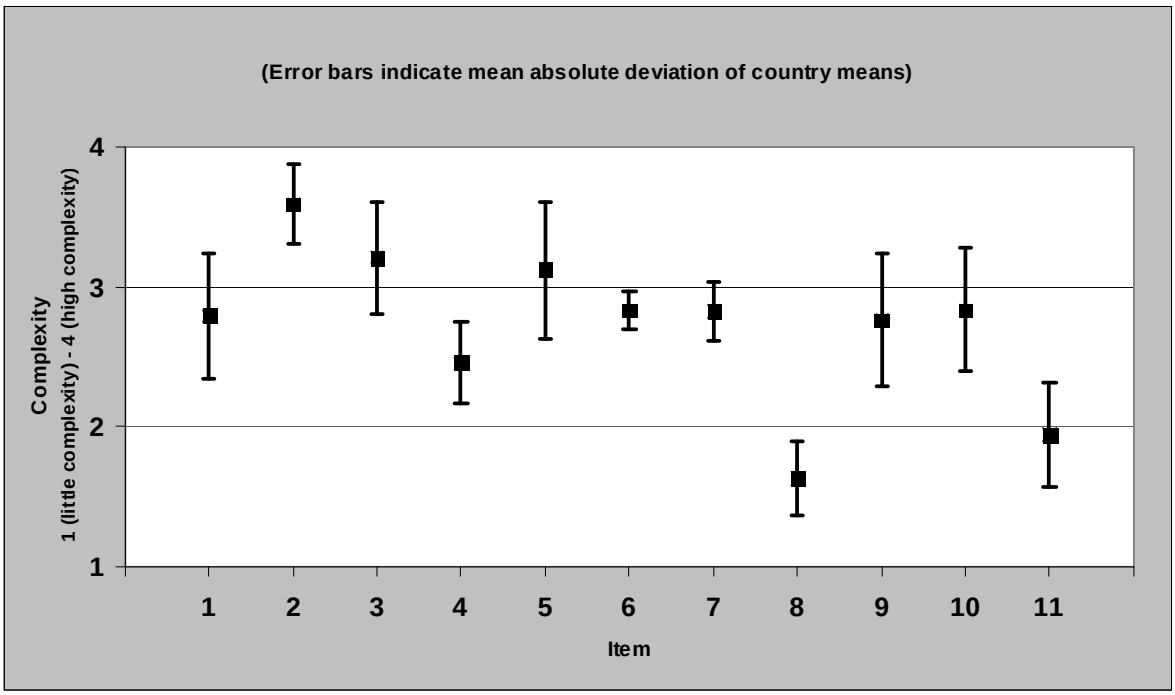
Figure 3.2-17**: Electricians – industrial sector: evaluation tasks – complexity (country means)**



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

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

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



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

As in the craft sector task complexity was rates comparably across countries in particular for tasks 2, 4, 6, 7 and 8. Mainly the Swedish ratings show large deviations: tasks 3, 5, 9 and 10 were considered very complex. Within the core area control technology the level of complexity for two selected tasks was rated high 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. 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), parametrizing[83], process automation/regulation technology, commissioning, using of 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 to check 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 technology (e.g., modification of control and regulation systems, circuits of rotation reversing); connecting and parametrizing frequency converters; measurement technology and troubleshooting[84]; measuring (phyiscal) characteristics with active and passive electrical sensors (e.g.,

83 Included in additional occupational tasks for the industrial sector.

84 Despite the deviations between countries this area was considered relevant for all VET programmes during the final international workshop, the deviation was explained specific technologies or manufactures, which are not commonly used in some countries.

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 malfunctions or troubleshooting, this is covered by detecting the technical error in the installation or the electrical equipment and finally correcting it).

3.2.5 Summary

Based on an analysis of VET programmes, occupational tasks, qualification requirements and evaluation tasks, the possibility for 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 gives a recommendation concerning the eligibility of Electricians in the craft sector and in the industrial sector for VET-LSA.

Electrician – craft sector

The formal descriptions of national VET programmes for Electricians in the craft sector show high concordance: a minimum of 400 graduates could be confirmed for all countries, all programmes are classified at ISCED levels 3 (3 A/B, 3B, 3C) and have a duration of 3 to 4.5 years. At least compulsory school education is required 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 ratings of occupational tasks show widespread agreement across countries. Most of the tasks were rated as relevant; only one task was considered less important across countries. Two additional tasks were considered of high importance by the electricians expert group. In future steps it is recommended to check these tasks in detail. Taking into consideration that some tasks occur several times a month, expert ratings for task frequency match very well; only one task does not fulfil this criterion.

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

Qualification requirements

Three areas can be identified as of very high significance; all other areas show a slightly lower degree of relevance. Qualification requirements directly related to occupational aspects were rated particularly high 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 electrician in the craft sector is mainly characterised by domain-specific aspects of building and construction, e.g. installation technologies (cable routeing, usage und connection of various types of electrical equipments, bus technology), work organization, functional check, troubleshooting and the accordance of the electrical systems to local norms, standards and regulations; telecommunication, e.g., call systems or equipment of telecommunication and telephone systems; 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 characterised by rather general requirements of English language, 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

The rating of 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 confusions among some of the experts 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 is required for the development of test items in a possible future VET-LSA.

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

The findings show satisfactory concordance of ratings for all countries (except Norway). However, it is possible that these educational objectives are also relevant for Norway if the evaluation tasks were changed in the format towards 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: Bussystems (e.g. EIB, KNX, centralized systems)
3. Illumination (Calculation)

4. Drive Technology
5. Measurement technology (especially security and safety; according to guidlines)
6. Building control equipment (basics): Programming Logic Controller (e.g. S7 (Siemens) or others) or hardwired program controller
7. Service and maintenance

Electrician – 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 coverage for ratings of occupational tasks for the industrial sector can be evaluated as good. Most of the tasks were considered relevant for all countries; only two tasks were rated less important. Two additional tasks were considered of major importance by the electricians group, which should be analysed in future steps. There is 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 tasks seem to be performed less frequently which might be due to 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 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, installation and commissioning of electric and electronic control and regulation systems, other electric equipment or systems and electric loads; programming and handling of bus technologies also plays a major role. Diagnosis of malfunctions (troubleshooting), problem solving and putting systems back to operation is certainly included in all tasks. Moreover, electricians in the industrial sector perform tasks of advising to solve electric problems supported by technical documents (e.g., wiring diagrams, blueprints, and engineering instructions) in all countries. As for the craft sector, aspects of security and safety of electric installations and equipment according to national regulation, standards and norms, play an important role in all countries.

Qualification requirements

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

The common profile of qualification requirements for electrician in the industry sector is mainly characterised by the domain-specific aspects engineering and technology, e.g., knowledge, skills and abilities for applying direct, alternating and three-phase technology and hardwired programm controller or programmable logic controller into account, including drive technology concerning the various electric motor types, the possibilities of their control (regulate 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 switch, line safety switch, electronic fuses), computers and

electronics, e.g., electronic components like power electronics, electronic components (e.g., transistors, thyrstors and so on) and computer or control software and the more general requirements English language.

Evaluation tasks

The ratings for 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 rating of tasks of 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 fulfil all requirements yet.

Based on the rating 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 consensus within the same core area. .Against the background of the discussions in the international electricians group during the final international workshop, this seems very likely. In a similar way, it can be assumed for Switzerland that the disagreement mainly derives from the 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 program 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 the both sectors are likely to have clearly different cognitive preconditions. This would give additional possibilities for statements about different levels of the same occupational field. Moreover, the inclusion of both occupations would also allow 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 as a result of common protracted negotiations the baseline of an international comparison in VET with respect to (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 doing so, the national results will be compared to strike an agreement of conditions of comparison and to prepare a decision whether an international comparison particular in the field of business and administration is possible or not. 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, since selected national levels do not correspond with the Swedish educational system. The chosen ISCO 08[85] category 33 corresponds with skills taught in post-secondary education in Sweden, not in upper secondary school-education at the initial level[86]. Norway didn't take part in business and administration because the number of students is too small.

3.3.1 Specifics of national VET programmes for business and administration

The working 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 as an orientation contributed to a selection of VET programmes. Most countries focused on one or two VET programmes. An exception is Switzerland who selected in total 4 programs whereas the vocational training programmes (a, b) can be alternatively accomplished fulltime at school (c, d). Almost all training programmes are located at level 3B; the Finish programm at ISCED 3A/B; the Danish vocational program is on level 3C[87]

The vocational programmes one can find in Table 3.3-1 consist mostly in a combination of training on the job or practical training and training in school. The ratio between different training periods differs from 80% till 17% on work-based training and from 100% till 30% on school-based training. The fulltime-schooling program in Switzerland can explain the 100% ratio. The timeframe of the training programmes spread from 3 to 4 years of vocational training; in this respect they are very comparable. In all participating countries the educational prerequisite for the participation in training programs in the field of business and administration the completion of a compulsory school.

85 Former classified in ISCO88: 34 other associate professionals. Description in ISCO 88: (34 Other associate professionals). Definitional notes: [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.113).

86 The national expert for Sweden contributed to the discussion in the business and administration expert groups in all international workshops.

87 Classification based on expert agreement since there is no official ISCED classification in Denmark.

Table 3.3.-1: **General information on VET programmes – business and administration**

	Austria	Denmark	Finland	Germany	Slovenia	Switzerland
Title of VET programme	a) Bürokaufmann/-frau b) Industriekaufmann/frau	Clerical Assistant Administration	Business and Administration: Customer Services and Marketing, Business Administration	Industriekaufmann/frau	Economic Clerk (Ekonomski tehnik)	Kaufmann / Kauffrau EFZ: two profiles B (basic) andE (extended)
Total duration (years)	3 years	4 years	3 years	3 years	4 years	3 years
Number of graduates	In 2007: a) Bürokokaufmann/-frau: 3.518 b) Industriekaufmann/-fraz: 264 (Handelsschule: 3.347) (Fachschule für wirtschaftliche Berufe: 2.166)	in 2007: 1.098	In 2007: 3.337 (curriculum-based education)	in 2006: 17.952	new programm no numbers available yet (appr. 3.471 students in 2011)	in 2007: 11.090
ISCED level	3B	3C**	3A/B	3B	3B	3B
Entry requirements	completed compulsory education	completed compulsory education	basic (compulsory) school certificate; no entry requirements for cp* and ap*	completed compulsory education	successfully completed compulsory education (9 years) or completed short-cycle vocational education (2 years after basic education)	completed compulsory education
Access to next level of education/training* **	Meisterprüfung Berufsreifeprüfung Studienberechtigungsprüfung	ISCED 4	general eligibility for higher education in politechnics and universities	depending on specific regulations of the Länder access to University of applied sciences and Universities	higher vocational education (VIŠ), higher professional education (VIS), higher academic education (UNI)	higher vocational education (Berufs- und höhere Fachprüfungen, und höhere Fachschulen); with Berufsmaturität access to Universities of applied sciences
Organisation/learning arrangements:						
work-based learning % **school-based learning %**	a) & b) w: 80% ; s: 20% c) & d) s: 100%	w: 55 % / s: 45%	w: 17%c / 70%ap / 70%cp* s: 83%c / 30%ap / 30%cp	w: 60 % / s: 40%		w: 70% / s: 30%
alternating programme / or periods of training	apprenticeshop training; alternating school and work; longer periods or seasonnally	basic part: 38 weeks vocational school; main part: alternating periods between school-based education and practical trainng in companies	apprenticeshop-based and competence-based education can be alterning or consist of longer periods of training in school and at the workplace	dual system: training in vocational schools and at the workplace are alternating	full-time school programme with 4 weeks practical training at the workplace	dual system: training in vocational schools and at the workplace are alternating

* 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
Souce: investigate in 2008

3.3.2 Comparative analysis of ratings for occupational tasks

The selection of occupational tasks has been done by 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 figure out what kind of jobs in a first step, and what kind of occupational task, as a second step, in the working field of business and administration can be found 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). In addition the SVP range[88] (duration of specific vocational training) was used as an orientation (specified in Chapter 1.5.1). Related to these criteria the jobs displayed in Table 3.3.-2 were pre-selected:

Table 3.3.-2: **Selected occupations based on the o*net -database**

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

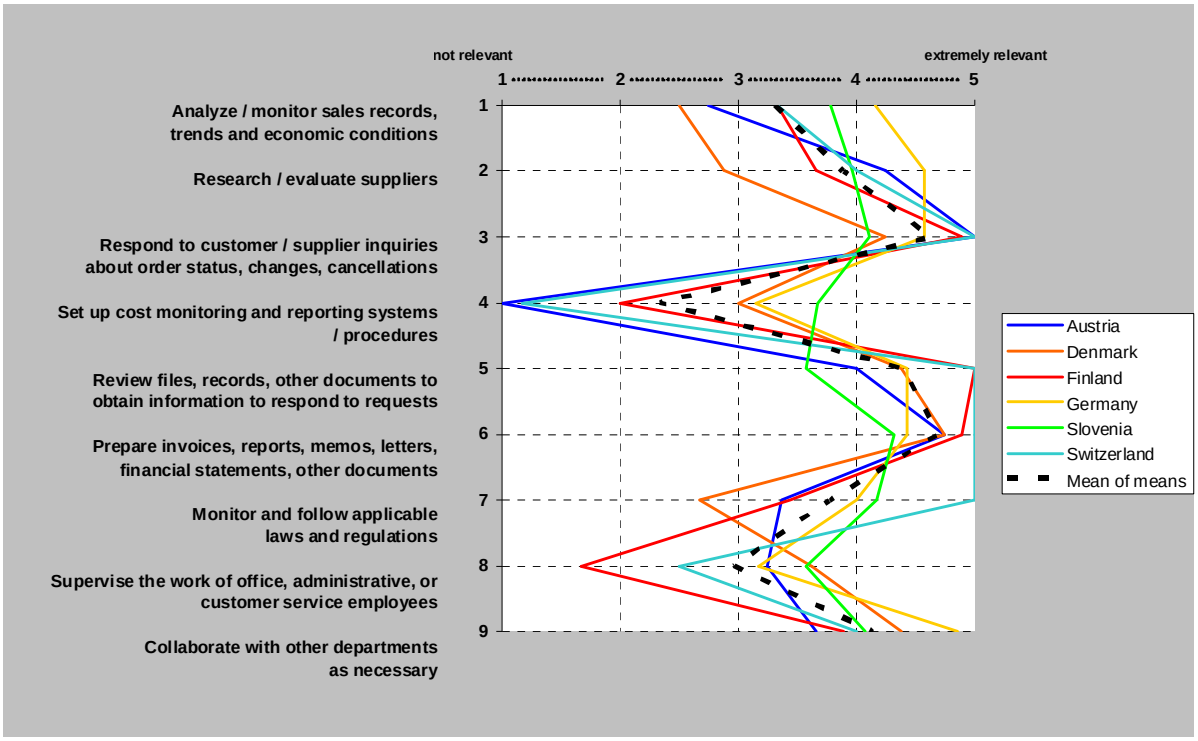
The formal requirements for each of the selected jobs are comparable: most of the jobs refer to job zone 3 and 4; the SVP range from 6.0 to < 8.0[89]. The selection of occupations based on comparable job characteristics is important to illustrate the many-sidedness of the business and administration area as well as the different facets of occupational integrations of merchants and economists in the labour market.

The selection of occupational tasks as a cross intersection of the tasks[90] was related to all jobs mentioned above. Therefore, the o*net-database as a common reference system was used. The final decision what kind of occupational tasks (see research tool, Table 3.3-

88 http://online.onetcenter.org/help/online/svp
89 There are two exceptions in the selection: Secretaries and Office Clerks are ranked in job zone 2
90 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

A1) should be included in the Research Tool 1 was taken as a follow up of the second international workshop (Berlin, October, 2008) in agreement with the business and administration group.

