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Results from the EQUAL-CLASS project

Engineers qualified in higher non-university VET institutions – providing arguments and evidence for NQF/EQF classification

3 perspectives

LEARNING OUTCOMES
(THEORETICAL – DESCRIPTIVE)

Structured description and comparison of qualifications based on learning outcomes

- Using adapted methodology from the ‚ZOOM' project
- Comparing qualification profiles
- Comparing the assessment of knowledge, skills and competence

LEARNERS
(PRACTICAL – PERFORMANCE TESTING)

'Remote Laboratories'

- Online laboratories to remotely conduct real experiments
- Testing learners' PLC* knowledge, skills and competence
- Learners in the participating countries have to solve the same programming exercises online.

* PLC = Programmable Logic Controller

GRADUATES
(LABOUR MARKET)

Alumni survey

- Comparing graduates' occupations and positions in the labour market
- Web-based questionnaire in four different languages
  – Job level and status
  – Degree of responsibility
  – Career prospects
  – Type of tasks executed

+

How can learning outcomes acquired in the workplace be taken into account?

Desk research & interviews

- Validation and recognition of non-formal/informal learning
- Higher NQF/EQF level?

Results from the EQUAL-CLASS project

Engineers qualified in higher non-university VET institutions – providing arguments and evidence for NQF/EQF classification

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Executive Summary

This publication is the final outcome of the work undertaken by the core partners of the EQUAL-CLASS project, led by 3s Unternehmensberatung, Austria. It intends to provide a summary of the results and outcomes of the project.

There is a rich diversity of VET systems across Europe, many of which have a long tradition in their respective countries. Even when focusing on a very narrow segment of the system, such as the EQUAL-CLASS target of non-university engineering qualifications in the field of mechatronics and electrical engineering/electronics, there is a variety of different programmes and qualifications across different nations. This diversity is both enriching and desirable. The objective of European harmonisation initiatives is not to change these qualifications, which are often deeply rooted in national systems, nor to make them more alike. In times of increasing international mobility and cooperation, however, a growing need has been identified for tools and procedures that make qualifications easier to understand and more comparable. One of these tools is the European Qualifications Framework.

The EQUAL-CLASS project studied qualifications in the field of **mechatronics and electrical engineering/electronics** that can be obtained in higher non-university VET (vocational education and training) institutions or comparable institutions in Austria, Germany, Lithuania, Portugal, and Switzerland. The project thus aimed to make an active contribution to promoting the **transparency and comparability** of vocational education and training qualifications, with particular focus on the field of mechatronics and electrical engineering/electronics. The qualifications are examined from **three different perspectives – learning outcomes, learners, and graduates** – with particular focus on their **NQF/EQF classification**.

This publication is structured according to the work programme of the EQUAL-CLASS project, distinctly reflecting the different perspectives studied. The first two chapters provide an introduction to the project and

the topic. Learning outcomes are the focus of chapter 3, which details the work undertaken to develop a structured description and comparison of selected engineering qualifications based on learning outcomes (theoretical-descriptive perspective). Chapter 4 describes the testing of learners' PLC (programmable logic controller) skills within the so-called 'Remote Laboratories' experiment. Chapter 5 presents the results of an alumni survey, conducted in order to compare these qualifications from a labour market perspective. The analysis in chapter 6 focuses on the validation of non-formal learning, which is closely linked to NQF development in many countries, by describing the respective national validation environments of the five countries studied. Chapter 7 concludes the report with a summary and reflections on the topic.

This text is also available for download from the EQUAL-CLASS website **http://www.equal-class-eqf.eu**.

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1. Introduction

1.1. Aims of the project

The EQUAL-CLASS project is a European Commission-funded project which studied **qualifications in the field of mechatronics and electrical engineering/electronics** that can be obtained in higher non-university institutions of vocational education and training or comparable institutions in Austria, Germany, Lithuania, Portugal, and Switzerland.

The aim of the project was to compare selected non-academic engineering qualifications from several perspectives, with the ultimate objective of contributing to the understanding of foreign qualifications and promoting mutual trust with regard to the **classification of qualifications within National Qualifications Frameworks (NQFs) and their link to the European Qualifications Framework (EQF)**.

One of the main drivers of the project was the promotion of transnational mobility. Transnational mobility plays an increasingly important role in European labour markets. A number of the engineering qualifications studied in EQUAL-CLASS enjoy a very good reputation at national level, and provide learners with very favourable labour market prospects as employers are aware of the level of knowledge, skills and competence they can expect from a graduate. To employers outside of the country in which a specific national qualification is awarded, however, the capabilities of a graduate with such a qualification may not be equally obvious without the provision of additional information.

EQUAL-CLASS therefore attempted to:
- show how similar qualifications from different countries with different characteristics and formats can be made comparable;
- draw a comprehensive overview of the selected qualifications and make an active contribution to the comparability of qualifications in the field of mechatronics and electrical engineering/electronics;
- foster the exchange of experience between countries, considered key to creating mutual trust.

