RESULT 1
Concepts and models for dual courses of study with integrated Master's / Bachelor's degree

SmartVET–HighED
Development of a study program with an integrated master craftsman / bachelor's degree

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Key Action 2: Partnerships for Cooperation

SmartVET HighED

Co-funded by the European Union

Result 1

Concepts and models for dual courses of study with integrated Master's / Bachelor's degree

Content

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1. Summary of the Project

1.1 Background

Across the EU, small and medium-sized enterprises (SMEs) are struggling with an increasing shortage of competent and qualified management and specialist staff, which is having a negative impact on the economic development of the EU and affecting general prosperity. Individual countries, such as Germany or Austria, train their entrepreneurs and skilled workers to a very large extent through vocational training. Here, master craftsman training in particular plays a key role.
However, master craftsman training is increasingly confronted with problems that need to be solved. The attractiveness of master craftsman training is declining, and more and more young people are choosing an academic path via university studies, which are seen as the better option for pursuing a career in the globalized world. In this context, traditional master craftsman training is not seen as very desirable, even though it is classified at the same level (6) of the European Qualifications Framework (EQF) as the bachelor's degree. However, this has little impact in reality. Skills and qualifications acquired in master craftsman training are not normally credited as achievements for a course of study. While in other countries, such as Lithuania, master craftsman training is not offered at the same level. In addition, due to the high and massive differences in training in the European countries, the completion of a master craftsman training is hardly recognized across countries.
But also, the classical study shows more and more problems. Many students drop out of their studies before graduation or miss relevant practical skills after graduation to be able to carry out professions. This applies to almost all EU countries. Master craftsmen have extensive experience and knowledge in the practical field of application since they have several years of professional practice in their field and thus have the specialized theory and practice. However, they have limited knowledge in areas relevant to business management, which are essential for managing a company.
For academics, the situation is generally the other way around. For SMEs as well as for self-employed people, professional and practical experience is essential not only to meet the demands of the market, but also to manage the company in a future-oriented way. Many academically educated people lack these skills. Therefore, SMEs hardly have the possibility to find fully trained people and must train occupied positions themselves.
In this project, this problem is to be solved by an innovative combination of the two trainings and thus an optimal combination of professional practice and theory as well as relevant professional knowledge. Through the innovative approach of combining and stimulating existing learning and teaching practices, the qualification and knowledge gaps of both trainings will be closed and simultaneously a contribution to innovation in vocational education will be created. For future generations, the dual degree will create a reward of excellence in learning, teaching and competence

development, providing trainees with knowledge and experience through the acquisition of high and diverse and, above all, needed competences in a manageable time. In addition, EU-wide solutions to these problems are sought through the international transfer of the results.

1.2 Objectives

Through the implementation of the project and the subsequent transfer of the project results, the qualification and knowledge gaps of two different educations shall be closed and simultaneously educations shall be harmonized and a better comparability of different educations in different EU countries shall be generated. Furthermore, this project will stimulate innovative learning and teaching practices, contribute to innovation in vocational education and training by optimally combining two existing forms of training, and generate rewards of excellence in learning, teaching and competence development of participants, as the combination of trainings will allow for a massive increase in competence in a relatively short period of time.
The project activities also serve to provide future generations with training that perfectly combines theory and practice to face the competition in the global market. This project will establish the innovative dual study model in the partner countries. In the long term, other EU countries should also benefit from the findings and results of this project. The competitiveness of the European economic area is to be strengthened in the long term. More specific training gives young people better opportunities on the European labour market. It also strengthens transnational partnerships through knowledge transfer and fair mobility in the European labour market.

1.3 Implementation

The project aims to achieve a set of outcomes that require carefully planned activities in a specific sequence to achieve the objectives. The activities are carried out jointly by the project partners and are intertwined. The results are intended to be usable in all countries, so all partners must contribute to all activities. The project will start with an inventory and analysis of the state of the art and the definition of the specific study program. This will be developed and tested jointly and according to country-specific aspects.
All relevant documents, including module manuals and examination regulations, are prepared. The partners develop, test and implement a bachelor course of studies, which, after successful completion, is concluded with a bachelor’s and master’s degree. This course of studies optimally combines practice and theory in the training phase. This course of studies is to be widely disseminated in the EU area. The following objectives are addressed by the project activities:

- Inclusion of practice and theory in training
- Combination and increase of the quality of the trainings

- Contribution to innovation in vocational education and training
- Improvement of both training models
- Stimulation of innovative learning and teaching methods
- Reduction of the shortage of managers and specialists
- Internationalization of the form of training
- Increasing attractiveness and rewarding excellence in learning, teaching and skills development
- Development of new training models for EU member states.