Figure 3.3.-1: **Business and administration: occupational tasks – relevance (country means)**



Question: "How relevant is the task on average to the performance of jobs in the field of Business & Administration?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

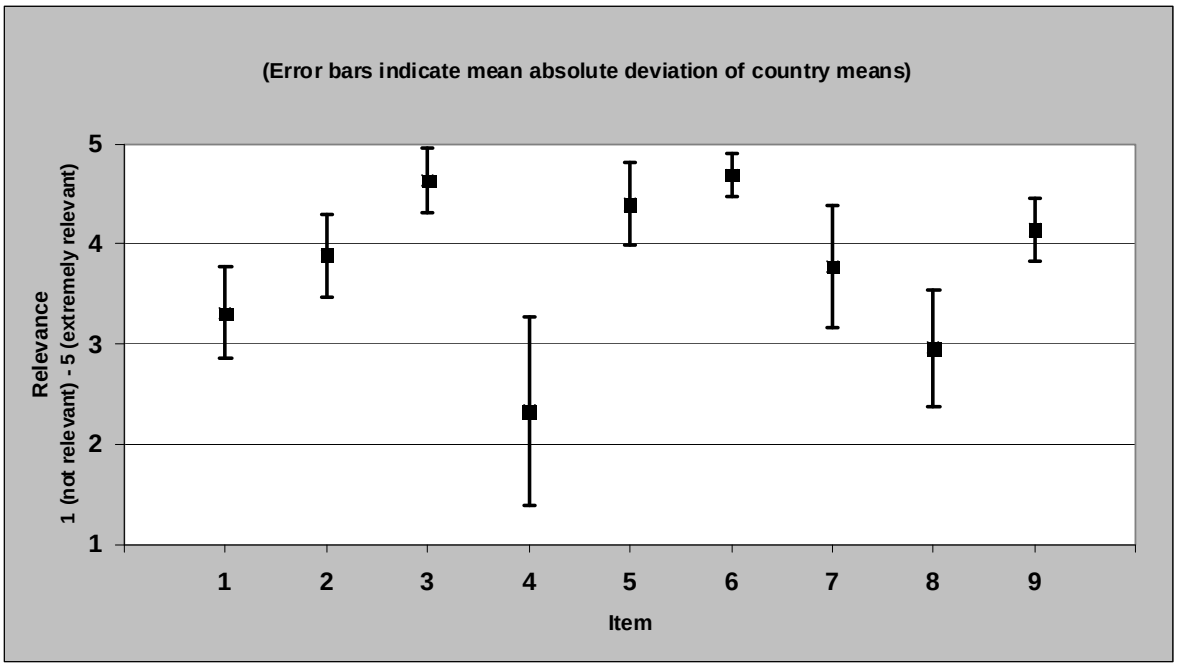
Finally the business and administration group agreed on nine occupational tasks representing the field (research tool 1 with the original items displayed in full length is provided in Annex 3.3; Table 3.3-A1). The tasks are based on typical activities of employees like dealing with sales records, financial statements and invoices as well as organizing customers´ and suppliers' inquiries. The tasks were rated during the first national workshop in all participating countries.

The diversity of the ratings (Figure 3.3-1) relating to the question how relevant a particular task is, differs rather 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, 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 critical high (see 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 as task for senior accountants at a higher level than skilled workers, which explains the low ratings. The same is valid for task 7 and 8. For the tasks 7 and 8 the ratings between countries illustrate a misfit between the countries, as well. For task 8 ("supervising") the ratings of Finnish experts are different from the ratings of other

countries[91], whereas the bias in task 7 ("laws and regulations") is based on the strong agreement of Switzerland. Especially regarding "laws and regulations" (item 7) the divergence is based on the specifics brought out in the national VET programmes. In addition it can be assumed that occupational tasks, which are related to the laws and regulations of the different countries, are not necessarily suitable for an international comparison.

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 & Administration?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

All in all, Figure 3.3.-2 reveals a concordance in the international ratings about 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").[92] Therefore, responding to customers and suppliers inquiries is an occupational task that is relevant for all participating countries. Those kinds of occupational tasks are going into details of customer and suppliers support. The field of business and administration defines itself mainly in terms of service orientation as well as 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 are common occupational tasks across the countries. It can be recommended to set the focus of an international comparison particularly on occupational tasks, which are dealing with aspects of rendering a service in different ways and based on different work processes.

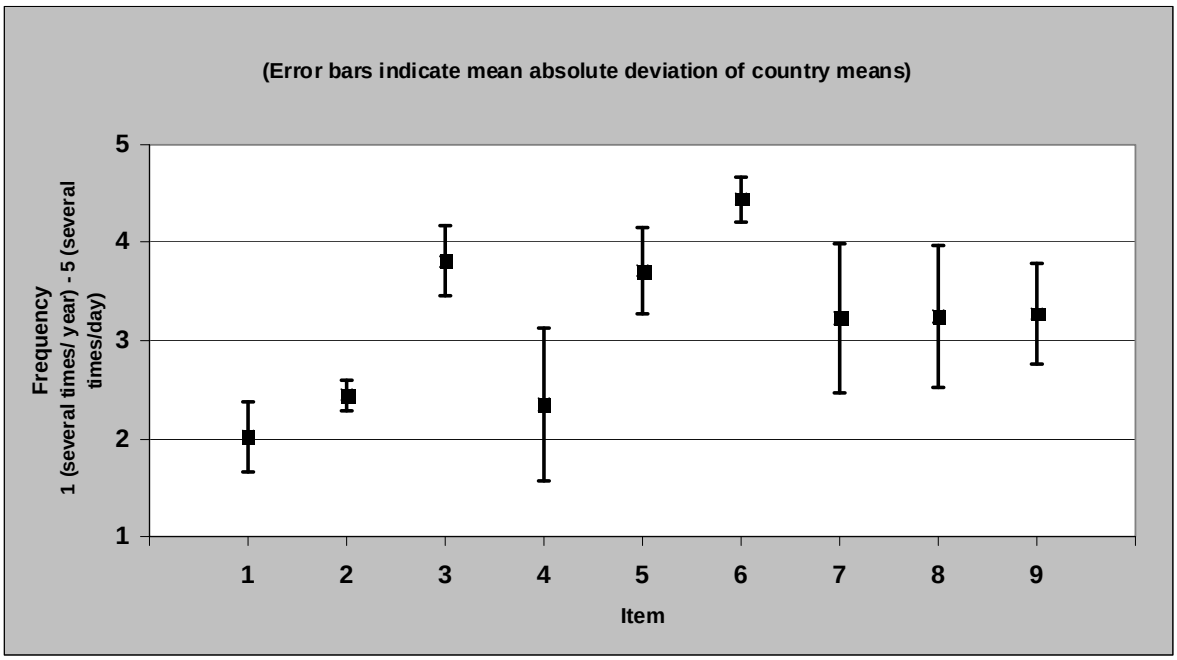
To summarize, the results of the expert ratings show that the comparison of occupational tasks is possible and that the judgement of experts across countries is relatively

91 The mean absolute deviation of means of Item 8 is 0.9.
92 The mean absolute deviation of means of Item 3 is 0.3.

uniform. To receive a clearer picture the Kendall W- test[93] is used to indicate in which extent this concordance has taken place. The trends described above can be confirmed with the Kendall-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 of tasks' relevance the experts had to rank the frequency of occurrence 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.

Figure 3.3.-3: **Business and administration: occupational tasks – frequency (mean across countries)**



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)

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 if 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 very comparable. The widest deviation in this rating is related to item 4 ("set up cost monitoring and reporting systems/procedures"). The Kendall-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 tasks' frequency across countries correspond approximately to activities at 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 relevant files to obtain

93 Kendall's Coefficient of Concordance, *W*, is a measure of the agreement between several judges who have rank ordered several entities. It represents the ratio of the variability of the total ranks for the ranked entities to the maximum possible variability of the total ranks; a small ratio implies disagreement between judges.

information to respond to requests. The same is true for task 3; task 3 is dealing with customers and suppliers care including routine procedures like modifications and changes of deliveries. In contrast, task 1 and task 2 are related to activities that are addicted to rather periodical activities like sales analysis and trend research (task 1) or to operational activities with respect to changes in production processes as well as in goods and services (task 2). The selection and evaluation of suppliers, for example, represent those kinds of operational) activities (the country means and mean absolute deviations within country means for each country are provided in Annex 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. One can find below some of the main comments from the different country representatives: e.g., *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"; "some of the categories are rather broad".* Therefore, the international expert group suggested a reformulation of one item and added two additional items from o*net for subsequent steps in a possible future VET-LSA: Task 6 is 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 is focused on the methods of progressing goods and services as well as on the work 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)" is 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 used 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 of the business and administration expert group confirmed the relevance of the additional tasks for their countries during the group discussion in the final international workshop[94]. The additional tasks should be taken into consideration in subsequent steps of framework development in business and administration.

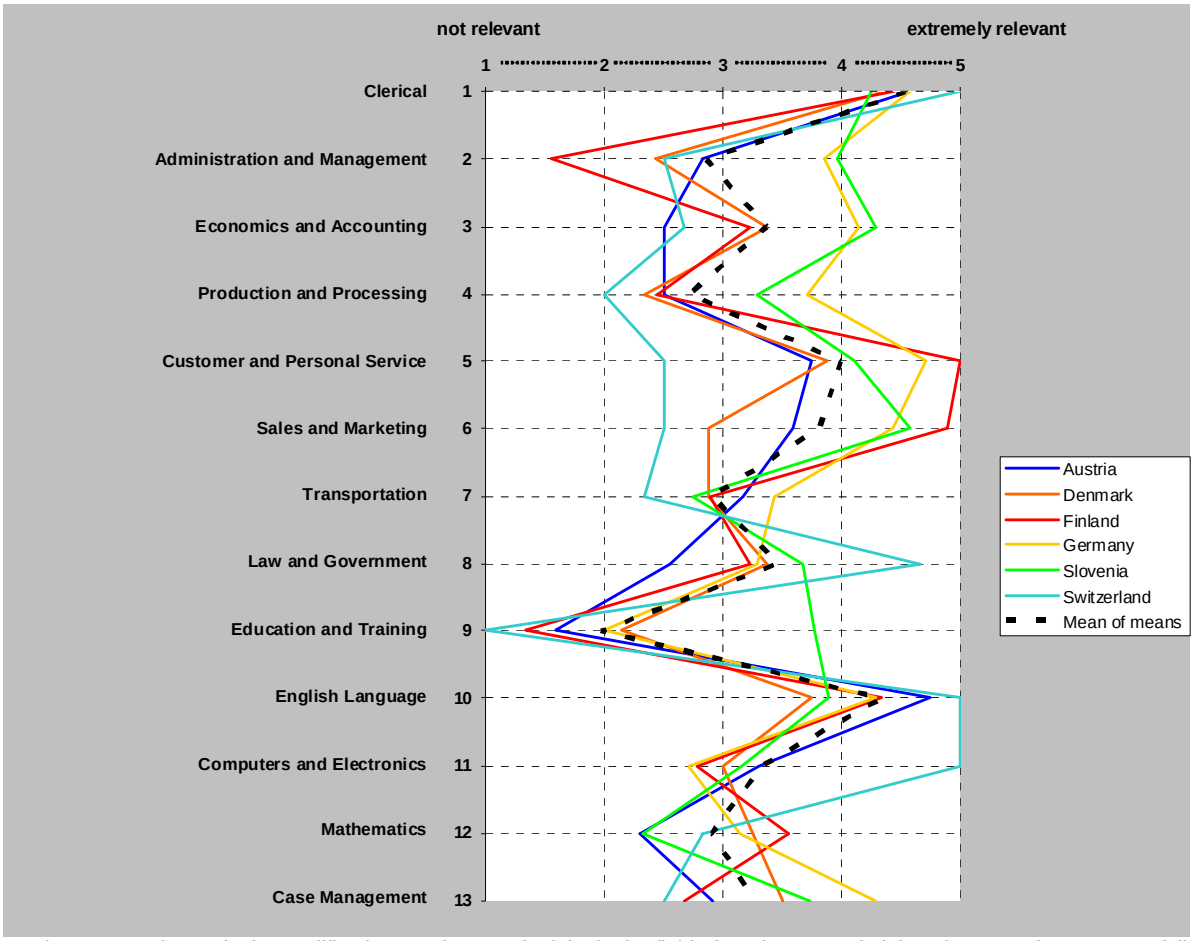
To sum up, the occupational profile in all countries is mainly characterised by service orientation and service delivery as baseline for tasks related to the support of goods and services. Therefore, employees in the field of business and administration have to be multi-skilled. In particular those kinds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

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

3.3.3 Comparative analysis of ratings for qualification requirements

The procedure to come to an agreement regarding the qualification requirements was similar to the one for the selection of occupational tasks. Like before the o*net -database was 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 like clerical qualifications (item 1) as well as qualifications in the field of economics and accounting (item 3) to generic requirements necessary for life performance like mathematics (item 12), English language (item 10), and computer literacy (item 11). The list of qualification requirements is completed by qualifications that correspond to different company areas like administration and management (item 2) and sales and marketing (item 9) on the one hand to operational functions like production and processing (item 4) as well as customer and personal services (item 5) on the other hand.

Figure 3.3.-4: **Business and administration: qualification requirements – relevance (country means)**



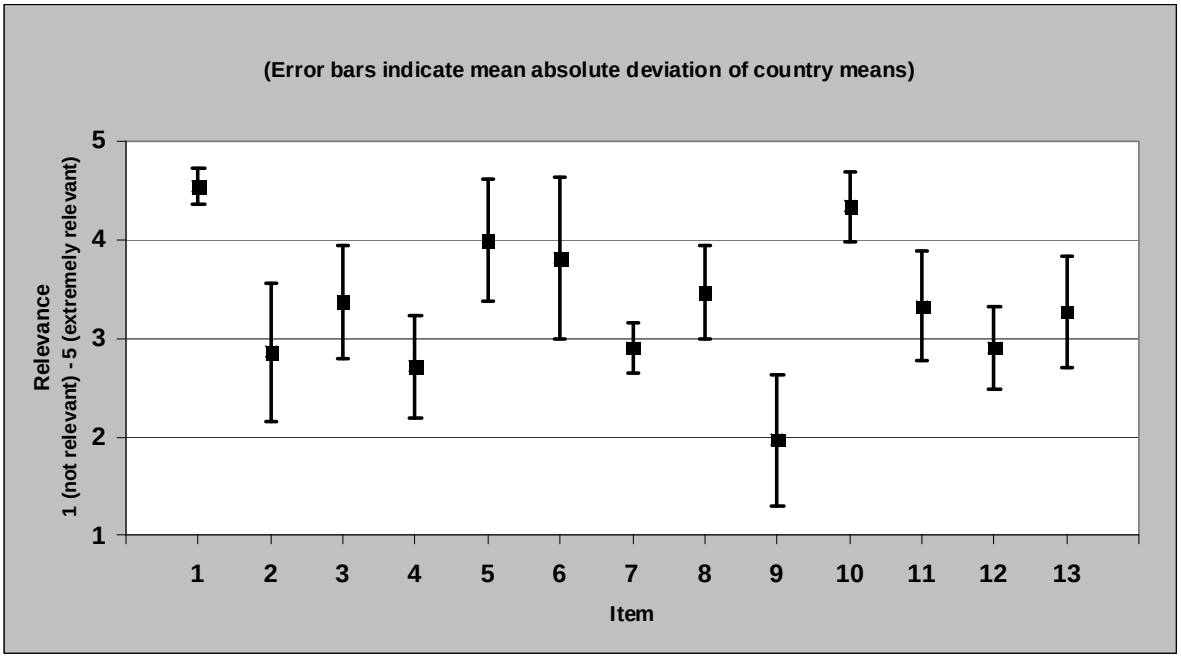
Question: "How relevant is the qualification requirement for jobs in the field of Business & Administration to perform successfully on the labour market?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

The ratings about educational requirements demonstrate less obviously an agreement in 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). Especially the ratings of

Switzerland are worth to mention: For four qualification requirements the Swiss ranks are statistical animally: for the requirements 5 (customer and personal service) and 6 (sales and marketing) the items are ranked as less relevant whereas the requirements 8 (law and government) and 11 (computers and electronics) are ranked as more relevant compared to the rank of other participating countries. During the final international workshop, Switzerland emphasised that the differences rather refer to translation differences than content.