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1.2. Background

Increased focus on higher vocational education and training

In 2013 youth unemployment stood at 23.4 percent across the European Union, and yet at the same time there were more than two million available vacancies. Vocational education and training has become a central focus of European public policy in recent years as countries have identified significant skills mismatches in the labour market and struggled with high (youth) unemployment rates. Great hope is being placed on the ability of vocational education and training to enable the labour force to react to skills shortages in growing sectors and provide the European economy with the advanced vocational skills it requires to flourish. Labour market requirements have changed in recent years - the number of jobs that require high level skills has increased and this trend is expected to continue at a rapid pace.

The 2010 Bruges Communiqué on enhanced European Cooperation in Vocational Education and Training for the period 2011-2020[1] explicitly calls on Member States to

- 'develop or maintain post-secondary or higher VET at EQF level 5 or higher, as appropriate, and contribute to achieving the EU headline target of 40 % [of 30-34 year olds] with tertiary or equivalent education';
- 'promote flexible pathways between VET, general education and higher education, and enhance permeability by strengthening the links between them. To achieve this aim, as well as greater participation in lifelong learning, participating countries should accelerate the establishment and implementation of comprehensive national qualifications frameworks based on learning outcomes'.

Vocational education and training (VET) at higher levels contributes to better permeability of education and training systems, as it frequently serves as a gateway to higher education, in particular for non-traditional

students. It can also help promote social permeability, providing a pathway for learners with lower socioeconomic status.

In these times of increasing international mobility and cooperation, a growing need has been identified for tools and procedures that make qualifications – vocational and others - easier to understand and more comparable. One such tool is the European Qualifications Framework.

The European Qualifications Framework (EQF) and National Qualifications Frameworks (NQFs)

The European Qualifications Framework is an eight-level framework that has been designed to act as a reference for different qualifications systems and frameworks in Europe. It aims to facilitate comparison of qualifications and qualification levels to promote both geographical and labour market mobility of citizens, and lifelong learning. The 2008 Recommendation of the European Parliament and of the Council on the establishment of the European Qualifications Framework for lifelong learning[6] builds the formal basis for the implementation of the EQF.

> **Learning outcomes** are 'statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence'. EQF Recommendation, 2008

The EQF effectively acts as a translation device in which countries' qualifications systems or frameworks are linked to a meta framework, the EQF. Qualifications from different countries can be compared on the basis of their respective positions on the EQF. The EQF consists of eight qualifications levels which are described through learning outcomes – in terms of **knowledge, skills and competence**. Its main purpose is to make qualifications easier to understand and more comparable, i.e. increasing transparency and thus increasing the mobility between different systems and countries, alongside supporting lifelong learning. Countries are asked to link their qualifications systems or frameworks to the EQF using transparent procedures and methods.

The **learning outcomes approach** is central to the EQF. It serves as the common language to facilitate the comparability of qualifications, prompting countries to move away from pure input orientation in their

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qualifications systems by comparing qualifications on the basis of their outcomes, rather than inputs (such as programme duration or subjects taught).

The following table provides an overview of NQF developments in the five countries studied in the EQUAL-CLASS project.

Table: Overview of NQF developments

Country	Name	Referencing to the EQF carried out in…	No. of NQF levels	Scope	Dimensions of level descriptors
AT	Austrian Qualifications Framework for Lifelong Learning	2012	8	Comprehensive; open to all forms of learning and all sectors of education	Knowledge Skills Competence
DE	German Qualifications Framework for Lifelong Learning (DQR)	2012	8	Comprehensive; open to non-formally and informally acquired competences	Professional competence (knowledge, skills) Personal competence (social competence, autonomy)
LT	Lithuanian Qualifications Framework (LTQF)	2011	8	Comprehensive	Characteristics of activities (complexity, autonomy, changeability) and types of competence (functional, cognitive, and general); knowledge, skills, competence
PT	Portuguese Qualifications Framework	2011	8	Comprehensive	Knowledge Skills Attitude
CH	Swiss National Qualifications Framework for Vocational and Professional Education and Training (NQF VPET)	Not yet	8	Currently two separate frameworks – one for VET, and one for HE (Bologna qualifications)	Knowledge (declarative knowledge, understanding); skills (procedural skills, sensorimotor skills); and competences (vocational/professional competences and personal competence). Personal competence emphasises self-competence, social competence, and leadership competence

Source: EQF Referencing Reports[10]; Cedefop (2013)[4].

National qualifications are **not directly allocated to the EQF**; they are allocated to national qualifications levels that are to be linked to the EQF levels.

2. The EQUAL-CLASS Approach

Throughout the EQUAL-CLASS initiative, the project team used and tested several different approaches to the comparison of qualifications in order to develop transparency and a better understanding of engineering qualifications in the field of mechatronics and electrical engineering/electronics, with particular focus on their classification within National Qualifications Frameworks and their link to the European Qualifications Framework.

Learning outcomes perspective (theoretical-descriptive)
Structured description and comparison of qualifications based on learning outcomes. > See chapter 3.

Learners' perspective (practical – performance testing)
Implementation of the Remote Laboratories experiment – testing learners' PLC skills through standardised online assessment. > See chapter 4.

Graduates' perspective (labour market)
Comparing graduates' occupations and positions in the labour market. > See chapter 5.

Validation perspective
How can learning outcomes acquired in the workplace be taken into account? > See chapter 6.

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3. Focus on: Learning Outcomes

This chapter describes how the 'ZOOM' methodology was used to compare qualifications from the field of mechatronics, electronics/ electrical engineering between five partner countries, particularly in relation to their classification within National Qualifications Frameworks (NQFs).