This is achieved through the following results:

- Development of concepts and models for dual study programs with integrated master's/bachelor's degrees.
- Creation of module manuals for study programs
- Development of examination regulations for study programs with master's/bachelor's degrees

Furthermore, continuous project management as well as public relations and regular project meetings and evaluations will take place.

1.4 Results

Concepts and models for dual study programs with integrated master's/bachelor's degrees

- Models for organizing dual bachelor’s degree programs with integration of initial vocational training.
- Methods for implementing an integrated master's and bachelor's degree program *Basic concept for testing and implementing dual bachelor's degree programs with integrated master's / bachelor's degrees.
- Three implementation concepts adapted to the national conditions of the project countries.
- Explanations and application notes for future use. Module manual for study program.
- Curriculum or a fully described module manual (with described compulsory and elective compulsory modules) in accordance with the conditions for a dual bachelor course of study with integrated master's/bachelor's degree in Germany for professions associated with automation.
- Results of testing and evaluation in all partner countries
- Preparatory measures in the form of research of all necessary materials for accreditation in Austria and Lithuania.
- Submission of the accreditation of the study program in Germany.
- Adaptation of the module manual for Austria and Lithuania.
- Explanations and application notes for future use.

The results contain examination regulations for a dual bachelor study program with master/bachelor’s degree for selected professions related to the field of automation.

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The following is a summary of Result 1:

- ✓ a brief abstract on the current status of permeability between vocational and academic education.
- ✓ a description of alternative models and methods to effectively implement a professional master training as a bachelor's degree program.
- ✓ an approach to integrated teaching of master craftsman qualification and bachelor's degrees as a base model.
- ✓ a presentation of alternative options to realising initial vocational training and pursuit of professional activities, both constituting prerequisites for admission to the vocational master examination.
- ✓ a model subject to implementation under this project.
- ✓ In an excursus, summary analyses of the working world of tomorrow and the thoughts and needs of the younger generation and companies.
- ✓ Selection of a field of study with the study foci as well as the vocational master training and the professions of the vocational training.
- ✓ Implementation concepts for Germany, Austria, and Lithuania.

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2. Current situation related to permeability of vocational and academic training

Whereas in the earlier years and decades a relatively clear distinction was identifiable in the profile of vocational and academic educational and qualification pathways[1], especially in Austria and Germany as well as other European countries the contours have blurred nowadays.

With increase of the number of bachelor courses since the beginning of Bologna reforms in 1999 and their professional differentiation and specialization today many courses have acquired strong professionally utilizable components with a view to the requirements of the economy.[2] On the other hand in the field of vocational further training the requirements to the participants of, for example, master craftsman and state-certified technician courses become stricter on the basis of permanent consideration of current technologies and techniques or they stay consistently strict. These overlaps with other training and qualification systems respectively result in the fact that professional requirements which must be fulfilled in the professional sphere (master craftsman, technician etc.) in some places are more and more difficult to distinguish from the requirements of bachelor courses.

In many cases within rather technically oriented qualification pathways (vocational and academic) it is required to perform a comprehensive and profound analysis of a problem or issue from practical experience having recourse to valid obtained measurement results using approved tools, methods, and methodologies, and subsequently to develop reflected suggestions concerning the form and the solution of the problem and to document them in a legal manner.

[1] professional training and further training = orientation at operating requirements of economy; academic training = orientation at scientific and research-oriented requirements of society