In addition to the Swiss ratings the ratings of Slovenia diverge the most compared to the other countries.[95] The qualification requirement 9 (education and training) is rated as not relevant (except the Slovenian rank). During the final international workshop, Slovenia pointed out that "education and training "was associated rather with lifelong learning than instruction as it was the case in the other countries.

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 & Administration to perform successfully on the labour market?" (1= not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant; 5= extremely relevant)

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" doesn't play that major role in the Austrian and the Danish VET programmes.

In conclusion, there are at least three qualification requirements highly relevant for all participating countries (see Figure 3.3.-5): (1) clerical qualifications, (2) English language, 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

95 Correlations: country and mean of all other countries is for Slovenia (0.35) and Switzerland (0.49).

personal service are related to particular operational functions. The domain of generic qualification requirements is occupied by English language. Therefore, the result confirms the complexity of occupational activities and the theoretical assumption of different vocational competencies. The business and administration group discussion 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 Annex 3.3; Tables 3.3-A7, 3.3-A8).

One remarkable result from the discussion at the third international workshop (Berlin Jan 09), was the agreement on an additional item. As follows one can find that different countries made the suggestion to add the item 'communication'.

Table 3.3.-3: **Suggestions for additional qualification requirement "communication"**

Proposal	**Country**
Communication: ability to communicate target-orientated with adequate communication technology	Austria
Communication with the client (Kommunikation zum Kunden, D)	Germany
Communication with and consulting of costumers (Kunden umfassend beraten und Dienstleistungen vermitteln, Kundengespräche führen (CH)	Switzerland

That 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 minimize negative impacts on a business.*

Since communication was considered of major importance it should be taken into consideration in the next project phase for further specifications of the field.

3.3.4 Comparative analysis of ratings for the set of evaluation tasks

The occupational field of business and administration and their corresponding apprenticeship or training programmes have a huge diversity. That is, in the beginning of the international meetings no agreement on the core content areas could be accomplished. In almost all other professional fields a definition, classification or demarcation of the core content areas were done in advance. Therefore it was a challenge for the expert group to find a procedure to come to an agreement on the selection about the core content areas where the evaluation tasks should be related to. In a way the selection procedure was turned upside down.

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

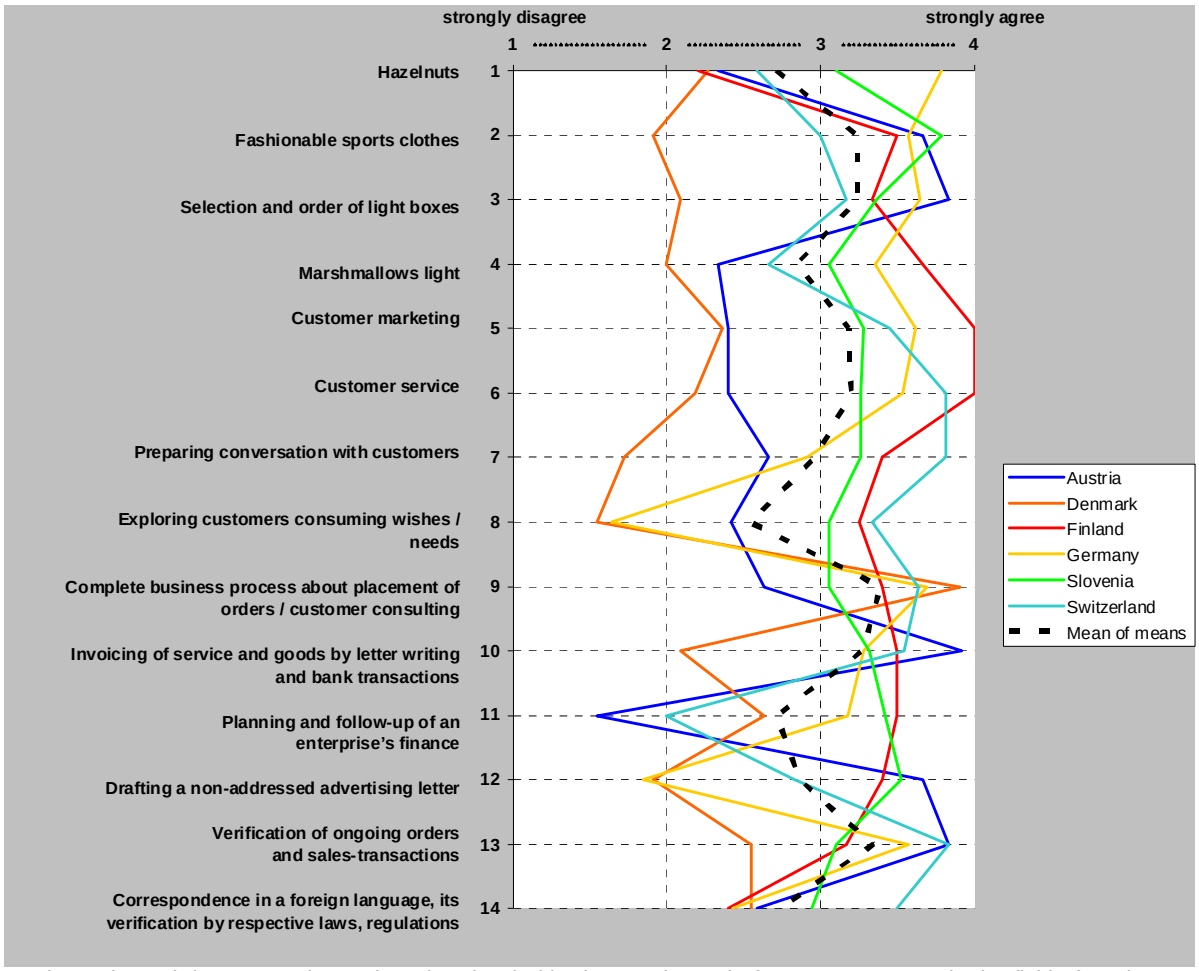
The participating countries agreed that the pre-selected national evaluation tasks should contain three main criteria:

(a) a complete business process,
(b) evaluation tasks should be related to already agreed occupational tasks in the Research Tool, and
(c) representativeness of the assessment task[96].

Especially assumption (a) is the determining factor for describing evaluation tasks in the field of business and administration. Complete business process stands for an integrating view of the ways materials, facilities and staff are used to deliver services. That is, descriptions of business processes combine function-oriented and process-oriented tasks.

Each country did the very first pre-selection of evaluation tasks. This decision was mostly based on their first national workshop when the ratings of the national tasks were conducted (see national reports). Afterwards a clustering from the expert coordinator was conducted to finally figure out the overlapping core content areas and submitted to the international expert group for agreement. Finally, 14 evaluation tasks were agreed (the complete set of evaluation tasks, research tool 2, with the original items displayed in full length will be provided in the final publication in Annex 3.3, Table 3.3-A2).

Figure 3.3.-6: **Business and administration: evaluation tasks – educational objectives (country means)**



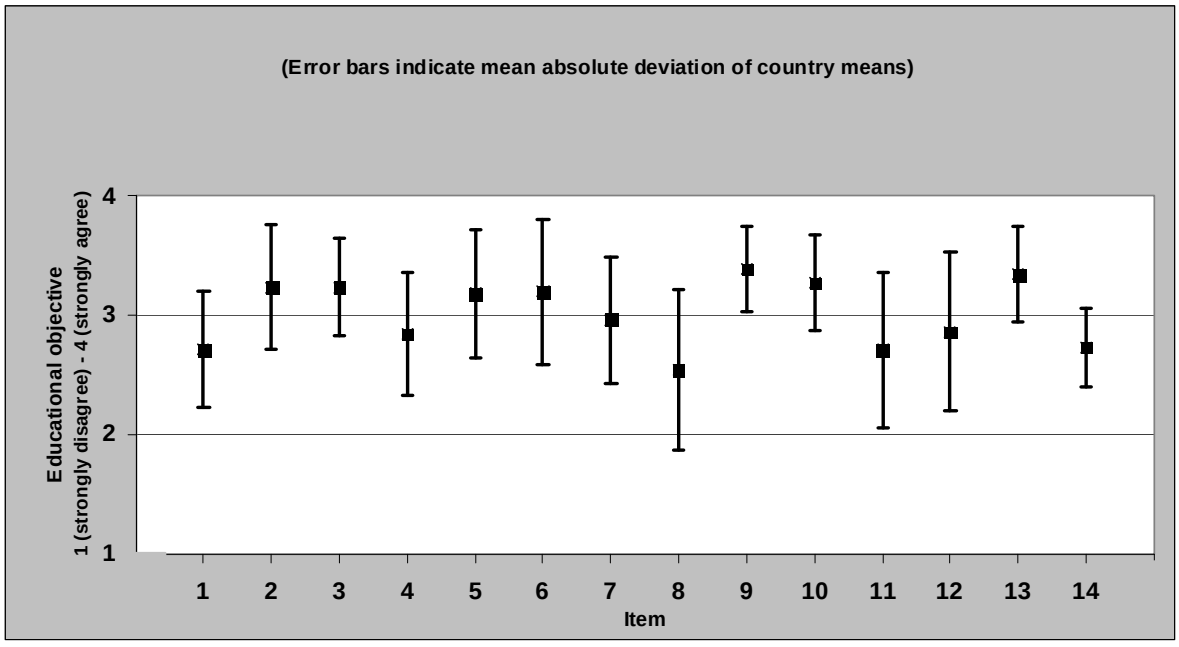
Question: "The task is representing major educational objectives at the end of VET programmes in the field of Business & Administration" (1= strongly disagree; 2= disagree; 3=agree; 4=strongly agree)

96 The criterion 'representativeness' was added because it has shown that in some of the participating countries evaluation tasks do not exist on a national or on a country level.

The results as well as their interpretations are ambiguous: at a first glance, there are divergences rather across the countries than across the evaluation tasks. In some respects these results are a reflection of some diversity regarding the occupational tasks in addition to the national conception of core content areas: how do we define the main ideas, the most relevant activities and in the following which major educational objectives are most relevant for 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 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 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 usually the rank of one or maximal two countries are statistically animally. 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 tasks is comparable high.

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



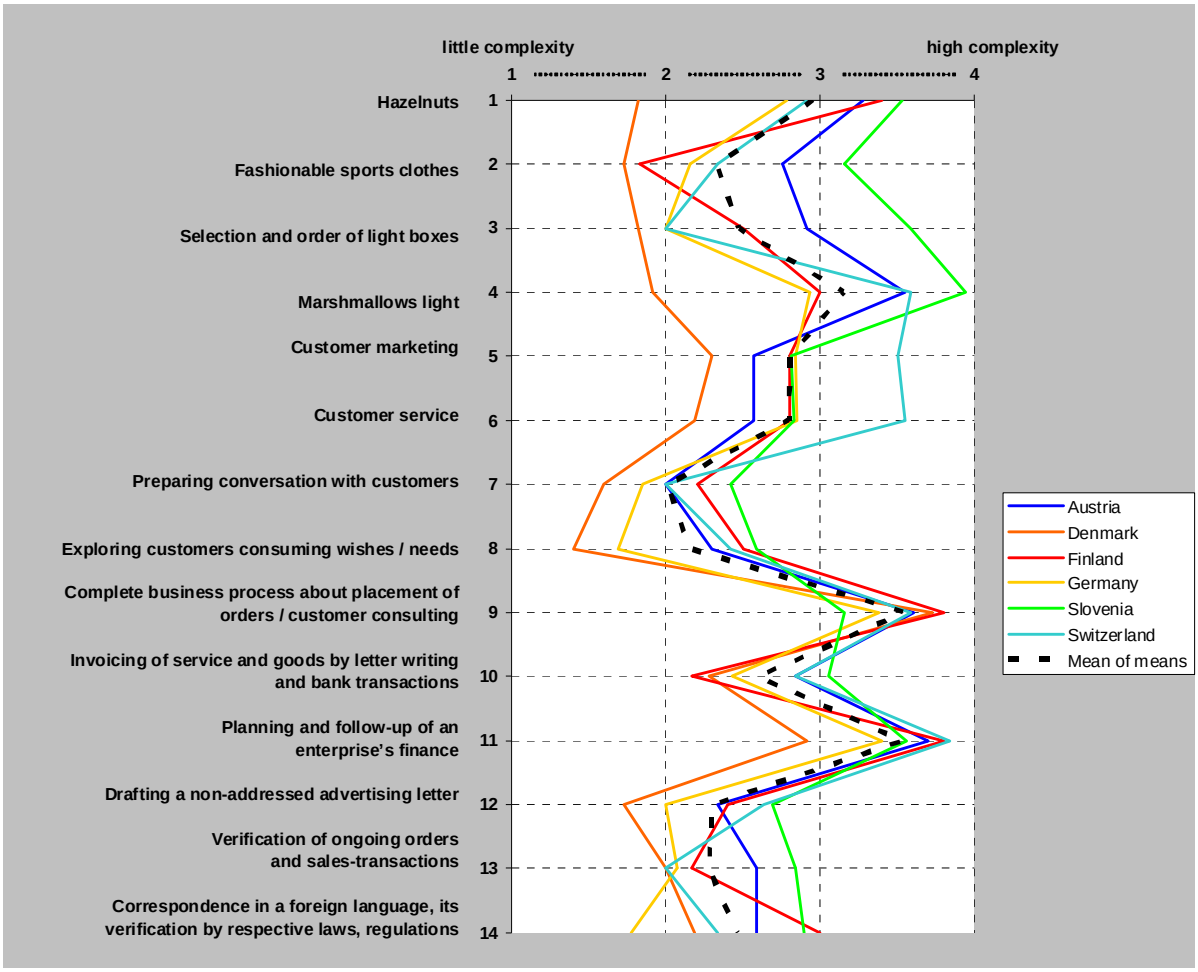
Question: "The task is representing major educational objectives at the end of VET programmes in the field of Business & Administration" (1= strongly disagree; 2= disagree; 3=agree; 4=strongly agree).

In conclusion, the comparative analysis of evaluation tasks of educational objectives shows more diversity in the results than all other ratings before (Kendall's-W is 0.204; p = ,255). In specific, the ratings of Denmark and Austria on the one hand show larger deviations as all the other countries. This was explained by the inclusion of 5 out of 14 tasks with a focus on sales during the discussion in the business and administration group in the final international workshop. On the other hand the evaluation tasks fit 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 even the ratings don't reveal a less clear picture; there is no single item of 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) it has to be checked in detail where the differences come from, and (2) those tasks that represent educational objectives in accordance with the countries have to spread off. That means, that an analysis with respect to their comprehension and their representativeness is demanded.

In addition to the rating of relevance of the evaluation tasks their complexity was estimated (see Figure 3.3.-8).