3.1. Methodology used

Qualifications in the field of mechatronics, electronics/electrical engineering from five countries – AT, DE, CH, LT and PT - were described on the basis of a template adapted from the classification report of the 'ZOOM' project. Subsequently, these descriptions, which are primarily based on curricula information and descriptions provided by the respective schools or colleges, were compared and analysed according to the categories of the template.

The most significant element of this work package was the adaptation and revision of the classification contained in the ZOOM project report in order to meet the different aims and needs of the EQUAL-CLASS project and reflect changing circumstances (e.g.

The ZOOM project
The methodology used for comparing qualifications in EQUAL-CLASS is based on the outcomes of the ZOOM project. ZOOM developed a methodology to support the objective and unambiguous classification of the master craftsperson qualification to National Qualifications Framework levels.
More information: http://www.zoom-eqf.eu

more countries have presented their National Qualification Frameworks since the completion of the ZOOM project). Therefore, the ZOOM methodology had to be adapted to serve the needs of the EQUAL-CLASS project.

The engineering qualifications were described using the new template, with each description consisting of three main sections - information on qualifications (input criteria), qualification profiles (based on learning outcomes), and evaluation process - and two optional sections - statistical indications and annexes.

3.2. Results

Different approaches to describing learning outcomes. The analysis and comparison of the qualification profiles show quite different approaches towards the description of learning outcomes. In Switzerland, Austria and Lithuania work process orientation can be found, whereas in Germany learning process descriptors are the focus (learning fields approach). This made it difficult to compare the different qualification profiles and to highlight differences.

The ZOOM method can be used in various contexts to describe qualifications in an objective and unambiguous manner. But the objectives of the template - to support an objective and unambiguous classification of qualifications within respective NQFs based on arguments substantiated by details provided on the evaluation process of a qualification, results from expert consultation, and additional statistical indications supporting the classification suggestion - can be difficult to achieve.

The full report, including a more detailed description of results of this work package, can be downloaded at http://www.equal-class-eqf.eu/results/.

3.3. The diversity of qualifications at EQF level 5/6

The analysis of the EQF Referencing Reports[10] of those countries that have already referenced their qualifications to the EQF provides a very varied and multifaceted picture of VET qualifications at these levels. Of particular importance in this context is the area surrounding EQF level 5, as it is in a number of countries the interface between vocational and higher education. National qualifications levels linked to EQF level

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5 include qualifications belonging to different sub-sectors, including vocational education and training, higher education, continuing VET and general education. Many of these qualifica-

tions have a clear hybrid character: they have a 'hub function' since they are valued both as labour market entry qualifications by employers and at the same time have currency for entry to higher education.[5] Austrian VET college qualifications are one example. Graduates of these VET colleges acquire a double qualification, the 'Reifeprüfung' certificate, which grants them general access to higher education and a VET diploma, which allows them to hold a senior occupation in their respective field.

But not only EQF level 5, also EQF level 6 includes a very heterogeneous mix of qualifications, including 'Master' craftsperson qualifications, diploma in technological specialisations, and professional qualifications outside initial, formal education and training.

Table: Engineering-related VET qualifications at EQF levels 5 and 6 – selected examples

EQF level 5	EQF level 6
Examples:	*Examples:*
France: Brevet de technicien supérieur	France: Licence Professionnelle
Latvia: Diploma of first level professional higher education	Lithuania: Professional bachelor's qualification degree
Austria: VET college qualifications (provisional)	Germany: Advanced vocational qualification (Fachschule): State-Certified Technician
Luxembourg: Master Craftsperson Diploma	Estonia: Diploma of professional higher education
Portugal: Diploma in Technological Specialisation (DTS) of a TSC - Technological Specialisation Course (CET)	Austria: Master craftsperson qualifications (provisional)

Source: EQF Referencing Reports[10]

4. Focus on: Using Remote Laboratories to Assess Learners

This chapter describes the implementation and outcomes of the Remote Laboratories experiment within the EQUAL-CLASS project, in which Remote Laboratories were used to assess and compare learners' PLC (programmable logic controller) skills.

What is a Remote Laboratory?

The term 'Remote Laboratories' refers to online laboratories used to remotely conduct real experiments. These are scalable (accessible via internet) e-learning instruments especially for use by those studying technical and natural scientific disciplines.

The underlying technology allows for collaboration and (for instance) joint programming in online-laboratories across long distances and national borders. At the same time, tasks can be assigned and undertaken regardless of time and location.

The objective of this approach was to assess whether comparable information on learning outcomes, and additional evidence regarding the NQF/EQF classification of comparable qualifications, could be gained by the use of Remote Labs. In addition, this approach aimed to bring schools in different European countries together to foster sustainable cooperation and secure mutual support in the future development of laboratories.

Thus, results from the Remote Laboratories experiments should address and provide answers to the following questions:

- Are the students in the different vocational schools equally successful in completing their tasks?
- What are the differences and similarities between the results of different countries?
- Can the results be used as additional evidence for the comparability of qualifications and their classification?