[2] Thanks to the Bologna process especially further development of national higher education systems in Europe, the qualification of specialists for the labour market as well as of the junior scientific staff were taken into consideration. In this regard the increase of the so-called employability plays a special role. It means that university graduates can take up qualified employment based on scientific education (professional and interdisciplinary competences as well as qualifications related to the specific profession). (Source: https://www.bmbf.de/files/Bericht_der_Bundesregierung_zur_Umsetzung des_Bologna-Prozesses_2012-2015.pdf, p. 5)
In actual fact the higher education system thereby becomes closer exactly to the (at least) German vocational training system, because in § 1 paragraph 3 of the Vocational Training Act (BBiG) it is defined for the training that vocational training (…) has to convey required professional skills, knowledge and capabilities (occupational competence) within the framework of well-regulated courses in order to perform qualified professional activity in the changing working environment. Also, within the framework of further training in the field of skilled crafts the orientation of the examination in crafts which are subject to authorization according to the criteria of employability and thereby the participation at the market or competition belongs to the cornerstones of the vocational training system. In § 45 paragraph 2 of the Trade and Crafts Code it is determined that “thanks to the master examination it must be determined if the examinee is qualified to exercise a craft which is subject to authorization and to perform independently as well as properly train the apprentices.

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Therefore, it comes as a little surprise that the question of equivalence of vocational and academic training and qualification pathways and degrees is being increasingly discussed in the European countries which have both: a differentiated academic and at the same time professional training and qualification system (e.g., Germany, Austria, and Switzerland). Thereby an important milestone is the creation of the instrument of the national qualification network using which it can be specified on which levels vocational and academic training and qualification can be acknowledged as equivalent. In the German Qualifications Network (DQR) after intensive verification and application of DQR criteria the vocational qualification “Meister (Master craftsman)” was classified as equivalent (not: similar) to the academically established bachelor’s degree.

However due to diverse national provisions in the laws related to higher and vocational education this basic representation of equivalence in everyday life does not lead to any consequences for the holders of corresponding vocational or academic degrees. A master craftsman may not refer to himself only based on obtained master craftsman degree either as “Bachelor” or this fundamental equivalence of degrees in the DQR does not enable him to have simplified access possibility to master craftsman courses.

On the other hand, graduates with a bachelor’s degree also may not refer to themselves as master craftsmen even if they should have acquired their academic bachelor’s degree in a similar professional field.

It is very unlikely that the fundamental legal barriers will be removed in the foreseeable future and a genuine applicability of equivalence will be available in the everyday practice through full recognition of performance in the corresponding other system.

Due to not complete legal separation of different vocational and academic educational and qualification pathways there are however fundamental possibilities of application of performance results in one system into the other system.

Therefore, for example, there is a fundamental possibility to achieve (at least) partial applicability of performance during one training according to the requirements of the vocational training system (here: master craftsman’s examination) in order to have passed both training and qualification pathways in the end according to a very costly procedure which can only be schedulable conditionally as well as be able to use corresponding qualification designations without legal restrictions (bachelor and title of a master craftsman).

On the other hand, there is also a fundamental possibility to credit vocational qualifications of training and further training in one course of studies at least partially in order also to subsequently obtain a degree according to the model which will be kind of streamlined concerning time, basing on vocational degrees.

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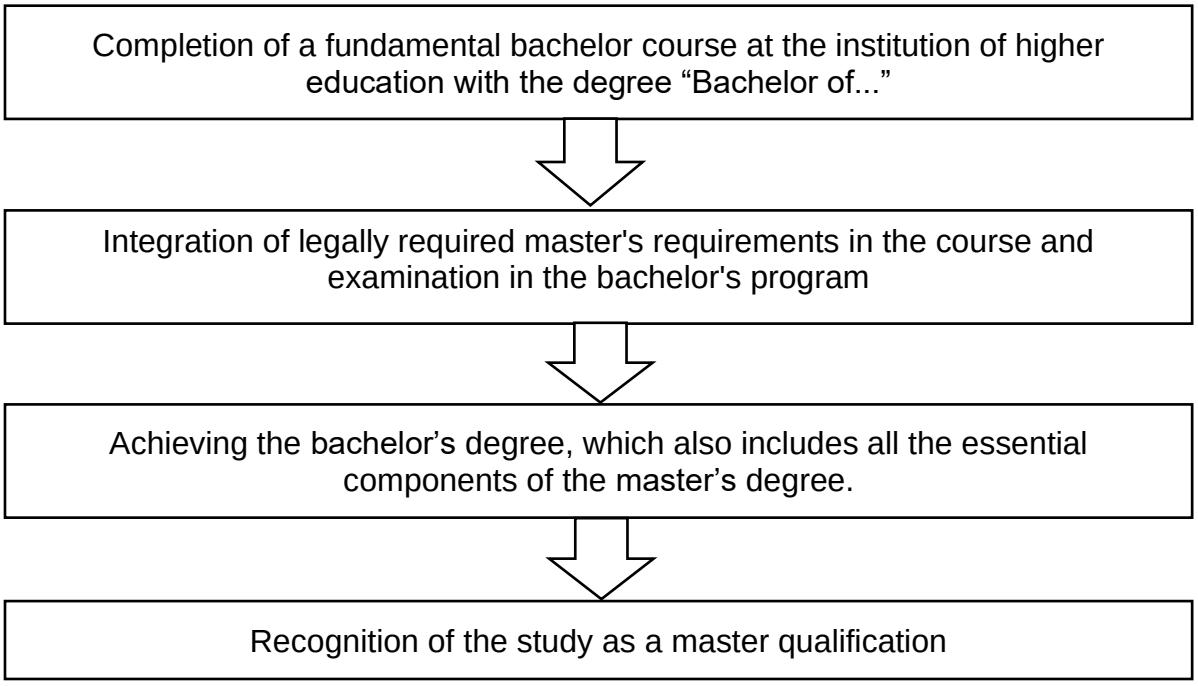
Both possibilities will be presented and critically examined below.