Figure 3.3.-8: **Business and administration: evaluation tasks – complexity (country means)**

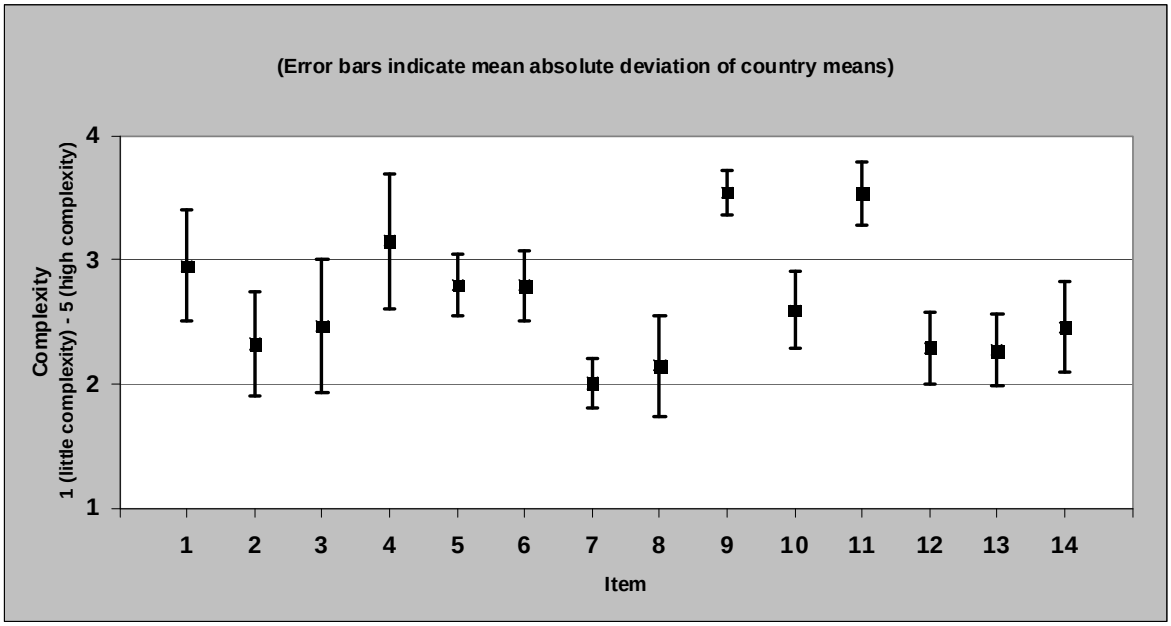


Question: "Indicate the level of complexity of the task!" (1= little complexity to 4=high complexity)

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 as the rankings of all other tasks do. 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 regarding the educational objectives the impression is given, that there are some misconceptions as well as misinterpretations of the content and the design of complex tasks between the countries.

This was confirmed by the discussion in the business and administration group during the final international workshop.

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



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

The experts rated items 5, 6, 7, and 9 to 14 uniformly. Therefore, the concordance in ratings about 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 Annex 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 what complexity means in evaluation tasks is overlapping. That an assessment task is rated as highly or lower in terms of complex is not a positive or a negative criterion. The operative point is an agreement on the level of processing which is necessary to solve the tasks. The more the participation countries agree upon 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 could be explained by the selected set of evaluation tasks, which did not cover all core areas relevant for 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 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: sales/marketing & customer service) and Denmark (focus: organisational activities). For measurement in a future VET-LSA, the possibility of including modules for specialisations (e.g., one module marketing/sales; second module 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 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[97], is integrated in 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[98]. Table 3.3.-4 gives an overview of the selected evaluation tasks and the corresponding core areas.

Table 3.3.-4: **International set of evaluation tasks for business and administration**

Core area	**Task heading**
Purchasing	Hezelnuts
Purchasing	Fashionable sports clothes
Purchasing	Selection and order of light boxes
	Marsh mellows light
Sales and marketing	Customer marketing
Customer service	Customer service
Customer service	Preparing conversation with customers
Customer service	Exploring customers consuming wishes and needs
Sales and marketing	Complete business process about placement of orders / customer consulting
Sales and marketing	Invoicing practice
Sales and marketing	Invoicing of service and goods by letter writing and bank transactions
Financials/Accounting	Planning and follow-up of an enterprise's finance
Sales and marketing	Drafting a non-addressed advertising letter
Customer service	Verification of ongoing orders and sales-transactions
Customer service	Correspondence in a foreign language

97 Communication aspect – internal and external related to customers and business by eventually 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 minimize negative impacts on a business.

98 (Sweden: Sales & Marketing, Customer service).

3.3.5 Summary

Finding a common ground for comparison proved to be a more challenging task than for the industrial occupations since 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: occupational tasks, qualification requirements and evaluation tasks.

Occupational tasks

The selection of occupations based on o*net illustrates the many-sidedness of the business and administration area as well as the different facets of occupational integrations of merchants and economists in the labour market. Occupational tasks in the field of business and administration are characterised by typical activities of employees like dealing with sales records, financial statements and invoices as well as organizing customers´ and suppliers' inquiries in all participating countries.

The coverage in the relevance of occupational task can be evaluated as good. Whereas only one task was considered less important across almost all countries, the judgement for four tasks indicates a high agreement across all participating countries These tasks are significantly relevant for the description of both job- as well as workplace-related activities in the field of business and administration. For future steps it is recommended to check and specify these tasks – namely responding to customers and suppliers inquiries, reviewing documents, preparing documents, and collaborating with other departments. The judgement of task frequencies is underlined in the findings: using the expert ratings day-to-day in contrast to periodical working activities can be defined. The proposals and suggestions the expert group made should be taken to add the additionally named items or make the mentioned critical items more precise to reduce uncertainty, hence, variability in the rating. There might be a correlation between the unambiguousness and the absolute mean deviation in ratings.

Qualification requirements

The experts came to an agreement about qualification requirements 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 merchants` and economists` job performance like clerical, economics and accounting, to generic requirements necessary for life performance like mathematics, English language, and computer literacy. Moreover, qualification requirements that correspond to different company areas like administration and management, sales and marketing on the one hand to operational functions, like production and processing as well as customer and personal services on the other hand were considered important in all countries.

The coverage in the relevance of qualification requirements can be evaluated as good. Three qualification requirements were judged highly relevant for all participating countries: clerical qualifications, English language, and customer and personal service. It is recommended to interpret those requirements 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 for 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. The proposals of the international expert group to add communication and make the critical item (6, 9) more precise to reduce variability in the rating should be taken into consideration in the next project phase.

Evaluation tasks

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

Despite some convergence in ratings for relevance, the coverage 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 to construct test items in a possible future VET-LSA and one of the prerequisites to make test items more likely to be comparable as well.

During the final international workshop a step towards more consistency has been taken: six core areas as a common basis for all selected national VET programmes were formulated:

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

Communication is integrated in all six-core areas

For the development of a common framework for business and administration as a basis for test construction in the next project phase these core areas should be taken as a basis.

All in all, it has to be stated once again, that the selection of evaluation tasks as well as the judgment of their complexity were intended to provide a representative reference for interpreting the possibilities for an international comparison. In summary, based on the rating procedures of 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 prepares an acceptable baseline for comparison. Nevertheless, the diversity of tasks judgment is able to indicate some difficulties and

expected challenges regarding the development of test instruments of competence 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 validity, reliability as well as adequate quality of the test procedures.

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). For the development of a common framework in the next project phase more specification within the filed is required.

3.4 Social and health care *(Thomas Bals / Eveline Wittmann)*

3.4.1 Specifics of national VET programmes for social and health care

In the Feasibility Study Denmark, Finland, Germany, Norway, Slovenia, Sweden and Switzerland participated in the field of social and health care. The selected national VET programmes have certain specifics due to different political, historical and cultural backgrounds. Thus, it was necessary to agree on a common structural frame 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 foci like paramedics were precluded as well. It was discussed, if core competencies for the occupations are personal and social skills and competences, because the 'work object' of social and health care workers is – by definition – a person in a situation of some kind of need for help.

In October 2008, the national coordinators of all occupational areas met in Berlin. For social and health care, the initially proposed o*net task and knowledge descriptors, based on the profile 'Licensed Practical and Licensed Vocational Nurses', were criticized as rather corresponding 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 with regard to social aspects (mirrored in the renaming). Finally, o*net profiles of six occupations were selected as frames of reference and adapted to the European fields of social and health care. According to 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 a whole, the selected programmes are meeting the determined profiles of reference, although minor national specifics are apparent (for details see Table 3.4.1). Most importantly, the VET programmes selected by the countries have different titles[99]. In particular, some of the titles point at the contextual focus of the programmes, particularly leaning rather towards health care than towards social care. Programmes in Norway, Sweden and Slovenia tend to be rather 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 durations of the VET programmes range from 3 to 4 years, except from the Slovenian with a duration of 4 or 5 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

99 It has to be taken into consideration that most of the titles have been translated to English.

selected VET programmes is wide ranged. This does not imply any information on the programmes' national significance, as it has to be seen with relation to several factors (population figure of the country, alternative programmes, labour market etc.). As 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. For all countries, except for apprenticeship-based education in Finland, the completion of the compulsory school is basically required. 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. Moreover, in some countries, access to higher education is provided (universities and universities of applied sciences/polytechnics).

Regarding the organisation of the programmes (respectively programme periods), different types can be distinguished: [100]

- 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).

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

To sum up, the VET programmes selected by the countries meet the given framework of occupational profiles, but have certain national specifics to be taken into account for the sampling and the data acquisition of VET-LSA. Particularly, the national-specific organisations of programmes as well as the proportions of theoretical and practical learning have to be considered.

100 Leaving apart competence-based programmes in Finland.

Table 3.4-1: **General information on VET programmes – social and health care**

	Denmark	Finland	Germany	Norway	Slovenia	Sweden	Switzerland
Title of VET programme	Social- and Healthcare Education Social- og Sundhedsassistent uddannelsen	Social and Health Care Sosialija terveysalan perustutkinto	Care for the elderly Altenpflege	Health Care Worker Helsefagarbeider	Health Care	Health Care Omvårdnads-programmet	Care specialist Fachfrau /-mann Betreuung
total duration (years)	3 years 2 month	3 years	3 years	4 years	4-5 years	3 years	3-4 years
number of graduates (latest available data)	in 2007: 2.289	In 2007: 3.417 (curriculum-based education)	in 2009*: 14.000**	in 2010: 800 - 1.000**	in 2008: 892 *	In 2007/08: 2.876	Not yet any graduates in 2007 appx. 1.600 and 1.800 estimated between 2009. 2010 and 2011
ISCED level	3C	3A/B	3B	3C	3B	3A/B	3B
Entry requirements	completed compulsory education	basic (compulsory) school certificate; no entry requirements for cp* and ap*	completed education of ten years ('Realschulabschluss' or equivalent qualification) or general school leaving certificate & completed 2-year apprenticeship programme or 1-year VET programme (e.g. elderly care assistant)	lower secondary school (compulsory, comprehensive)	successfully completed compulsory education (9 years) or completed short-cycle vocational education (2 years after basic education)	completion of compulsory school	completion of compulsory school (lower secondary, 9 years of schooling)
access to next level of education/ training*	ISCED 4	general eligibility for higher education in polytechnics and universities	higher education (access to universities of applied sciences or universities after entrance examinations depending on Länder-specific regulations)	University College for nurses, level 5A, after one year supplementary general study.	higher vocational education (VIŠ), higher professional education (VIS), higher academic education (UNI)	basic eligibility to higher education	most part of graduates: access to tertiary-level professional education and training program-mes; about 10% of graduates have Federal Vocational Baccalaureate (FVB) (is possible to complete during or after the VET-Programme); direct access to universities of applied sciences (UAS)
Organisation/ learning ar-rangements:							
work-based training % **school-based training %**	w: 60% / s: 40%	w: 17%c / 70%ap /70%cp* s: 83%c /30%ap /30%cp	w: 55 % / s: 45%	w: 60% / s: 40%	w: 6,2% / s: 73,8 % (thereof 14,8% practical training at school)	w: 15% / s: 85%	70% w / 30% s

* 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 8433 (derivated from numbers of first year students, cf. Berufsbildungsbericht 2008).

Source: investigated in 2008

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 agreed upon 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. The development of this research tool is described in detail in Chapter 1.

Occupational reference profiles, particularly with regard to social aspects, gave 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:

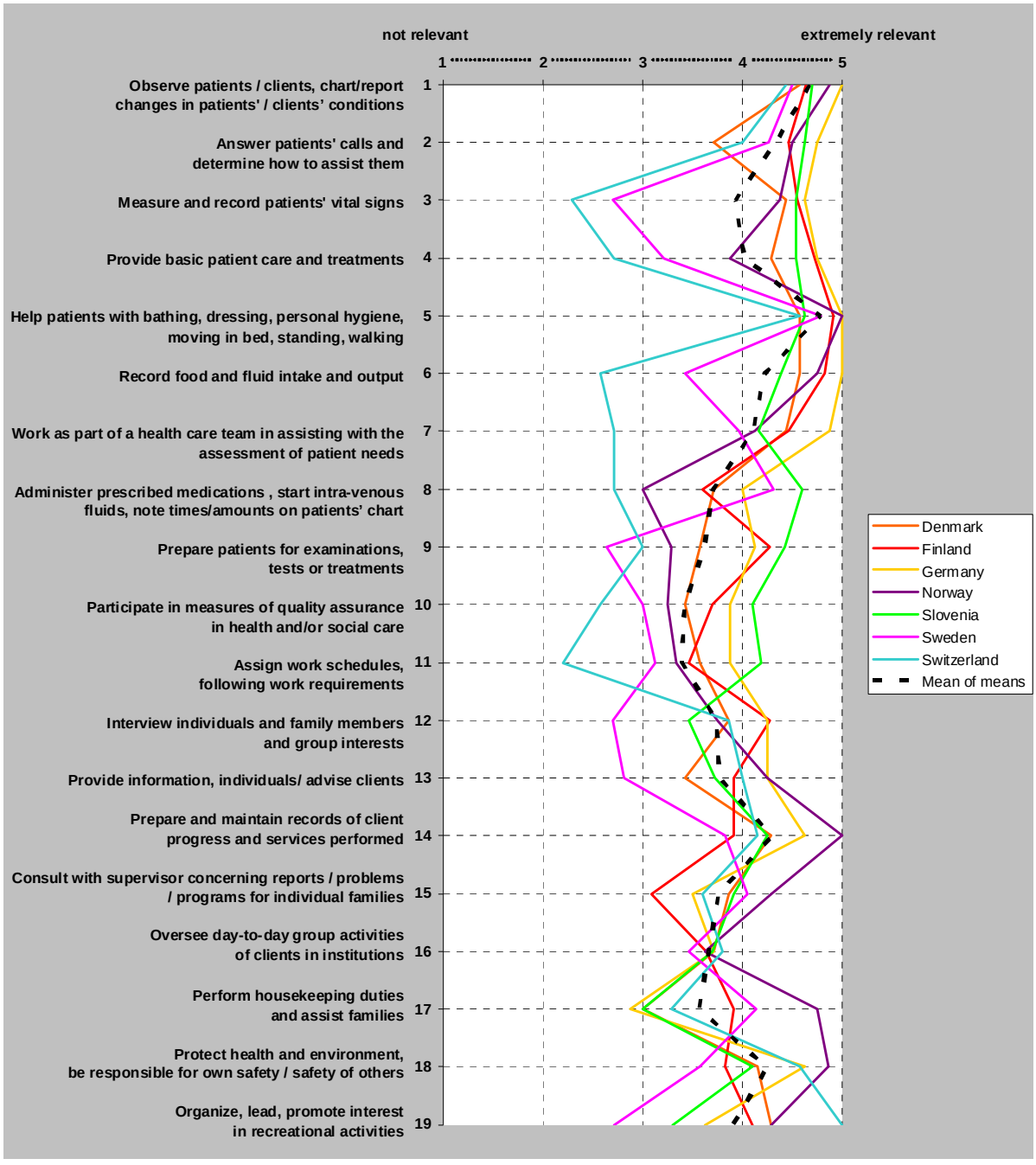
1. identical tasks from the profiles were excluded,
2. similar/related tasks were summarised and compressed, and
3. the profile was sharpened, tasks regarded as not significant were excluded, others were added.