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4.1. Methodology used

In a first step, teachers at the participating VET schools and colleges had to be instructed in the use of Remote Laboratories and lesson preparation. By March

Remote Laboratories experiment – participants:
Austria   HTL St. Pölten (VET college)
Germany   Grundig Akademie
Lithuania   Kaunas College
Switzerland   ABB Technikerschule Baden

With support from: CEyeClon, Siemens and SITELA

2014, a total of 164 learners from 10 classes in Germany, Austria, Lithuania, and Switzerland had been trained in the use of 30 remote PLC workstations. Of these students, 150 had logged onto the examination task by the end of May 2014, with 112 passing and 38 failing the examination.

All students who successfully passed the examinations (test score better than 50 percent) were issued a certificate and a certificate supplement, as shown on p. 18.

A questionnaire was designed and distributed to the teachers and/or trainers who worked with the Remote Labs as partners in the EQUAL-CLASS project, in order to learn more about their experience of the experiment.

Table: Remote Laboratories experiment - overview

Purpose	Assess and compare learners' PLC (programmable logic controller) skills.
Format	Remote Laboratories: training + examination
Countries involved	Austria, Germany, Lithuania, Switzerland
No. of learners participating in the preparation classes	164 learners from 10 classes
No. of learners taking the Remote Laboratories exam	150 learners
No. of certificates awarded	112 certificates
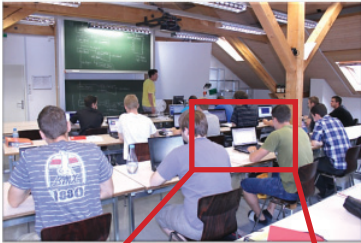
Classroom learning:
Learners in the control engineering theory lessons enhance their knowledge through operating in a real lab environment.

Student PC with free CEyeClon viewer software

Learners operate a Remote Laboratory workstation in real-time using a PC. The student's PC functions as screen and keyboard of the remote PC. In addition to access to the remote PC, the camera image of the system is transferred with synchronous sound on the screen of the student PC. The student PC requires only the free CEyeClon viewer software and any Windows-compatible operating system.

Remote PC with STEP 7 TIA Portal software

Live stream of the band model transmits real-time image and sound of the system
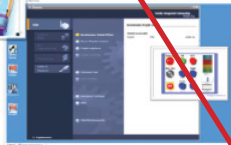
Easy access via Internet:
Access to the work stations on the Internet. The free viewer software CEyeClon provides and shows a media and control window.

Every workingplace is physically built up
Remote work places can be used in real working life. Here a mechatronic band circulation with pneumatic transport unit for logistics.

S7 1200 PLC

Network camera

Real conveyor-belt model

Remote work locations in a rack system
Remote workstations can be centrally set up and maintained. Regardless of the distance to the jobs, learners have the opportunity to operate these workstations.

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4.2. Results from the Remote Laboratories experiment

The participating schools' experience with implementing the Remote Laboratories experiment was very positive. Remote Labs were considered by the participating engineering schools and colleges as a new and interesting way to foster sustainable cooperation in the future development of their laboratories. Furthermore, they all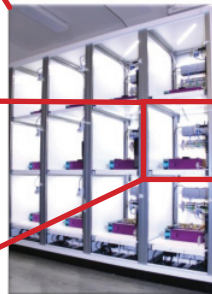ow students and instructors to perform both exercises and examinations at any time regardless of their location providing they have access to the internet.

At the same time it must be noted that the results from this experiment provide limited evidence for the comparison of levels of learning outcomes achieved between learners of different programmes/qualifications.

The following observations were made when analysing and comparing the results from the Remote Laboratories experiment:

- Results show a Gaussian normal distribution curve.
- The questionnaire responses and the analysis of the examination results indicate that the implementation of the PLC was quite difficult for the students, and this is reflected in the fact that the instructors had to provide a lot of support.
- There are significant variations in the pass rate between the different classes, ranging from 38.9 percent to a pass rate of 100 percent.
- Regardless of the average score per class, each class shows top scoring individual student results, i.e. learners with a score of more than 90 percent of achievable points.
- Some classes had only 20 lessons on the subject of PLC, while others had up to 140 lessons. The different number of PLC-specific lessons shows in the test scores and also in the amount of support required by the learners on how to use and operate the systems.
- English language proficiency could be a factor in individual results, but this could not be verified.

Participating schools had lesson plans with different subject emphasis; these could not, of course, be altered a great deal in the implementation of this project. Another significant factor is that in some schools PLC-specific lessons are taught in early semesters while other schools leave this teaching until later semesters. Naturally, this may explain some variations in the level of learning outcomes achieved.

For the purpose of the public report, the decision was taken not to produce a 'ranking' based on the detailed results by VET institution, but instead to publish an anonymous summary of classes classified by number. The full report on the detailed results and analysis of the Remote Laboratories experiment can be downloaded at http://www.equal-class-eqf.eu/results/.

Example: Certificate and certificate supplement for successful participation in the Remote Laboratories experiment

5. Focus on: Comparing Graduates' Labour Market Experience – Alumni Survey

This chapter summarises the results of the alumni survey carried out within the EQUAL-CLASS project in order to gain a deeper understanding of the occupations and positions of graduates with mechatronics, electronics/ electrical engineering qualifications. Data on the tasks which

graduates are required to undertake in their jobs and other relevant information about their qualifications and work life was collected and analysed.