3. Possibilities of application of performance results which have been already obtained in one educational system

3.1 Recognition of academic achievements in the parts of the vocational master examination

If an academic training is completed successfully the graduate in Germany can be exempt from separate of the four parts of the master craftsman's examination in a craft subject to authorization according to relevant provisions in the Crafts Code if during these examinations at least similar requirements are set as during the master craftsman's examination (cf. § 46 paragraph 2).

Overview 1: Based on training to also become a master craftsman.



Peculiarities and problems:

The determination of meeting the requirements is up to the examination board of the vocational training organization (as a rule Chamber of Crafts). Thereby the determination of requirements takes place only afterwards, i.e., after the completion of the studies. Thus, there is absolutely no planning certainty, predictability or even "guarantee" for the determination of meeting the requirements of the studies for the master craftsman's examination. Besides, it can be almost impossible that the bachelor course which is designed solely for the purpose of achievement of an academic degree reproduces all the parts of the master craftsman's examination completely and extensively.

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Therefore, in practice it is about determining the similar requirement for separate parts of the master craftsman's examination but never about complete recognition of the course for all the parts of the master craftsman's examination. Therefore, the still absent parts of the master craftsman's examination must still be completed additionally by the graduates of a course subsequently with the corresponding amount of effort.

Conclusion:

In conclusion it can be determined for this procedure that there are significant risks in respect of the scope of actual acknowledgement of course contents. Furthermore, as a rule separate parts of the master craftsman's examination are not covered by the course anyway so that even after the partial acknowledgment persons interested in the master craftsman's degree face not only additional loads related to time but also organizational and as a rule financial load.

In the end this is not an attractive educational and qualification pathway which meshes vocational and academic qualification together in a reasonable manner. Despite basic available transparency related to the represented possibility of acknowledgement of studies for the master craftsman's examination this procedure is not the expression or even a good example for the creation of extensive equivalence of vocational and academic pathways and degrees.

Theoretically it would be possible to extend the above-mentioned procedure for the real equivalence only so that all the requirements of the master craftsman's examination which are relevant for this examination had to be integrated in the existing structures and legal provisions of the (already available) course. With the acquisition of the regular bachelor's degree, it could be proven that all the requirements of the master craftsman's examination are met. This evidence could be in turn completely acknowledged by the responsible master craftsman's examination board in order to be able to award also the title of a master craftsman correspondingly.

However, it must be critically noted that such integration of master craftsman's examination requirements in existing structures of a course which are secured by the higher education laws hardly has any realistic chances for success. Subsequent change of courses can therefore be regarded as generally pointless and hardly realizable.

Another possibility to credit vocational qualifications of training and further training at least partially in the course for the purpose of creating more equivalence is presented below.

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3.2 Acknowledgement of vocational master qualification for the parts of the training

This option is based on the crediting of knowledge and skills which have been acquired by persons with vocational qualification interested in the course outside of higher education. Institutions of higher education[3] have various possibilities to credit knowledge and skills which have been acquired within the framework of vocational training and further training, e.g., master craftsman's examination or within the framework of professional practice. The duration of studies should be reduced through crediting the performance results of persons with vocational qualification interested in the course and thereby one of the biggest inhibitions for the taking of a course of the target group of persons with vocational qualifications should be lowered.