Finally, the international expert group agreed upon a questionnaire based on 19 occupational tasks for both, relevance rating and frequency rating[101]. As outlined in section 3.4.1, a considerable programmatic variance between countries 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 displayed in full length is provided in Annex 3.4, Table 3.4-A1).

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

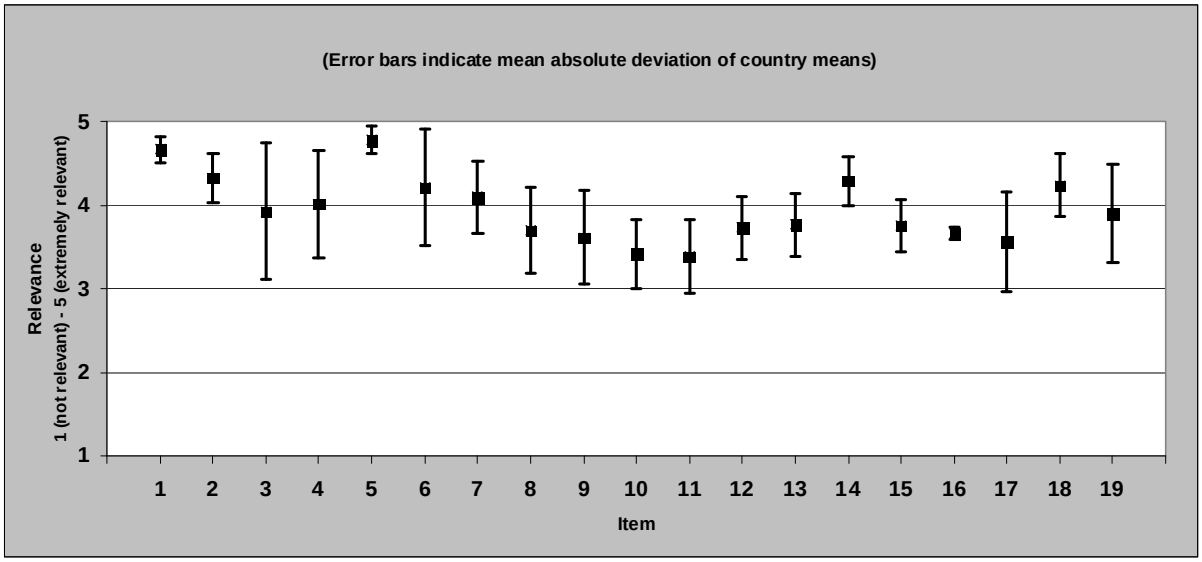
Task relevance on the labour market from a comparative international perspective

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



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)

Figure 3.4-2: **Social and health care: occupational tasks – relevance (mean across countries)**



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)

Good agreement was found for most of the o*net occupational tasks across countries. All of the tasks presented are considered at least somewhat relevant in all countries for 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). For the occupational field of social and health care, basic care is a core element. It is normally part of the curricula and referred to in compulsory law and guidelines.

However, when it comes to consistence 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 for some basic care related tasks (tasks 3, 4, 6) result from the differences in the selected country-specific profiles. Also, as outlined in the national reports, differences in Sweden and Norway on medical nursing skills-related tasks (items 8, 9) result from differences in the educational system in that they would be carried out by other professionals in the health service or by professionals taught at 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 tasks 12, 13 and 19 are considered less important in Sweden because in the way they are formulated they address the level of supervision; hence these tasks would be carried out by university-educated professionals. This means that coverage can be identified for occupational task relevance in the area of social care on the condition that they address the level below management.

The countries' experts mostly agree that occupational tasks in the field of administration and quality insurance can be considered important, although slightly less relevant (tasks 10 and 11). This indicates that these occupational tasks are relevant but more secondly in social and health care. According to the discussion in the final international workshop, they are only somewhat relevant for the Swiss programme because of its social inclination (see minutes

for the final international workshop).[102] Moreover, agreement is high in all 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. Moreover, Kendall's W (Kendall's coefficient of concordance) for the ratings concerning 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 notwithstanding the areas of dissent.

Figure 3.4-3: **Social and health care: occupational tasks – frequency (mean across countries**)

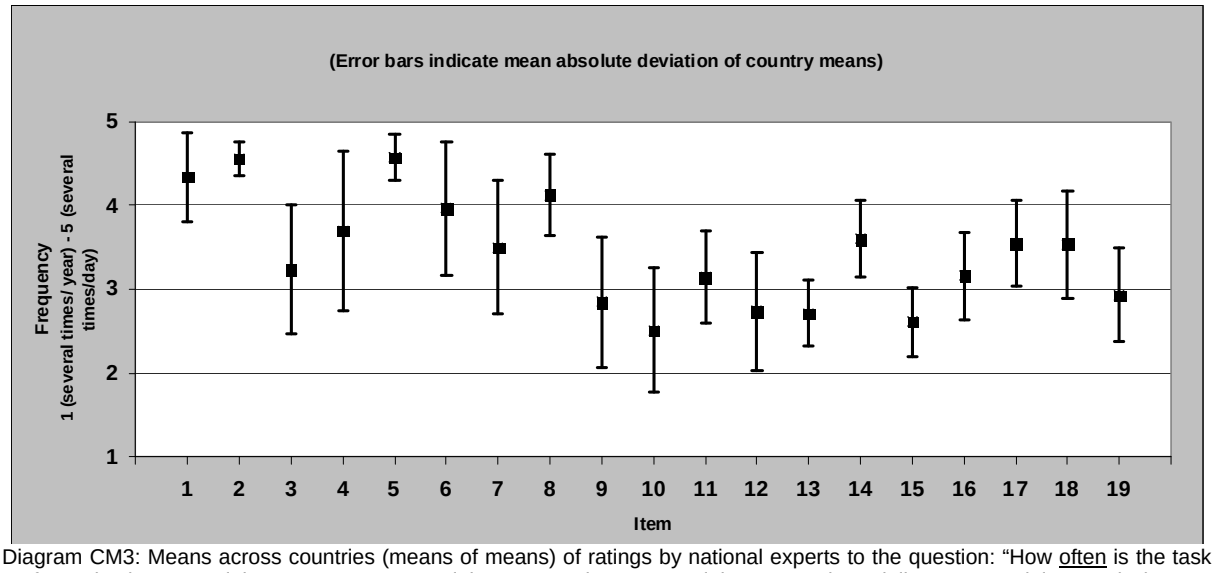


Diagram CM3: Means across countries (means of means) of ratings by national experts to the question: "How often is the task performed?" (1= several times a year; 2=several times a month; 3= several times a week; 4=daily; 5= several times a day)

Basically, the countries also agreed on tasks performed most frequently on 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 mirrors the 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 frequencies of occupational tasks are apparent. This is supported by the fact that high concordance was found for the countries' profiles with regard to occupational task frequency (Kendall-W = 0,743[103]). Similarities to the occupational tasks' relevance are obvious, for example the distinctive agreement on tasks rated as highly relevant and referring to basic

102 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.

103 Without items with missing values (items 11, 15, 16, 17, 18, 19).

care activities[104] (the country means and mean absolute deviations within country means for each country are provided in Annex 3.4; Tables 3.4-A3, 3.4-A4, 3.4-A5, and 3.4-A6).

Additional tasks

Suggestions for amendments were made by different countries. The most outstanding one is that ethical interaction and activating clients/patients is interwoven with care work across countries. Other occupational tasks suggested are relevant in some countries, but do not accord with the programmes of other countries, since they are rather related to the country-specific selected profiles. Most additional tasks have more or less strong affinity to given tasks.

To sum up, the occupational profile in all countries is mainly characterised by its coverage the areas of basic care, social care as well as public health, but in singular countries excluding medical nursing care, work in hospitals and management activities. Ethical interaction and the task of activating clients/patients are 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). Similar to the selection of the o*net task descriptors, the selection of the o*net knowledge skills and abilities descriptors proceeded in three steps:

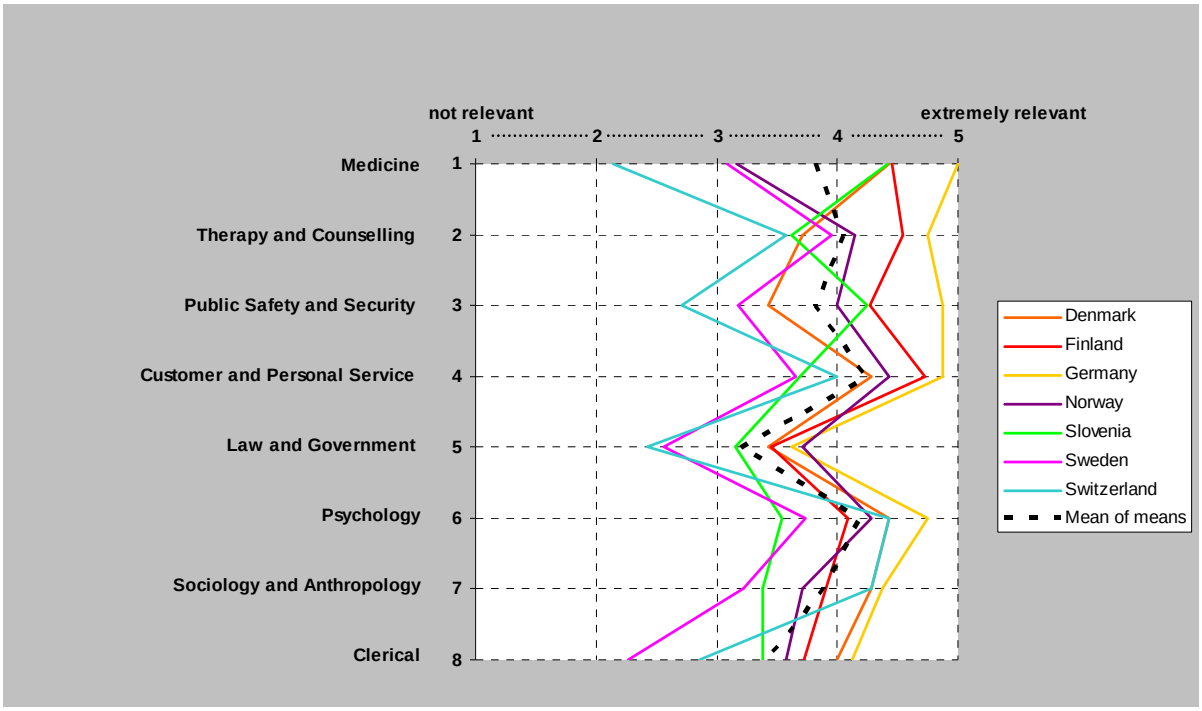
1) identical qualification requirements from the profiles were excluded,
2) similar/related qualification requirements were summarized and compressed and
3) the profile was sharpened, qualification requirements regarded as not significant were excluded, others were added.

Qualification requirements referring to general education were precluded, as they were considered less relevant compared to the vocational qualifications selected. Finally, the ratings of qualification requirements for the labour market as well as discussions and comments in the 1st national workshops were based on 8 qualification requirements[105]. The set of qualification requirements and the rating results of the first workshop are displayed in Figure 3.4-4.

104 In spite of similar tendencies in the comparative analysis of both relevance and frequency, it has to be kept in mind that a direct interdependence between relevance of a task and its frequency of performance is not necessarily existent.

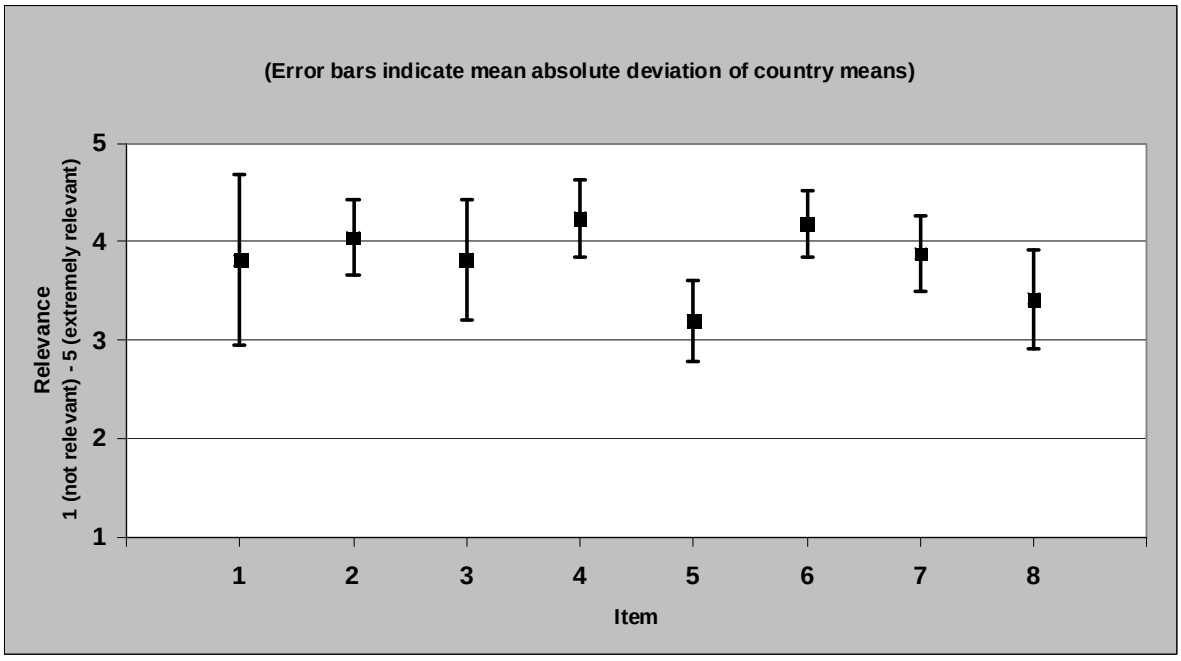
105 In Sweden, three qualification requirements were added to the research tool by the national expert (cf. Country Report 2.4.3).

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

Figure 3.4-5: **Social and health care: qualification requirements – relevance (mean across countries)**



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)

Experts from all countries agreed on the strong relevance of qualification requirements referring to 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. As pointed out by the experts in the final international workshop, they are also to be considered relevant for all countries in spite of the some differences in the ratings. Rather, 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). Compatible 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 regarding qualification requirements in the field of medicine (requirement 1). Mirroring the high deviations found for occupational tasks referring to medical/technical nursing, for some of the programmes chosen, medicine is a core reference (e.g., Germany). In contrast, it is of minor importance for 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 frame of required qualifications in the field of social and health care. As well, the countries' overall profiles match to a high extent (Kendall-W = 0,476). Similar to the rating of occupational task relevance, there is a tendency towards a high concordance between 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 Annex 3.4, Tables 3.4-A7, 3.4-A8).