The alumni survey was carried out to **compare the occupations and positions of graduates** in the field of mechatronics, electronics and/or electrical engineering in the labour market, in order to gain insight into the following aspects:

- What is the current job status of graduates?
- What job level & level of responsibility do they have?
- How effectively did their qualification equip them with the skills and competences required to succeed in the labour market?

The alumni survey was conducted through the use of a web-based questionnaire, developed in four different languages (English, Portuguese, Lithuanian, German) in order to allow graduates to complete the survey in their native language. The survey was carried out in Austria, Germany, Switzerland, Lithuania, and Portugal, in collaboration with selected local schools or training institutions.
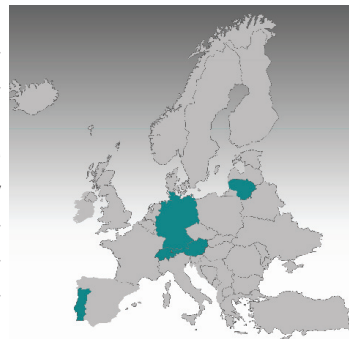
5.1. Methodology used

The survey was based on a questionnaire developed by the EQUAL-CLASS project team. The survey consisted primarily of multiple-choice questions which were designed to gather data that would enable the project team to learn more about respondents' engineering qualification and their professional pathway since graduation. Several demographic questions were also included.

The target group were graduates of the schools participating in the project who had graduated between two and five years ago. In order to be considered part of the target group, the graduates had to have received a qualification in mechatronics and/or electrical engineering/electronics at a level corresponding approximately to EQF 5-6.

Table: Alumni survey characteristics	
Purpose	Comparing graduates' occupations and positions in the labour market, their job status and level of responsibility.
Format	Online questionnaire
Languages	German, Lithuanian, Portuguese, English
Survey countries	Austria, Germany, Lithuania, Portugal, Switzerland
Sample size	Approx. 500 (graduates in the field of mechatronics and electrical engineering/electronics who graduated between 2 and 5 years ago)
No. of respondents	102
Response rate	20.4 %
Average age of respondents	28 years

The survey was carried out in cooperation with selected local schools or training providers. One school per country participated in the survey, i.e. graduates of five different schools or institutions participated in the survey. In order to increase response rates, the alumni were contacted directly by their alma mater, either by e-mail or post. More than 500 alumni

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were contacted across the five countries and 102 replied, which corresponds to a response rate of 20.4 percent.

A comparative analysis was developed on the basis of the results of the survey, examining the data both on an aggregate level and by country/qualification. In reading these results, it is important to take into account that the

Graduates from the following institutions were surveyed:	
Austria	HTL St. Pölten (VET college)
Germany	Grundig Akademie
Lithuania	Kaunas College
Portugal	ATEC
Switzerland	ABB Technikerschule Baden

aim of this survey was to analyse and compare qualifications by examining how effectively they equip their graduates for their future professional life, not to compare countries or national labour market situations. These conclusions must therefore be read in the context in which they are situated, in that they provide indications of possible tendencies of qualifications at EQF levels 5 and 6, and how these qualifications are viewed and used within Europe. Consequently, the findings of this survey cannot be used to make sweeping assumptions about the general labour market situation of engineering graduates at national level.

5.2. Survey results

This section details selected findings from the survey. Comprehensive results are presented in the full survey report, which can be found at http://www.equal-class-eqf.eu/results/

Aggregate results

Relevance. Respondents were asked to rate the extent to which their study programme equipped them with the relevant competences for their professional activity, on a scale of 1 to 5. Graduates were specifically questioned about the **relevance of skills obtained** during their participation in the qualification programme. The results indicate that respondents felt that they were not taught all of the skills necessary to the performance of their jobs, but that they were taught all of the necessary technical skills.

Level of autonomy. With regard to the level of autonomy participants enjoyed in their first job after graduation, this seems to vary depending on the area. For instance, the overall findings suggest that the level of autonomy is high in that the graduate jobs entailed many responsibilities. However, when the results are analysed in detail it becomes clear that in terms of individual responsibilities, for example budget or management skills, the respondents believe that they had a relatively low level of autonomy.

The effect of a job change. Significant differences can be observed between respondents who are still working in their first role after graduation and those who have had more than one position. Respondents who have switched jobs (40 percent of respondents) appear to perform much better in the labour market. They have a significantly higher job level and are more likely to hold senior positions (e.g. team leader, project manager). Furthermore, their job tasks have a significantly higher level of complexity: 88 percent of those who have switched jobs consider their tasks complex or very complex, compared to only 46 percent of those remain in their first job following graduation. Those who have had multiple roles also have a higher level of responsibility for budgets and financial accountability in their current jobs.

Work placements and job offers. When asked whether their qualification programme included a mandatory work placement, the slight majority of respondents (52 percent) stated that their qualification programme did not, while the remaining respondents (48 percent) indicated that theirs did. Those respondents whose qualification programme did include a mandatory work placement were asked whether they received a job offer from the placement company. 65 percent of respondents stated that they did receive an offer of employment from the placement company, suggesting that more than half of the respondents were invited to continue working with the enterprise in question.

Limited transnational mobility. In terms of mobility across borders, almost all respondents are employed in the same country in which they received their qualification. This suggests, therefore, that these qualifications have a very limited mobility factor.