This acknowledgement of educational background including not formal and informal learning required by the European education ministers within the framework of the Bologna process was obligatorily implemented, for example, in Germany for the institutions of higher education already through decisions of the Conference of Ministers of Education and Cultural Affairs[4]. According to the results of the Conference of Ministers of Education and Cultural Affairs the crediting of performance results can be performed through:

Individual examination on a case-by-case basis

Thereby based on documents provided by the vocationally qualified applicant it is examined if and to what extent his qualifications acquired outside of the sphere of higher education are equivalent to the parts of the course concerning the content and the level. If equivalence is determined within the framework of the examination on a case-by-case basis these proven qualifications can substitute the equivalent results of performance during studies and examinations.

General crediting

Thereby certain vocational qualifications which have been as a rule determined by the institution of higher education in advance as equivalent concerning content and level are acknowledged for a homogenous group of applicants (like e.g., graduates of a master craftsman's examination) without further verification of the individual case.

Placement examination

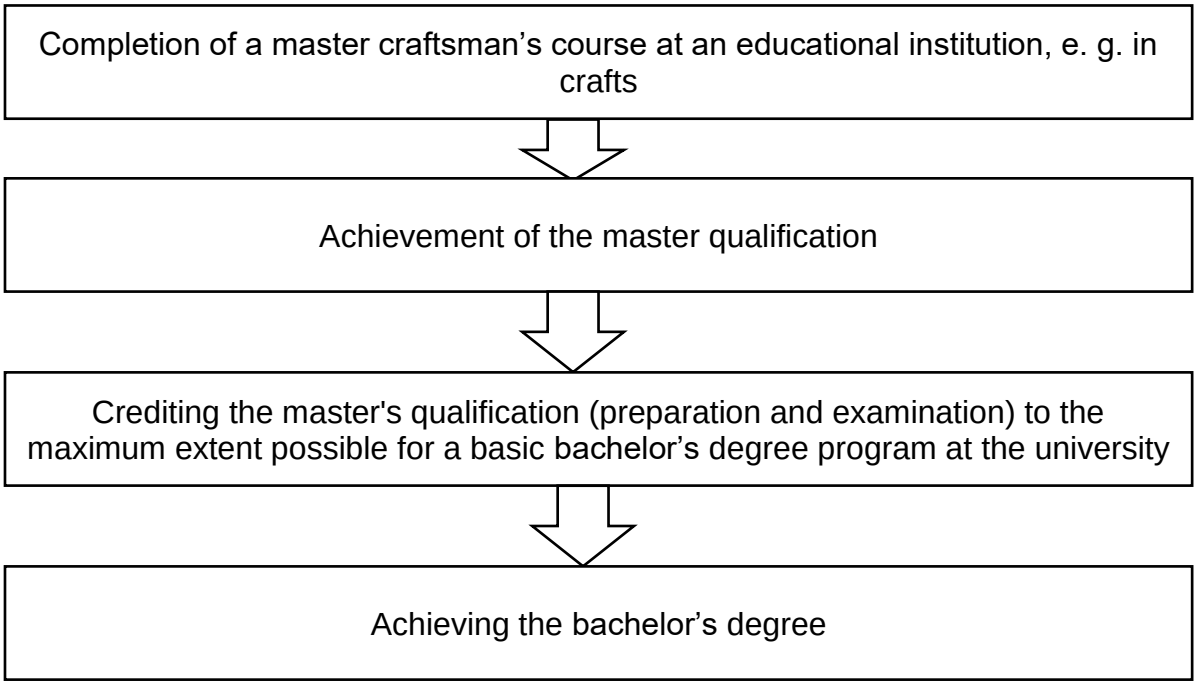
[3] Also, further in the text the term "Institution of higher education" is used as a generic term for institutions of the tertiary education sphere, including universities, universities of applied sciences, technical colleges etc.

[4] Cf. decisions of the Conference of Ministers of Education and Cultural Affairs concerning the crediting of knowledge and skills acquired outside of the sphere of higher education in the higher education I (dated 28.06.2002) and II (dated 18.09.2008)

Thereby individual knowledge and skills of the vocationally qualified applicant are verified in a formal examination procedure for the purpose of his placement to a higher study semester.

The Conference of Ministers of Education and Cultural Affairs in Germany has limited the amount of credit possibilities to 50% of the volume of higher education studies.