Additional tasks

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

To sum up, the profile of qualification requirements for all countries is mainly characterised by its coverage 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 would only be relevant in all countries if 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 to send summaries of authentic, national evaluation tasks to be taken into the international set. The tasks should be selected according to the core areas determined beforehand. Based on the obtained tasks 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 national specifics (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 the 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 had been sent to the national experts. Due to 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 displayed in full length will be provided in the final publication in Annex 3.4, Table 3.4-A2). In the second national workshops, the final set of assessment task was rated with regard to the representation of major educational objectives and the level 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)**

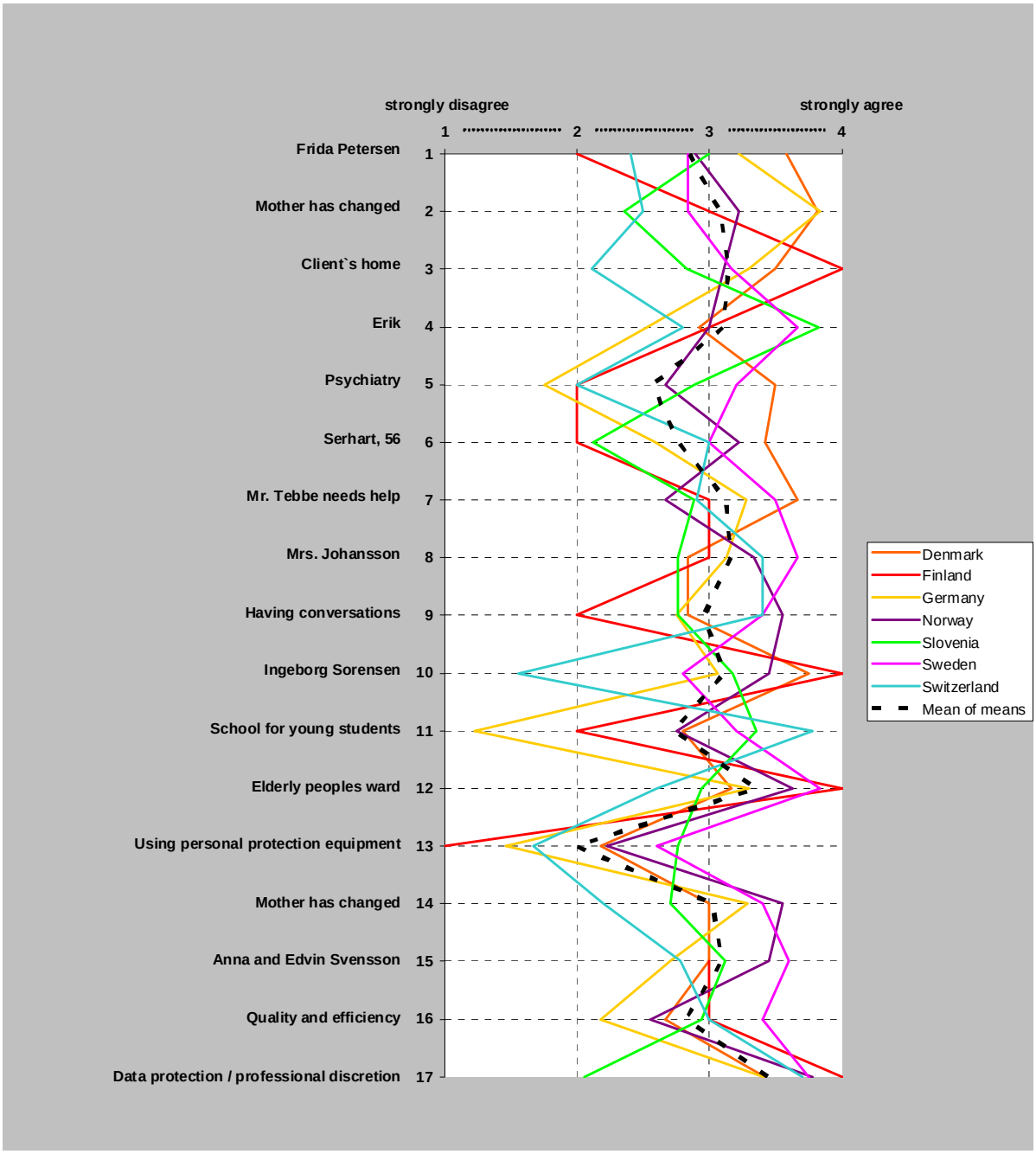
Core area	Task heading	Description
Client care, service and assistance within the care process	Frida Petersen	Complex case of an elderly woman waiting to move into a sheltered accommodation. Task focuses on clinical symptoms, treatment and medication
	Mother has changed	Assess planning, conduction, documentation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

Ratings of the international set of evaluation tasks from a comparative international perspective

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 to be relevant in all countries (tasks 7 and 8). As well, agreement is consented upon for 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 it 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 whether, besides the common ground identified for core area 2, commonality can be found on core area 1 – client care, service and assistance within the care process – as well, seems vital for this feasibility study.

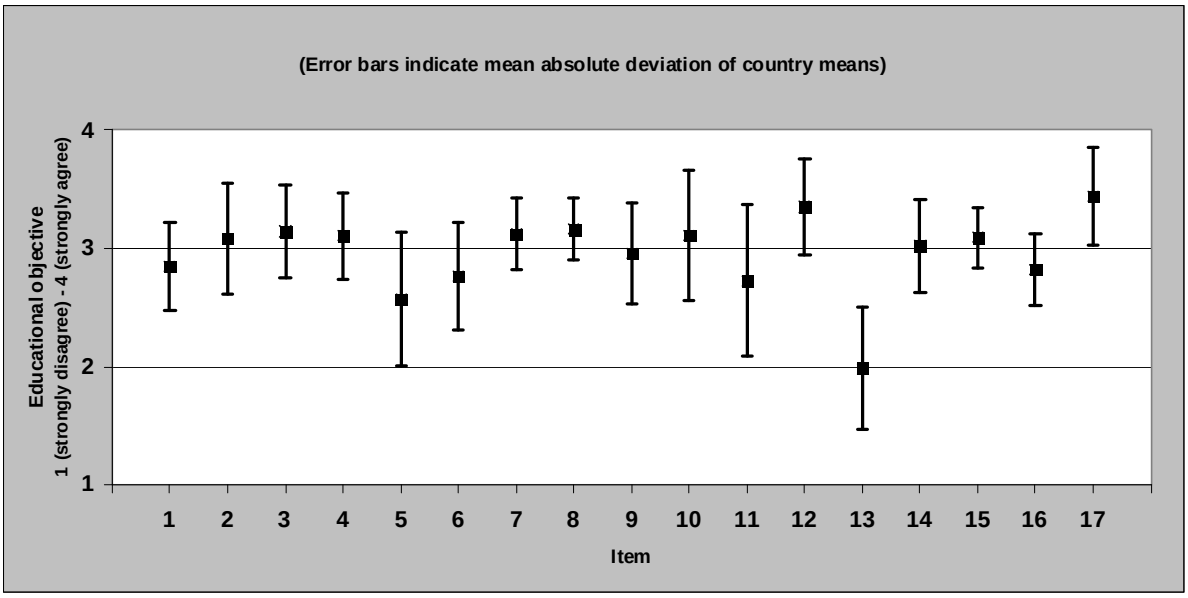
Results of the feasibility study strongly indicate that this will be the case if tasks are set up in a way that takes the countries' programme specifics into account. Specifically, task 4 is agreed upon by all countries' experts apart from the German one. However, the character central to the case is 52 years old, hence does not belong to an age group dealt with in the field of care for the elderly. Still, German experts rated this item medium high.

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



Question: “The task is representing 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)

Figure 3.4-7: **Social and health care: evaluation tasks – educational objectives (mean across countries)**



Question: "The task is representing 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)

In addition, the final international workshop lead 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 inclination 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 differing from German standards on task formulation for examinations.

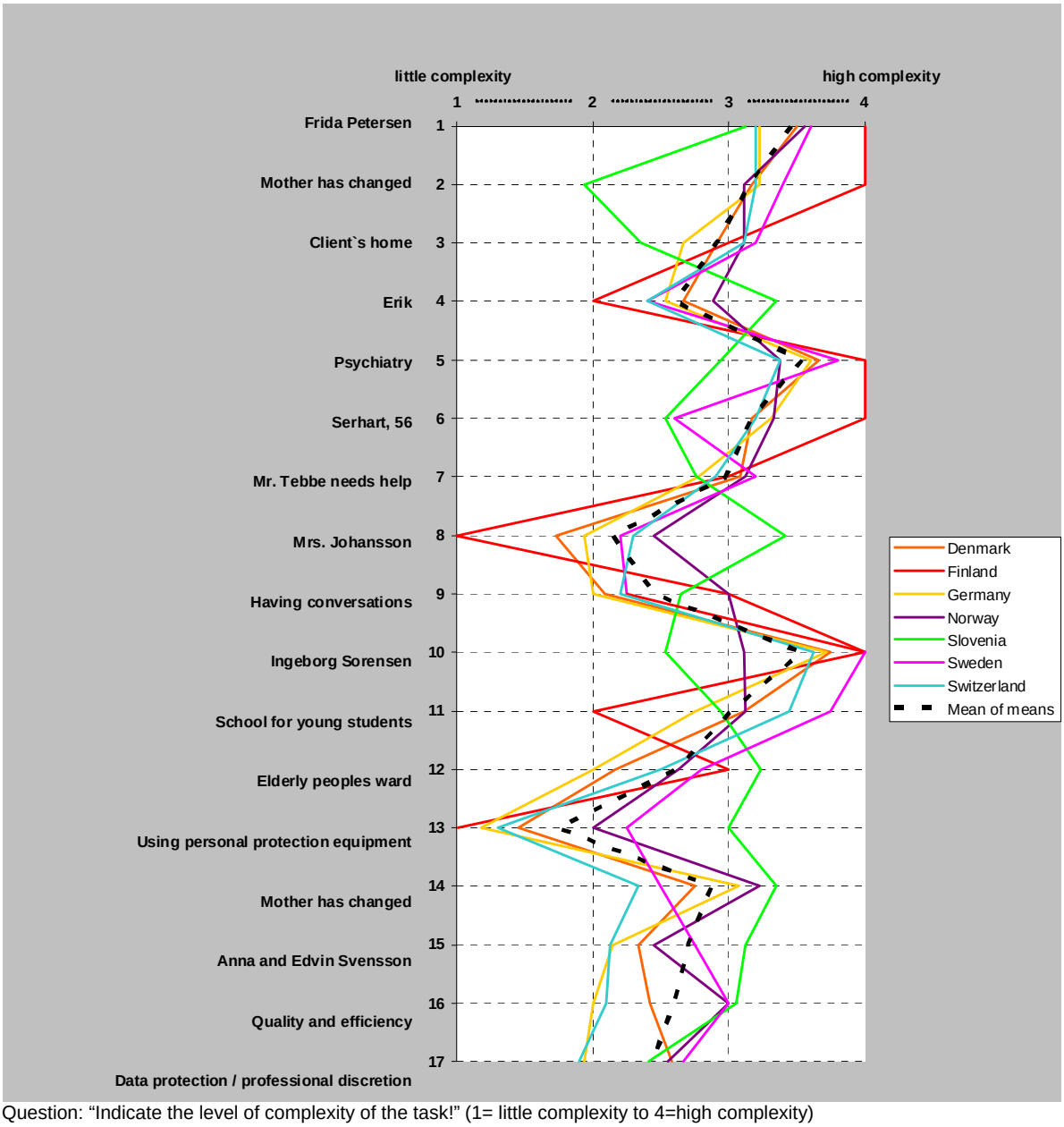
For some tasks, coverage was found neither in the national expert ratings nor in the international experts' discussion in the final international workshop, either due to the orientation of the programmes or to the programmes' target groups. Specifically, low relevance of task 3 in Switzerland was explained by the fact that checking the 'medication dosette' 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 confirm that deviations in Germany and Finland on item 11 are caused by 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 final international workshop).

While in none of the core area all tasks are considered relevant by all countries, it is possible to identify evaluation tasks relevant in all countries for all of the core areas. Apart from task 16 which is age-unrelated, the tasks agreed upon share common content in that they deal with elderly people and disabilities. While they contain medical aspects, they also pertain to the area of social care. They require knowledge from 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 also 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 points to significant agreement in the overall profile of the countries' ratings (Kendall-W = 0,278[106]) and mirrors the impression of considerable commonality between the countries' ratings for the set of evaluation tasks despite their programmatic differences.

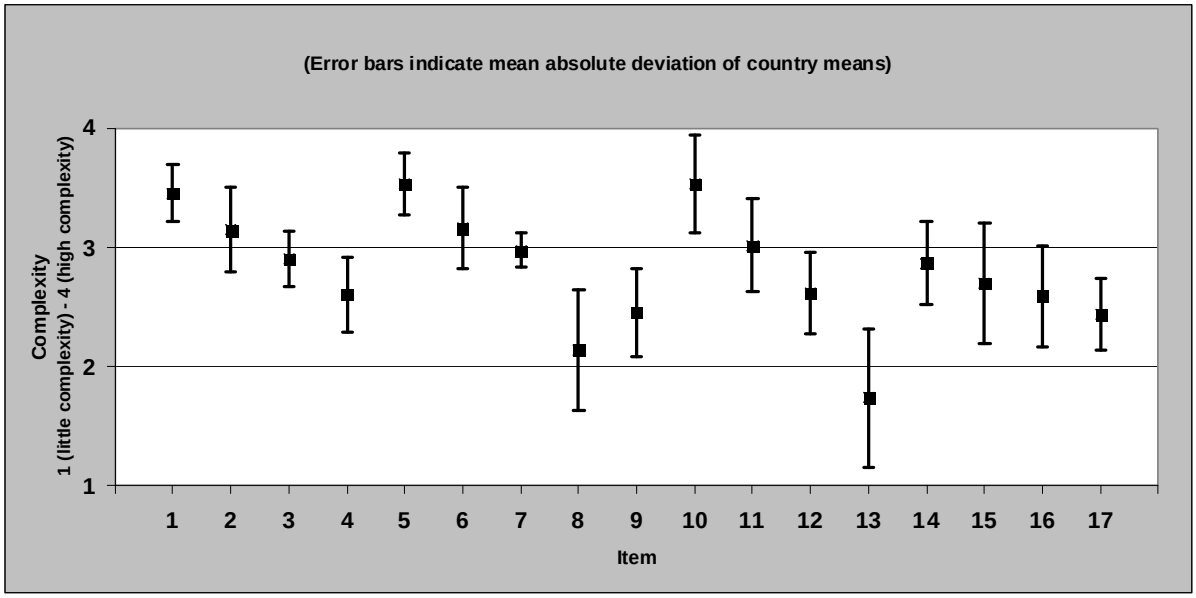
Figure 3.4-8: **Social and health care: evaluation tasks – complexity (country means**)



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

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

Figure 3.4-9: **Social and health care: evaluation tasks – complexity (mean across countries)**



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

While the tasks differ in the level of complexity experts attribute to them, the countries' experts tend to strongly agree in their judgement on the level of complexity. High complexity is attributed to tasks entailing case studies based on complex constructions (tasks 1, 2, 5, 7, 10, and 11) or requiring theoretical analysis to define and solve a problem (e.g., tasks 6 and 7). Evaluation tasks considered medium relevant either focus on procedural aspects of knowledge (tasks 3, 4, 8, 9, 11, 12) or require an argument on the basis of rather reference to 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 to multiple choice tasks –, which is likely to be 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 conformingly high concordance (Kendall-W = 0,518), pointing to a similar profile of complexity ratings across countries. It 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 Annex 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 disabilities requiring *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 foci. Some of the selected programmes are focused on social care (e.g., Switzerland), other rather on health care (e.g., 'Nursing and Care' in Finland). The broad occupational field,

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 frame for social and health care, if the field was specified more for groups of the elderly and disabled (cf. minutes 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 in the Feasibility Study: occupational tasks, qualification requirements, and evaluation tasks.