Gender imbalance. The survey sample appears to reflect the gender balance in this area of education. It comes as no surprise that there continues to be a significant gender imbalance among engineering graduates. The size of this imbalance is still surprisingly high, with 96 percent of survey respondents (i.e. 98 participants) being male.

Evidence for NQF/EQF classification

Complexity of tasks. EQF level descriptors have been written to reflect distinct progress in dimensions of change, such as the complexity of learning and the demands made to learners or workers. One could thus reasonably assume that individuals who hold a qualification at a higher level will also have more complex job tasks.

Given the limitations of the data (see below for more details), caution must be exercised when analysing it for possible evidence for the NQF/EQF classification of a qualification. With this caveat in mind, however, the results of the survey clearly indicate that graduates of EQF level 6 qualifications consider the level of complexity of their job tasks to be higher than graduates with EQF level 5 qualifications, who believe complexity of their job tasks to be somewhat lower. Similar, although less pronounced, results emerged in relation to other dimensions studied, such as the level of accountability/responsibility.

5.3 Challenges encountered

The results from this survey can provide a valuable contribution to the transnational comparison of different engineering qualifications, and assist the development of a better understanding foreign qualifications. It is important, however, to consider the limitations of the comparability of the data, which to a great extent are a result of the highly diverse landscape of VET qualifications across Europe. The qualifications studied are located at similar yet different levels. Some qualifications are considered to be initial vocational education and training whereas others are continuing VET. The qualifications also differ in the average age of learners, which inevitably has an effect on the average age of graduates and their

average number of years of professional experience. Finally, graduates' career prospects are highly influenced by the economic situation (e.g. rate of unemployment) in the respective country.

Low response rate. One of the challenges faced by the project team was achieving a sufficiently high number of responses, although ultimately the total number of achieved responses exceeded expectations. Due to issues of data protection, some schools were unable to contact their graduates by e-mail, but had to send written invitations to alumni requesting their participation in the survey.

Different response rates across countries. There is significant variation in the number of responses received across countries. This must be considered when analysing the data.

Missing EQF levels. The methodology proposed for EQUAL-CLASS was very much based on the assumption that the relevant engineering qualifications would already be linked to EQF levels during the implementation of the project. However, only some of the qualifications studied here had been linked to the EQF at the time research was being conducted. This makes it difficult to draw significant conclusions or evidence for the classification of qualifications within frameworks.

The full report on the results of the alumni survey can be downloaded at **http://www.equal-class-eqf.eu/results/**.

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6. Focus on: Progression Through Validation – Taking Stock

One facet of the work of the EQUAL-CLASS project was to explore the context of the **validation of non-formal and informal learning (VNIL)** in five countries: Austria, Germany, Lithuania, Portugal, and Switzerland. Learning that takes place outside formal education and training systems and institutions – i.e. outside traditional school-based education – has been attributed greater significance in recent times. The aim of validation of non-formal and informal learning is to make this learning visible and usable for individuals, for their professional career or personal life. As the results from the alumni survey carried out within the EQUAL-CLASS project show (see chapter 5), a substantial amount of the surveyed learners had previous learning experiences before enrolling in formal education, thereby potentially benefiting from procedures for validating non-formal and informal learning.

Non-formal and informal learning refers to learning that takes place outside formal education and training institutions, for example at work, during leisure activities, and at home.
Validation of non-formal and informal learning is based on an assessment of the individual's learning outcomes and may result in the issue of a certificate or diploma.
Based on: Cedefop (2009). European guidelines for validating non-formal and informal learning, Luxembourg

This report summarises the results of the research carried out by EQUAL-CLASS project partners to explore the context of validation of non-formal and informal learning in their respective countries, with particular focus on the link to National Qualifications Frameworks. One consideration is how learning outcomes acquired outside formal education can be taken into account when allocating qualifications to National Qualifications Frameworks.

6.1. Methodology

The results described in this report are based on research work conducted by the EQUAL-CLASS project partners. This work was carried out in two stages. The first consisted of **desk research** undertaken by the project partners. Using on a common template, researchers were asked to provide an overview of the national context for the validation of non-formal and informal learning, the role and impact of validation at national level, and to identify examples of good practice of validation arrangements that could be of interest to (non-academic) engineers.

In the second stage, in early 2014 project partners conducted **expert interviews** to obtain additional information on possible examples of good practice and the link between validation and National Qualifications Frameworks.

6.2. Policy background and country developments

Although a topic of discussion for some time, the issue of validation of non-formal and informal learning has in recent years been elevated up the political agenda – both at European and national level – and has formed a crucial component of several European policy initiatives, such as the respective Council Recommendation of 2012.

> **The Council Recommendation on the validation of non-formal and informal learning of 2012[7]:**
> This document calls for Member States to, by 2018, establish arrangements at national level to enable individuals to validate the knowledge, skills and competences they have acquired through non-formal and informal learning. These arrangements should also allow individuals to obtain a full or partial qualification on the basis of validated non-formal and informal learning experiences.