Overview 2: Based on master craftsman's qualification also become a bachelor.



Peculiarities / problems:

The regulation related to the crediting of knowledge and skills of persons with vocational qualifications as performance results of studies and examinations is basically reasonable and based on theoretically possible share of credit of 50% and can therefore contribute to the reduction of the period of studies and to the politically desired facilitation of transfer of persons with vocational qualification in the sphere of higher education.

In the crediting practice of institutions of higher education, the situation however shows that crediting volume which leads to the significant reduction of studies and thereby creates an incentive for taking a course is achieved relatively seldom. The decision of the Conference of Ministers of Education and Cultural Affairs from the year 2008 has basically determined that the institution of higher education shall decide under own responsibility if and to what extent the crediting of those knowledge and skills can be performed which have been acquired outside of the sphere of higher education. Thereby it is explicitly pointed out that such a decision of the institution of higher education [can] not be replaced "On the basis of diverse possibilities of content-related

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design of courses, [...], on the one hand, and the variety of possibilities for professional training and further training, on the other hand […]".[5]

Especially due to the reason of diversity of vocational and academic qualification substantial problems arise during the verification of proven vocational qualifications in respect of equivalence concerning contents and level. The equivalence of vocational qualifications is therefore often not determined only because the quantity of hours of courses attended within the framework of formal vocational qualification measure is as a rule lower than the workload[6] of courses evaluated within the framework of the ECTS. Thereby however knowledge and skills which are acquired in this field in the professional environment in the informal manner are not taken into consideration completely. Moreover, in the curricula of vocational qualification measures as a rule only the number of classroom-based events (class hours) is declared and not the time for "self-study phases" which are however entered as "self-study" in the estimation of academic courses workload.

Further difficulties can arise during the verification of equivalence regarding levels. Due to diversity of goals of vocational qualifications and academic courses the comparison is also difficult in this case. While vocational qualification measures are aimed at the transmission of professional competences in case of academic courses also science-oriented goals are paramount. In the form of the German Qualifications Network (DQR) an aid is available for the determination of equivalence which can help at least by formal recognized vocational qualifications. So, for example, the master craftsman's qualification is assigned to the same level as the bachelor's degree. However vocationally qualified applicants cannot derive a right for the crediting of their qualifications. During the verification institutions of higher education can independently of the grading in the DQR come to the result that qualifications are not equivalent. Therefore, the DQR does not have a direct influence on the crediting practice of institutions of higher education.

Apart from these problems during the verification of equivalence due to structural diversity substantive reservations are observed by several university representatives in respect of acknowledgement of equivalence which can lead to an especially strong application of formal verification criteria regarding content, time scope and levels in the verification practice.

3.3 Generalized crediting through cooperation with vocational education and further education institutions

[5] Cf. decision of the Conference of Ministers of Education and Cultural Affairs concerning the crediting of knowledge and skills acquired outside of the sphere of higher education in the higher education II (dated 18.09.2008), p. 3.
[6] Workload = amount of work for studies in a classroom and self-study

The decisions of the Conference of Ministers of Education and Cultural Affairs in Germany already cited above obligate the institutions of higher education "… to make use of existing possibilities of crediting and to develop procedures and criteria for the crediting of knowledge and skills acquired outside of the sphere of higher education in the corresponding examination regulations".[7] The Conference of Ministers of Education and Cultural Affairs recommends the institutions of higher education to use cooperation with appropriate training and further training institutions in order to reduce effort related to examinations on a case-by-case basis and to enable generalized crediting for homogenous applicant groups.

An example of such cooperation is the collaboration of a university of applied sciences for SMEs (FHM) with the Cologne Chamber of Crafts. Collectively the course "B. Sc. Industrial Engineer" was developed which is based on the complete crediting of master craftsman training conducted by the Chamber of Crafts. The course was "… conceived so that competences transferred during the master craftsman training correspond to the competences provided for the bachelor course of FHM and due to equivalence can be completely credited during studies".[8] Thereby the allowed volume of acknowledgement of 50% was exploited completely and thus the reduction of the regular study time from 18 terms to 9 terms was achieved.[9]

It is undisputed by university representatives if vocational qualification measures in respect of conveyance of science-based fundamentals are sufficient.[10]
Both specified fundamental possibilities of crediting of acquired performance results of a training and qualification system in the corresponding other system and the outline of problems which are related thereto and which are partly substantial during the achievement of real equivalence of vocational and academic degrees and authorizations lead to the consideration that it is more expedient in total to conceive a bachelor course from scratch so that both the required science-oriented fundamentals and competences necessary for the achievement of a master craftsman's qualification are conveyed integrally. This possibility is presented in the following option.