Occupational tasks

Results point to high relevance of most occupational tasks and considerable commonality across countries regarding tasks relevant for jobs in the field of social and health care. In particular, basic care activities as well as certain social care activities can be considered as common frame for occupational tasks in the field of social and health care; administration and quality insurance appears to be sufficiently relevant as long it is related to the level of the focussed group's work. Generally, differences in the relevance of occupational tasks concerning technical care (nursing skills) refer to different focal points of the selected VET programmes.

The occupational profile in all countries is mainly characterised by its coverage in the areas of basic care, social care as well as public health, but in singular countries excluding medical nursing care, work in hospitals and management activities. Ethical interaction and the task of activating clients/patients are interwoven with care work in all countries.

Qualification requirements

Apart from medicine, where disagreement occurs due to programmatic differences between countries, all qualification requirement areas confirmed to be 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. All in all, this points to a high relevance of qualification requirements and strong commonalities for all countries in the areas of personalized, non-medical care.

The profile of qualification requirements for all countries is mainly characterised by its coverage 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 would only be relevant in all countries if incorporated into day-to-day activities.

Evaluation tasks

Common agreement among countries was found for tasks in each of the core areas agreed upon beforehand, ranging from 'client care, service and assistance' with the care process to 'administration and legal framework'. Agreement across 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, not immediate medical nursing intervention. They also refer to an elderly age group and therefore, allowing the German programme of care for the elderly to agree on the evaluation tasks' relevance.

While tasks pertaining to procedural knowledge or with little reference to a case description were considered medium or less complex, some tasks were held to be highly complex by the experts, specifically those tasks requiring reflections upon complex case study descriptions for their solution. Generally, very high agreement across countries is 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 protection of health and environment are predominantly relevant across countries, and activating patients and interacting in an ethical manner is considered important when carrying out care related tasks in all countries;
- qualification requirements in the social and interpersonal field as well as ethics are highly agreed across 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 in other ones;
- evaluation tasks represent major educational objectives in all countries if they reflect the profiles outlined for occupational tasks and qualification requirements, hence 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 administration and legal framework;
- it is recommendable to check further evaluation tasks within the five core areas. Evaluation tasks of high importance in all participating countries as well as additional occupational tasks and qualification requirements should be taken into account;
- attention has to be paid to national specifics of the VET programmes, particularly regarding the client/patient population they are related to;
- for the selection of 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).

CHAPTER 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[107].

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 to identify comparable occupational profiles and respective VET programmes in all participating countries. The development of test items for competence measurement is 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 selected in addition 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 hand, on occupational tasks and qualification requirements on 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

107 Some countries did not participate in all four occupations.

setting in each expert group internationally and rated by national experts in each participating country subsequently.

- To incorporate national specifics, 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 the national perspective were discussed on the basis of the international sets of occupational tasks, qualification requirements and evaluation tasks.

The discussions in expert groups during the three international workshops provided a forum for analysing domain-specific aspects of comparability and national specifics. 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-scales 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 for all aspects but a *certain degree* of coverage in terms of occupational tasks, qualification requirements and assessment tasks, which is the precondition for a possible future VET-LSA

4.2 Main results of the Feasibility Study

4.2.1 Institutional aspects of VET-programmes

Regarding 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 between 3 and 4.5 years (most programmes have duration of 3 years). For accessing the programmes at least completed compulsory school is required. The typical entrance qualification for level 3 is nine years of full-time education and completion of ISCED level 2; the typical entrance age is 15 or 16 years. All programmes are classified at ISCED level 3 (3A/B, 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%)[108]. Very little information about possibilities for transition from VET to Higher Education was reported by the countries. After all, there are possibilities for accessing post-secondary education at ISCED level 4 after completion of most VET programmes.

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

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 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 the Slovenian report.

In a possible 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 subsume different governance structures, e.g., the extent and type of participation of social and economic groups or the relation between central and decentral steering, the type of financing with regard to amount and expenditure of resources. Moreover, indirect factors refer to the permeability to higher education and links to the labour market; they 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 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. Supposed, quality monitoring has a high impact on VET outcomes, 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 coverage in all occupations/occupational fields for a comparison of VET in the eight participating countries[109]. The identified common sets of occupational tasks and qualification requirements for the labour market and core areas in VET provide a basis for constructing frameworks in each of the four occupations/occupational fields and consequently the development of test instruments for a possible future VET-LSA.

There is high coverage for nearly all selected indicators for occupational profiles and VET programmes. The comparative analysis of expert ratings shows that all results are significant[110]. As expected, the degree of coverage varies depending on the vocational area:

109 Some countries did not participate in all four occupations (see Chapter 3).
110 except for one aspect evaluation tasks business and administration

for the two craft and industrial occupations (carmechatronics, electricians) there is higher coverage due to the clear definition of the occupation, whereas for two service occupations (social and health care, business and administration) the coverage is lower due to the broadness of the field. However, taking into consideration that qualifications for service occupations in Europe are increasingly converging, the service occupations are judged to be equally comparable as the industrial occupations. With regard to the subsequent steps of framework construction for test item development, in particular the service occupations fields should to be specified further.

With regard to the statistical analysis one has to keep in mind: the ratings are based upon international expert group discussions previously to the national workshop and discussed, commented and supplemented during these workshop. So far the ratings can be considered outcomes of qualitative procedures.

The high coverage of expert ratings in all countries is illustrated on the basis of diagrams and graphs in Chapter 3. The coverage becomes apparent even better by comparing numeric values for each country. For very few countries and items the mean values differ more than 10% from the country means (Annex). High concordance of ratings between individual countries, tested with Kendall's concordance coefficient W and the equivalent average Spearman's correlation is illustrated in Table 4-1.

Table 4.2-1: **Kendall`s W measure for concordance**

Vocational Area	Workshop	Set of Items	N*	Kendall's W	Chi2	df	p	Average Spearman correlation	Omitted items[1]
Business and administration	1	Occ Task Relevance	6	0,630	30,248	8	0,000	0,56	
	1	Occ Task Frequency	6	0,634	26,625	7	0,000	0,56	item 4
	1	Qualification requirement Relevance Qualification	6	0,591	42,567	12	0,000	0,51	
	2	Eval Task Major Educational Objective	6	0,204	15,898	13	n.s.	0,04	
	2	Eval Task Complexity	6	0,692	53,960	13	0,000	0,63	
Carmechatronics	1	Occ Task Relevance	7	0,701	63,809	13	0,000	0,65	
	1	Occ Task Frequency	7	0,852	77,495	13	0,000	0,83	
	1	Qualification requirement Relevance Qualification	7	0,864	48,394	8	0,000	0,84	
	2	Eval Task Major Educational Objective	7	0,411	43,145	15	0,000	0,31	
	2	Eval Task Complexity	7	0,517	54,289	15	0,000	0,44	
Electricians (craft)	1	Occ Task Relevance	7	0,450	34,648	11	0,000	0,36	
	1	Occ Task Frequency	7	0,431	30,154	10	0,001	0,34	item 7
	1	Qualification requirement Relevance Qualification	7	0,570	31,903	8	0,000	0,50	item 7
	2	Eval Task Major Educational Objective	6	0,318	22,918	12	0,028	0,18	item 7
	2	Eval Task Complexity	6	0,788	51,990	11	0,000	0,75	items 6, 7
Electricains (industry)	1	Occ Task Relevance	6	0,615	36,881	10	0,000	0,54	
	1	Occ Task Frequency	6	0,574	34,416	10	0,000	0,49	
	1	Qualification requirement Relevance Qualification	6	0,505	24,259	8	0,002	0,41	
	2	Eval Task Major Educational Objective	6	0,301	18,080	10	0,054	0,16	
	2	Eval Task Complexity	6	0,655	39,274	10	0,000	0,59	
Social and health care	1	Occ Task Relevance	7	0,479	60,356	18	0,000	0,39	
	1	Occ Task Frequency	7	0,743	62,399	12	0,000	0,70	items 11, 15, 16, 17, 18, 19
	1	Qualification requirement Relevance Qualification	7	0,476	23,325	7	0,001	0,39	
	2	Eval Task Major Educational Objective	7	0,278	29,193	15	0,015	0,16	items 14
	2	Eval Task Complexity	7	0,530	51,951	14	0,000	0,45	items 14, 16
			* N = number of countries						

1 In case of missing country means for individual items the item was onitted from the analysis rather than the country.

All ratings, except for business & administration evaluation tasks and electricians industry nearly reaching 5%, are highly significant (Table 4-1). The high ratings for “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: first for occupational tasks and qualification requirements in the labour market and second, for evaluation tasks corresponding to major core areas in VET[111].

4.2.2.1 Carmechatronics

From the selected four occupations 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 occupational tasks were rated as relevant or very relevant. In particular tasks concerning diagnosis and troubleshooting appear to be very relevant for jobs in the field of carmechatronics. There has been a shift from traditional tasks of repairing or replacing parts to tasks of diagnosis using electronically equipment. The results for frequency differ between the tasks and there is a tendency that tasks with lower ratings for relevance correlate with a lower frequency.

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

In this first approach to occupational profiles of carmechatronics the ratings appear very consistent all over the participating countries. They point to a high 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

Concordance concerning the ratings for evaluation tasks appears as medium high. However, the rating results as such mainly show strong agreement and comparable levels of complexity. In particular the core areas engine management, brake system and comfort and

111 The sets of occupational tasks were rated on basis of 5-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 is representing major educational objectives at the end of VET for carmechatronics?”) and *complexity* (“Indicate the level of complexity!”).

security systems appear very relevant for major educational objectives at the end of VET programmes for carmechatronics. Within the core areas the types of tasks can be differed 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 occupational tasks. The five core areas representing relevant educational objectives in all national VET programmes are recommended to be taken into consideration for subsequent steps in the next project phase:

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

In an overarching view to the three content oriented approaches the following can be concluded:

- a predominant relevance of diagnosis and troubleshooting oriented tasks can be confirmed for occupational tasks,
- technical and vocational oriented qualification requirements can be considered very relevant for successful performance in the labour market (general qualifications in natural sciences were rated low in relevance),
- the selected evaluation tasks could be 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 has to 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 Electrician (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 coverage of expert ratings in all participating countries was mostly high, in particular for the ratings in the craft sector. For electricians industry, national specifics 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 ratings of occupational tasks show widespread agreement across countries: most of the tasks were rated as relevant. Two additional tasks were considered 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"). In future steps it is recommended to check these tasks in detail. The expert ratings for task frequency match very well, taking into consideration that most occupational tasks occur 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 equipments. In detail this includes: work scheduling, installation of wirings and connecting of electrical equipment. Moreover, the common profile includes troubleshooting in the case of malfunctioning, correcting the problem and inspecting electrical equipments or systems by using technical documents. All operations are performed according to applicable national regulations, standards and technical norms. Aspects of 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 high 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 electrician in the craft sector is mainly characterised by domain-specific aspects of "building and construction", e.g., installation technologies, work organization, functional check, troubleshooting and the accordance of the electrical systems to local norms, standards and regulations; "telecommunication", e.g., call systems or equipment of telecommunication and telephone systems and "engineering and technology. The profile is also characterised by rather general requirements of "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 concordance for the core areas. The seven core areas representing relevant educational objectives in all national VET programmes are cecommended to be taken into consideration for subsequent steps in the next project phase:

8. Classic Installation technology
9. Intelligent Building automation: Bussystems
10. Illumination (Calculation)
11. Drive Technology
12. Measurement technology
13. Building control equipment (basics): Programming Logic Controller
14. Service and maintenance

Electricians industry

Occupational tasks and qualification requirements in the labour market

The coverage for ratings of occupational tasks for the industrial sector can be evaluated as good. Most of the tasks were considered relevant for all countries; only two tasks were rated less important. Two additional tasks were considered 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"), which are recommended to be analysed in future steps. There is also high agreement in terms of task frequency. In summary, high 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, installation and commissioning of electric and electronic control and regulation systems, other electric equipment or systems and electric loads; programming and handling of bus technologies also plays a major role. Diagnosis of malfunctions (troubleshooting), problem solving and putting systems back to operation is certainly included in all tasks. Moreover, electricians in the industrial sector perform tasks of advising to solve electric problems supported by technical documents in all countries. As for the craft sector, aspects of security and safety of electric installations and equipment according to national regulation, standards and norms, play an important role in all countries.

For qualification requirements three areas of major importance for all countries could be identified: "engineering and technology", "computers and electronics", and "English language"; all other requirements were considered less relevant. The common profile of qualification requirements for Electrician in the industry sector is mainly characterised by the domain-specific aspects "engineering and technology", e.g., knowledge, skills and abilities for applying direct, alternating and three-phase technology and hardwired programm controller or programmable logic controller, "computers and electronics", e.g., electronic components like power electronics, electronic components and computer or control software; and the more general requirements "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 national experts agreed that if more practice oriented tasks were selected the ratings would have been higher. 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 requirements yet.

According to the results, the possibility for comparison could be confirmed for Sweden, Slovenia, Norway and Germany; there are also wide areas of concordance in Finland. In subsequent steps it is recommended to analyse whether modifications of tasks would result in higher concordance for the remaining areas. The discussion in the expert group during the final international workshop indicated that this is very likely. The following four core areas representing relevant educational objectives in all national VET programmes are recommended to 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

Contrary 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 illustrates the many-sidedness of the business and administration area as well as the different facets of occupational integrations of merchants and economists in the labour market. However, given the diversity of occupational profiles and VET programmes in participating countries, the coverage 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 by typical activities of employees like dealing with sales records, financial statements and invoices as well as organizing customers´ and suppliers' inquiries in all participating countries. The coverage in the relevance of occupational task can be evaluated as good. Whereas only one task was considered less important across almost all countries, the ratings of four tasks indicate high agreement across all 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: day-to-day in contrast to periodical working activities can be defined. The proposals and suggestions the expert group made are recommended to be taken to add the additionally named items or make the mentioned critical items more precise to reduce uncertainty, hence, variability in the rating.

The experts came to an agreement about qualification requirements of major importance. Qualification requirements range from strictly occupational requirements necessary for merchants` and economists` job performance like clerical, economics and accounting, to generic requirements necessary for life performance like mathematics, English language, and computer literacy. Moreover, qualification requirements that correspond to different company areas like administration and management, sales and marketing on the one hand to operational functions, like production and processing as well as customer and personal services on the other hand, were considered important in all countries.

The coverage in the relevance of qualification requirements can be evaluated as good. Three qualification requirements were judged highly relevant for all participating countries: "clerical qualifications", "English language", and "customer and personal service". It is recommended to interpret those requirements as the baseline for qualifications in the field of business and. The proposals of the international expert group to add communication and

make the critical items more precise to reduce variability in the rating are recommended to be taken into consideration in the next project phase

Evaluation tasks at the end of VET programmes

The coverage of ratings for "relevance" of the selected evaluation tasks is much lower than the results for complexity. This indicated that the selected VET programmes correspond to similar educational levels but most likely comprise more core areas than covered with the selected evaluation tasks for the rating. The more participating countries agree upon 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 in Finland, Switzerland (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, during the final international workshop the business and administration group agreed on the following six core areas relating to *general aspects* of learning outcomes relevant for all national VET programmes as 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[112], is integrated in all six-core areas.

Starting from the six core areas each country specified the major focus of their national VET programme: 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[113].

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

112 Communication aspect – internal and external related to customers and business by eventually 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 minimize negative impacts on a business.

113 (Sweden: sales / marketing / customer service)

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 towards the social area; the Finnish, German and Danish programmes are placed at the intersection of both areas. The finding show that all VET programmes meet the given framework of occupational profiles, but certain national specifics are recommended to be taken into account for sampling and data acquisition in a possible future VET-LSA. In particular, country specific organisations of programmes as well as the proportions of theoretical and practical learning have to be considered. Against this background it is very surprising that there is widespread agreement between the ratings in all countries.