The link between validation and the NQF

In many countries, the discussion on validation arrangements has been closely linked to NQF development. However, the actual links between validation and the National Qualifications Framework remain weak in the five countries surveyed. An examination of developments across Europe reveals a very similar picture, highlighting that the link between validation

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arrangements and NQFs is either tenuous or does not exist at all in many countries. France, where only those qualifications that are open to validation are eligible for inclusion in the national register of qualifications, is the exception to this general trend.

Country developments towards comprehensive national validation strategies
None of the surveyed countries currently has a comprehensive validation strategy in place but, as research shows, significant developments have been reported in all five countries. The results of this study indicate an increasing trend towards the development of national validation strategies, both in the five countries studied and generally across Europe. The results also, however, suggest that the opportunities available to (non-academic) engineers to have their non-formally and informally acquired knowledge, skills and competences validated, are limited. Indeed, very few relevant practical examples could be identified throughout the research.

- In **Austria**, a comprehensive national strategy for validation of non-formal and informal learning is currently under development. This new strategy will be linked to both the ongoing process of the development of the NQF and the evolution of the Austrian Strategy for Lifelong Learning.
- In **Germany**, current validation arrangements can be described as a smorgasbord of local, regional, and national approaches, mostly below the legislative level. Significant progress has been made in the last few years towards developing a national framework or system for validation.
- In **Lithuania**, several changes have been made to the legal framework in recent years in order to pave the way for the development of a national validation system.
- **Portugal** is one of the few countries that has an established, mature (but not comprehensive) national validation system with a significant number of participants in validation arrangements.
- In **Switzerland**, the development of systematic validation arrangements has progressed slowly but steadily in recent years. Currently, only in the VET system are validation procedures organised in a structured manner, particularly at upper-secondary level.

In several countries across Europe – including Germany and Austria for example – it has been observed that validation procedures for non-formal and informal learning are a smorgasbord of different processes and initiatives that are frequently project-based, and which often lack coherence between one another.

Some countries reported that one of the key challenges is to raise people's awareness of the validation procedures available. This is particularly problematic in Lithuania, but is also an issue in Germany.

Taking relevant professional experience into account

One of the specific aims of this research was to take stock of existing validation arrangements (in particular those for engineers) through which relevant professional experience can be taken into account to obtain a new qualification, possibly at a higher NQF/EQF level. One example is the professional engineering title 'Ingenieur' in Austria:

> **Current reform of the professional engineering title 'Ingenieur' (Austria)**
> After they have obtained at least three years of relevant professional experience, graduates of engineering VET colleges have the opportunity to apply for the 'Ingenieur' title. This procedure is not based on any defined standards, and the 'Ingenieur' title cannot be considered a qualification in the context of the National Qualifications Framework.
>
> This process is currently being reformed. Learning outcomes (standards) are being defined and the procedure for the issue of the 'Ingenieur' title is being revised. The aim is to transform the 'Ingenieur' title into a qualification that is eligible for inclusion in the National Qualifications Framework. No information is currently available on the possible NQF level of such a qualification.

This specific research task has proven to be more difficult than anticipated for several reasons. Firstly, NQFs in Europe are at less advanced stage of development than was expected at the inception of this project. In Austria and Switzerland, for example, qualifications have yet have to be classified in the national frameworks and therefore no information is currently available as to which NQF level they will be assigned to. In addition, as stated above, the link between validation arrangements and National Qualifications Frameworks is weak in many countries.

Secondly, it is difficult to take stock of all relevant validation arrangements in one country. In several nations validation arrangements take the form of a collection of different initiatives, projects, and measures – some

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bottom-up, some top-down – and even validation experts are not always aware of every single validation opportunity available in a country.

Thirdly, it appears that, based on the desk research and interviews undertaken, there are few examples of validation procedures available which relate to the target group of this project - skilled professionals in the field of engineering. In many cases, validation initiatives primarily target the lesser-qualified and unemployed, as these individuals are those considered most in need of possibilities for validation.

Further information on validation across Europe
Cedefop's European Inventory on validation of non-formal and informal learning provides a comprehensive overview of validation arrangements and current developments in 33 countries: **http://www.cedefop.europa.eu/en/events-and-projects/projects/validation-non-formal-and-informal-learning/european-inventory**

The Observal & Observal-Net projects have identified examples of good practice in validation in several European countries: **http://www.observal-net.eu/**

7. Summary and Reflections

Throughout the EQUAL-CLASS project, the project team used and tested several different approaches to comparing qualifications, focussing on the field of non-academic higher qualifications in the field of mechatronics and electrical engineering/electronics, located between EQF levels 5 and 6. Special emphasis was placed on generating evidence, if possible, for the classification of qualifications in national qualifications frameworks and their reference to the EQF.

The *first approach* was theoretical-descriptive, comparing qualifications from the perspective of learning outcomes. The selected engineering qualifications were described in a structured way on the basis of templates which had been developed in previous projects. They were then analysed and compared with each other.

The *second approach* centred on the assessment of learners' skills in one specific engineering subject: PLC skills, or programmable logic controller skills. This was achieved through the 'Remote Laboratories' experiment, in which more than 150 learners across four different VET institutions in four countries (Austria, Germany, Lithuania, Switzerland) were specifically trained to work with Remote Laboratories as part of their classroom training (also see chapter 4). Having completed this training, learners then took a centralised online exam. The objective of this approach was to assess whether comparable information on learning outcomes, on the level of learning outcomes achieved, and additional evidence regarding the classification of comparable qualifications could be gained by the use of Remote Labs.