[7] Cf. decision of the Conference of Ministers of Education and Cultural Affairs concerning the crediting of knowledge and skills acquired outside of the sphere of higher education in the higher education II (dated 18.09.2008), p. 3.
[8] Expert report related to the decision of the FIBAA accreditation board for programs concerning the accreditation of the course Industrial Engineer (B. Sc.) dated 27. / 28.9.2012, p. 13.
[9] Cf. Homepage of FHM, http://www.fh-mittelstand.de/wirtschaftsingenieur/
[10] So, in the expert report related to the initial accreditation of the course "B. Sc. Industrial Engineer" of FHM it is criticized: "Especially concerning the part of the course related to engineering sciences experts missed various basic subjects. So, experts missed, for example, the following technical subjects: Fundamentals of Mechanics, Fluid Mechanics, Thermodynamics and Chemistry on the level of engineering sciences. The fundamentals resulting from the master craftsman training are oriented at crafts. The module provided in the FHM "Natural and engineering fundamentals I and II" is not sufficient in the opinion of experts for the conveyance of required fundamental knowledge of an engineer. (Expert report related to the decision of the FIBAA accreditation board for programs concerning the accreditation of the course Industrial Engineer (B. Sc.) dated 27. / 28.9.2012, p. 28.

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4. Integral conveyance of vocational master and bachelor within the framework of studies

On the basis of presented procedure related to the creation of equivalence as well as demonstrated problems, difficulties and challenges the third way for the design of vocational master and bachelor's degrees is presented below.
The fundamental objective of the project idea outlined here is to create an educational and qualification system where the master craftsman's qualification and the bachelor course are integral parts of a common system. Thereby all the required legal provisions and framework conditions for obtaining corresponding degrees must be identified at first and they must be considered during the design of a common educational and qualification pathway.

The design of such third way of a bachelor course with integral vocational master qualification in addition to legal provisions also includes a variety of institutional, organizational, curricular, personal and if necessary other design parameters which are clarified exemplarily in the overview below.

Overview 3: design parameters for an integral vocational and academic educational and qualification system

Fundamental design parameters of the system	**Verification of necessity and suitability of...**
Institutional and spatial equipment for courses and examinations	Seminar rooms, laboratories, technical rooms, libraries, examination rooms...
Sufficiency of personnel incl. lecturers and examiners	Qualifications, experiences, ideas about equipment and staffing incl. full-time and part-time lecturers and examiners
Sufficiency of personnel incl. employees for organisation, management and administration	Qualifications and experiences
Curricular and contextual requirements	(Framework) course concepts, module handbooks, minimum number of hours for modules, courses and examinations, examination requirements and tasks (written, oral, practical...)
Institutional and legal requirements	Implementing course and examination organizations, e. g. chambers, universities, educational institutions… Legal provisions for vocational and academic education pathways, e. g. admission regulations, course and examination regulations...
Practical requirements	Cooperation and practice partners, e. g. enterprises for the acquisition of practical experiences...
Other requirements	...

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If you follow this third way, there are three central areas of responsibility which emerge for the creation of such an integral system and which are briefly described below.