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 in the areas of basic care, social care as well as public health; some countries exclude medical nursing care, work in hospitals and management activities. Ethical interaction and activating clients/patients is integrated in care work in all countries

The results for occupational tasks point to high relevance for most occupational tasks and considerable commonality regarding tasks relevant for jobs in the field of social and health care. In particular, basic care activities as well as certain social care activities can be considered as common frame for occupational tasks in the field of social and health care; administration and quality insurance appears to be sufficiently relevant as long it is related to the level of the focussed group's work. In general, differences in the relevance of occupational tasks concerning technical care (nursing skills) refer to different focal points of the selected VET programmes.

The findings for qualification requirements confirm that, apart from medicine, where disagreement occurs due to programmatic differences between countries, all 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, yet sufficiently relevant for comparison. All in all, this points to a high relevance of qualification requirements and strong commonalities for all countries in the areas of personalized, non-medical care.

The profile of qualification requirements for all countries is mainly characterised by its coverage 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 would only be relevant in all countries if 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 upon 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 from the area of social action as a consequence of health related incidents - not immediate medical nursing interventions. While tasks pertaining to procedural knowledge or with little reference to a case description were considered medium or less complex, some tasks were held to be highly complex by the experts, in particular those tasks requiring reflections upon complex case study descriptions for their solution. In general, high agreement for the selected evaluation tasks became 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 protection of health and environment are predominantly relevant across countries, and activating patients and interacting in an ethical manner is considered important when carrying out care related tasks in all countries;
- qualification requirements in the social and interpersonal field as well as ethics are very relevant across countries; applied areas of law and administration are also needed in all VET programmes – medicine is relevant in some countries;
- evaluation tasks represent major educational objectives in all 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 as well as administration and legal framework;
- in subsequent steps further evaluation tasks within the five core areas are recommended to be checked, taking into consideration evaluation tasks of high importance in all participating countries as well as additional occupational tasks and qualification requirements;
- in subsequent steps it is recommended to pay attention to national specifics of the VET programmes, in particular regarding the client/patient population they are related to and administrative and legal subjects;
- for the selection of the VET programmes in a possible future VET-LSA, clear criteria for inclusion and exclusion need to be defined; 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 questions in the Feasibility Study: whether there is enough coverage in the selected VET programmes and occupational profiles in all participating countries as a basis for an international large-scale assessment of VET (VET-LSA). In terms of general aspects for the selected VET programmes, occupational profiles and evaluation tasks corresponding to major core areas this question could be affirmed – however, in different ways and for some vocational areas with additional conditions. This is specified in the following:

Carmechatronics
In all 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 relevance, representativeness and feasibility with regards to a possible future VET-LSA in the field of carmechatronics; only few inferior restrictions became evident, which are recommended to be analysed more detailed in the next project phase.

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

Business and administration
For the broader occupational field of analysis, we come to the conclusion that, despite the large 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 general aspects of VET programmes, occupational tasks, and qualification requirements. For the selection of representative evaluation tasks more information regarding national VET programmes and national educational targets are demanded. The significant concordance of complexity judgement is indicative for an acceptable fit of tasks standards. The international expert group in the final workshop agreed upon six broad core areas: purchasing, sales/marketing, stock keeping, financials/ accounting, customer service and organisational activities. In subsequent steps further evaluation tasks within the six core areas are recommended to be checked, taking into consideration evaluation tasks, occupational tasks and qualification requirements of high importance to further specify the field.

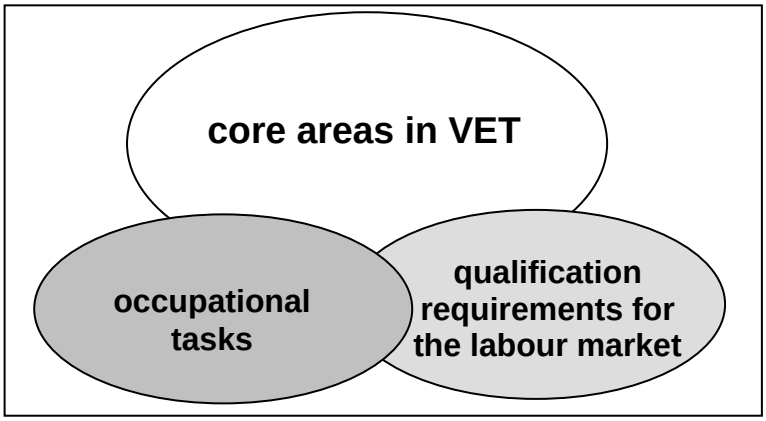
Social and health care
Despite the broadness of the field, social and healthcare can be recommended for an international large-scale assessment of VET. The approaches consistently confirm that there

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 coverage regarding educational objectives in all participating countries. It is recommenden to concentrate on programmes including social *and* health care and to check further evaluation tasks within the five core areas, taking into consideration evaluation tasks, occupational tasks and qualification requirements of high importance to further specify 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.

Figure 4.3-1: Basis for further steps in the next project phase



For the next planning phase to prepare an international large-scale assessment of VET (VET-LSA) the following steps are recommended on the basis of the results of the Feasibility Study:

- It is recommended to develop a framework for item construction in each occupation/occupational field. 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 recommended. The specification could be based on the following procedures:
  - further specification of the educational level within each core area,
  - checking possibilities for including modules (e.g., business and administration: core areas sales/marketing and organisational activities),
  - checking further evaluation tasks within each core area.

In addition, a number of helpful suggestions for a future VET-LSA were put down in the national reports which were confirmed during the final international workshop by all country representatives. It is recommended to take into consideration the following aspects 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 to involve national coordinators in the research process as early as possible. This should be included in the organisational structure of the project.

After all, given the tight timeframe of the Feasibility study we have all learned something in view of what is important for future large-scale assessment of VET (VET-LSA) and 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 lot and this is probably one important outcome. Now we better know the "how, why and what questions" so that we can prepare and continue this important "assessment work". We have also internationally had the opportunity to discuss the meaning of important key concepts and become aware of 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

Achtenhagen, F. & Tramm, T. (1983). Curriculumforschung aufgrund des Einsatzes neuerer empirischer Verfahren. In U. Hameyer, K. Frey & H. Haft (Eds.), *Handbuch der Curriculumforschung* (pp. 545-568). Weinheim: Beltz.

Achtenhagen & Winther (in press). *Konstruktvalidität von Simulationsaufgaben: Computer-gestützte Messung berufsfachlicher Kompetenz – am Beispiel der Ausbildung von Industriekaufleuten.* Bonn: BMBF

Arts, W. & Gelissen, J. (2002): Three worlds of welfare capitalism or more? A State-of-the-Art Report. In: Journal of European Social Policy 2002; 12, p. 137-158.

Baethge M., Arends, L. & Winther, E. (2008). *First international workshop Feasibility Study VET-LSA, Discussion paper,* workshop 3.-4. July, 2008 in Bonn. SOFI Göttingen.

Baethge, M., Achtenhagen, F. & Arends, L. (2008). How to Compare the Performance of VET Systems in Skill Formation. In K.-U. Mayer & H. Solga (Hrsg.). *Skill Formation – Interdisciplinary and Cross-National Perspectives.* New York: Cambridge University Press.

Baethge, M., Achtenhagen, F., Arends, L., Winther, E., Nickolaus, R., Gschwendtner, T., van Onna, M., Béguin, A., Sibberns, H. & Watermann, R. (2007). *Concept for an International Large Scale Assessment of Vocational Education and Training (VET-LSA).* Working paper for the international workshop, 29.-30. October, 2007 in Bonn. SOFI Goettingen.

Baethge, M., Achtenhagen, F., Arends, L., Babic, E., Baethge-Kinsky, V., & Weber, S. (2006*). PISA-VET. A Feasibility-Study.* Stuttgart: Steiner

Bell, D. (1973): The coming of Post-Industrial Society, New York.

Berger, S., Dore, R.P. (Ed.) (1996): National diversity and global capitalism, Ithaca, New York.

Bortz, J. & Lienert, G. A. (2008). *Kurzgefasste Statistik für die klinische Forschung: Leitfaden für die verteilungsfreie Analyse kleiner Stichproben*. Heidelberg: Springer.

Braithwaite, J., Luft, S., Bender, W., Callen, J., Westbrook, J.I., Westbrook, M.T., Mallock, N.A., Iedema, R., Hindle, D. & Jochelson, T. (2007). *The hierarchy of work pursuits of public health managers.* Health Service Management Research, 20; 2.

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

Cendales, L.C., Kirk, A.D., Moresi, J.M., Ruiz, P. & Kleiner, D.E. (2006). *Composite Tissue Allotransplantation: Classification of Clinical Acute Skin Rejection*. Transplantation, 81; 3.

Child, J., Heavens S.J. (2001): *The Social Constitution of Organizations and is Implications for Organizational Learning*. In: Dierkes, M./Antal, A.B./Child, J./Nonaka, I: (Hg.), *Handbook for Organizational Learning and Knowledge*, Oxford, p. 308-326.

Craigie, M., Loader, B., Burrows, R. & Muncer, S. (2002). *Reliability of Health Information on the Internet: An Examination of Experts' Ratings*. Journal of Medical Internet Research, 4;1.

CEDEFOP (2009). *Continuity, consolidation and change: towards a European era of vocational education and training*. Luxembourg: Office for official publications of the European Communities.

Council of the European Union (2002). *Detailed work programme on the follow-up of the objectives of education and training systems in Europe*. Official Journal of the European Union.

Descy, P., Nestler, K.; Tassaring, M. (2005): *Internationally comparable statistics on education, training and skills: current state and prospects*. In: Vocational Training No 36 (European Journal).

DISCO. *European Dictionary of Skills and Competencies* [online]. Available on the Internet: http://www.skills-translator.net (27.08.2007)

Esping-Andersen, G. (1990): *The three worlds of welfare capitalism*. Cambridge: Polity Press, 1990.

European Training Foundation (2005). *Financing vocational education and training in the EU new member states and candidate countries: recent trends and challenges*. Luxembourg: Office for official publications of the European Communities.

European Union (2008). *The Bordeaux Communiqué on enhanced European cooperation in vocational education and training*. Download at: http://www.eua.be/fileadmin/user_upload/files/Newsletter_new/Bordeaux_Communique_EN.pdf

European Commission (2004). *Maastricht communiqué on the future priorities of enhanced European co-operation in vocational education and training: a review of the Copenhagen declaration of 30 November 2002*. Brussels: European Commission, 2004.

European Commission (2006). *The Helsinki communiqué on enhanced European cooperation in vocational education and training: communiqué of the European Ministers of Vocational Education and Training, the European social partners and the European Commission convened in Helsinki on 5 December 2006 to review the priorities and strategies of the Copenhagen process*. Brussels: European Commission, 2006a.

Greinert, W.-D. (1998): Das ‚deutsche System' der Berufsausbildung, Baden-Baden.

Greinert, W.-D. (2005). *Mass Vocational Education and Training in Europe. Classical models of the 19th century and training in England, France and Germany during the first half of the 20th*. CEDEFOP Panorama, 118. Luxembourg: European Communities.

Howell, David C (2009). *Statistical Methods for Psychology*. Belmont: Duxbury Press.

Jackson; P.W. (1992). *Handbook of Research on Curriculum: A Project of the American Educational Research Association.* New York et.al.: Macmillan Library Reference.

Jonassen, D.H., Wallace, H.H., & Tessmer, M. (1989). *Handbook of task analysis procedures.* Westport: Praeger Publishers.

Kühnel, S. (2006). Annex D: Expertise by Steffen Kühnel: *Sampling plan for the German pilot PISA-VET study ,*in Baethge, M., Achtenhagen, F., Arends, L., Babic, E., Baethge-Kinsky, V., & Weber, S. (2006*).* PISA-VET. A Feasibility-Study*.* Stuttgart: Steiner

Leney, T. et al. (2004). *Achieving the Lisbon goal: The contribution of VET*. Final Report to the European Commission. The Lisbon-to-Copenhagen-to-Maastricht Consortium Partners. London: QC.

Leney, T. & Green, A. (2005). Achieving the Lisbon Goal: the contribution of Vocational Education and Training, *European Journal of Education, 40*, 3, pp. 261–278

Lewis-Beck, M.S.; Bryman, A.& Liao, T.S. (2004). *The Sage Encyclopaedia of Social Science Research Methods*. Thousand Oaks, et. al.: Sage.

Lipinska, P., Schmid, E. & Tessaring, M. (2007). *Zooming in on 2010.* Luxembourg: Office for official publications of the European Communities.

IG-Metall Bezirk Baden-Würtemberg (2004). *ERA-Wissen Handbuch I.* Lohr

Luomi-Messerer, K., Markowitsch, J. (Hrsg., 2006). *VQTS model. A proposal for a structured description of work-related competences and their acquisition*. Vienna: 3s research laboratory.

Markowitsch, J., Becker, M., Spöttl, G. (2006): Zur Problematik eines European Credit Transfer System in Vocational Education and Training (ECVET). In: Grollmann, P.; Rauner, F.; Spöttl, G.; (Hrsg.): *Europäisierung Beruflicher Bildung – eine Gestaltungsaufgabe.* Hamburg: LIT, S. 173-198.

Mueller, W. (2008): *Schein oder Sein: Bildungsdisparitäten in der europäischen Statistik*. In: Schmllers Jahrbuch 128, p. 511-543.

Nickolaus, R., Gschwendtner, T. & Abele, S. (in press). *Die Validität von Simulations-aufgaben am Beispiel der Diagnosekompetenz von Kfz- Mechatronikern. Vorstudie zur Validität von Simulationsaufgaben im Rahmen eines VET-LSA.* Bonn: BMBF

Nonaka, I., Takeuchi, H. (1997): Die Organisation des Wissens, Frankfurt/New York.

OECD (2008a). *Employment Outlook 2008*. Paris: OECD.

OECD (2008b). *Education at a Glance 2008: OECD Indicators*. Paris: OECD.

Ornstein, A.C., Pajak, E.T., & Ornstein, S.B. (2006). *Contemporary issues in curriculum*. Needham Heights, MA: Allyn and Bacon

Peterson, N., Mumford, M., Borman, W., Jeanneret, P., & Fleishman, E., 1995. *Development of prototype Occupational Information Network (O*NET) content model* (Vols. I & II). Salt Lake City, UT: Utah Department of Workforce Services.

Pett, M.A. (1997). *Nonparametric Statistics in Health Care Research: Statistics for Small Samples and Unusual Distributions*. Thousand Oaks, et.al.: Sage.

Polanyi, M. (1966); *The Tacit Dimension*, New York.

Seyfried, E. (2007). *Indicators for quality in VET*. Luxembourg: Office for official publications of the European Communities.

Schmidt, W. (1995). *The TIMSS curriculum analysis: An overview of an integrated system of curriculum measurement.* Curriculum Analysis Technical Report Series No. 1. East Lansing, MI: Michigan State University.

Schleicher, A. (2008). *PIAAC: a new strategy for assessing adult competencies. International Review of Education*. Springer.

Schmidt, W.H., Raizen, S.A., Britton, E.D., Bianchi, L.J., & Wolfe, R.G. (1997). *Many visions, many aims: A cross-national investigation of curricular intentions in school science.* Dordrecht, The Netherlands: Kluwer Academy Publishers.

Tessaring, M. (2007): Berufsbildung in Europa – Herausforderungen und Strategien. In: Prager, J./Wieland, C. (Hg.): Duales Ausbildungssystem – Quo vadis? Gütersloh. p. 57-76.

UNESCO (2006). *ISCED 1997 International Strandard Classification of Education. Re-edition*. Online: http://www.uis.unesco.org/TEMPLATE/pdf/isced/ISCED_A.pdf