The *third approach* focussed on comparing engineering qualifications from a labour market perspective. The project team surveyed the occupations and positions graduates hold in the labour market, between two and five years after graduation. The limitations of the data set meant that the evidence generated for the NQF/EQF classification of qualifications was also limited. The results did, however, provide some indications of a direct relationship between the EQF level of a qualification and the complexity of tasks carried out by graduates in their jobs. This also points to the range of acquired skills among those trained at the EQF levels scrutinised in this

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project. The survey results also showed that graduates with these engineering qualifications enjoy relatively favourable labour market prospects, compared to graduates in other fields and sectors.

In the *fourth* stage, research was carried out on the arrangements for the validation of non-formal and informal learning in the five partner countries, focussing in particular on the question of how learning outcomes acquired in the workplace can be taken into account in the pursuit of further qualifications allocated to a higher level.

The following **reflections and recommendations** have been drawn from work in the EQUAL-CLASS project.

Applying a combination of methods. Learning outcomes are considered a valuable tool in the comparison of different qualifications and in providing a 'common language' that is often referred to at European level. The work of EQUAL-CLASS has also demonstrated that in order to understand a foreign qualification, it is advisable to not only examine learning outcomes (descriptions), but also to consider other dimensions. EQUAL-CLASS attempted to do this by examining several different perspectives, as described in the different chapters of this report.
None of the methods utilised in EQUAL-CLASS can sufficiently provide full transparency and comprehensive understanding of a qualification if applied individually. Each method has its benefits and challenges, as pointed out in the individual chapters. Despite the limitations of the approaches studied, the results of the project show that they can indeed contribute to a better understanding of qualifications. The cooperation within the EQUAL-CLASS consortium and the collaboration with VET providers (e.g. for the alumni survey and the implementation of Remote Laboratories) has clearly shown that tools which help to increase mutual understanding of a qualification or system are both necessary and valuable.

Consistent use of learning outcomes descriptions. Learning outcomes descriptions differ significantly across countries. Countries, and different sectors within a single country, use different approaches in the description of learning outcomes. They vary considerably in their level of detail and granularity. Furthermore, they differ in their orientation: some learning outcomes descriptions analysed in EQUAL-CLASS indicated a clear orien-

tation towards work process, whereas others focussed more on learning processes. A common format for the description or presentation of learning outcomes could help increase comparability in this respect.

The concept of validation and its perception. The term validation of non-formal and informal learning is not commonly used across countries; what one country considers as validation, might not be considered validation of non-formal and informal learning in another. Validation arrangements are rarely integrated into a national system (see chapter 6 for exceptions), and even experts from the field of education and training sometimes find it difficult to provide comprehensive information on validation arrangements available to a particular target group, such as high-skilled (non-academic) engineers. Also, expert interviews suggest that at least in some countries the need for validation arrangements at higher skills levels is not widely acknowledged. Next to the creation of comprehensive national validation systems, as called for by the 2012 Council Recommendation[7], more work might be needed on communicating the value and benefits of validation and non-formal and informal learning.

Increasing awareness and visibility. The cooperation with engineering VET schools and colleges in EQUAL-CLASS confirmed what had already been suggested by many European and national studies: in most countries there is very little awareness of the existence of both national qualifications frameworks and the EQF outside of the policy level. This applies to both teachers/trainers and learners. Yet, for the EQF to reach its full potential in enhancing the transparency and comparability of national qualifications (systems), it must be communicated more actively to the target groups concerned, including teachers, trainers, and most importantly, learners.

Building of mutual trust – the importance of bilateral dialogue. The cooperation between engineering VET providers in EQUAL-CLASS has clearly shown that bilateral dialogue and exchange are the key to creating trust in foreign qualifications and their learning outcomes. Tools which help describe and compare qualifications in a structured way play an important role here, e.g. through templates for the description of qualifications, a pre-defined structure for the description of learning outcomes, or through competence matrices. The project results show that the methods/tools

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used in EQUAL-CLASS can support VET providers in conducting this dialogue. Such tools help to better structure exchange with foreign partners and make it more effective, thus contributing to increased transparency of programmes, qualifications, and systems.

To conclude, it should be pointed out that the decision to which NQF/EQF level a given qualification will be referred is essentially a political one. EQUAL-CLASS did not intend to influence this process in any way – its objective was simply to test and demonstrate different methods of and perspectives on comparing qualifications, under consideration of their NQF/EQF classification. The aim of EQUAL-CLASS was rather to test these methods and thus contribute to support these political processes. The project team therefore deliberately refrained from judging the suitability of the assigned NQF level of a given qualification, and in any case only some of the qualifications studied had been formally assigned to NQF levels at the time the project was being undertaken (specifically the qualifications from Germany, Portugal, and Lithuania).

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List of acronyms used in this publication

Cedefop	European Centre for the Development of Vocational Training
CVET	Continuing vocational education and training
EQF	European Qualifications Framework
HE	Higher Education
IVET	Initial vocational education and training
NQF	National Qualifications Framework
PLC	Programmable logic controller
VNIL	Validation of non-formal and informal learning

Please note: When we refer to 'validation' in this text, we usually refer to validation of non-formal and informal learning.

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