Area of responsibility A

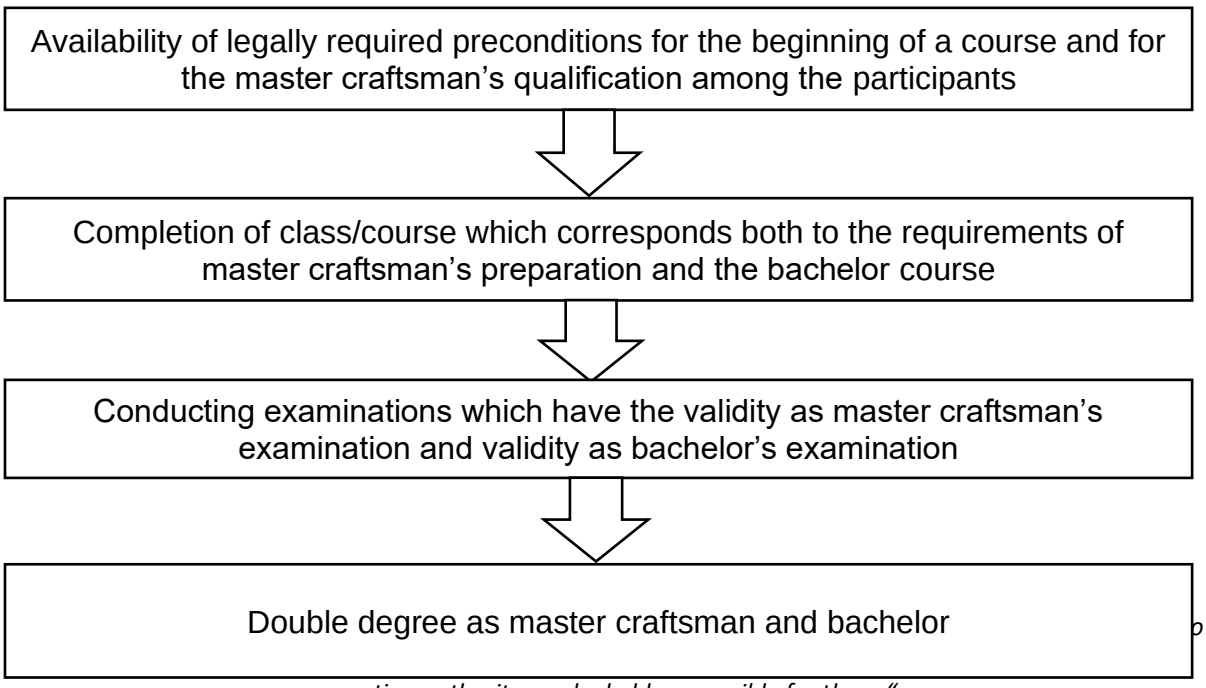
First, all existing and available legal and curricular framework conditions (as a rule laws and regulations) for the identification of (minimum) requirements of the vocational master examination and subject-specific comparable bachelor course should be surveyed and analysed.
The main focus of the analysis should be especially the corresponding admission provisions, scope and duration of the course and studies (minimum workload), main topics, types and scope of examinations, requirements and scope of final examinations as well as further specific requirements if any which have to be taken into account for the creation of an integral system.

Area of responsibility B

In connection with the survey and analysis a synopsis (comparison) should be prepared for the relevant legal provisions and regulations as well as curricular benchmark figures in respect of their differences and similarities and “open points”. Thereby the matching and especially not matching of the relevant legal and curricular framework conditions can be shown and the scope of substantial organizational areas can be determined.

Area of responsibility C

In this area of responsibility C on a specific example the development of a kind of “blueprint” for the organization of a bachelor course with integrated master craftsman’s qualification based on legal and curricular required framework conditions and organizational areas can be conceived.
Overview 4: Integral attainment of a bachelor and master craftsman degree



granting authority can be held responsible for them.“

The above model is realised in the present project with a complete integration of vocational master craftsman training in a dual bachelor's degree programme.
In addition, however, initial vocational training is integrated within the framework of the four-year dual study programme, so that the participants acquire three recognised educational qualifications:

- ✓ Journeyman or skilled worker
- ✓ Vocational Master in the learned occupation
- ✓ Bachelor in the chosen field of study

If initial vocational training is not to be integrated, alternative models for acquiring vocational training are described in the following chapter.

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5. Alternative options for achieving vocational training and activities

The prerequisite for admission to the master examination in countries with regulated master training is a successful completion of vocational training in the relevant or related profession. In addition, in some countries, several years of professional activity following successful completion of vocational training is a prerequisite for admission to the vocational master examination. Against this background, the question arises, how these conditions shall be fulfilled in a bachelor's degree course with integrated vocational master training.

5.1 Vocational Training

To begin with, it is plausible to develop a training program that integrates initial vocational training, vocational master training and a bachelor's study course with respective three recognised educational qualifications/diplomas/degrees. In Germany, occasionally such pathway is chosen as a so-called "three-way study pathway". In fact, this is not an integrated training program, but rather single parts of the training are completed one after the other. Integration of all three training courses under dual bachelor's programs is an excessive demand for the participants.
If all three training courses were integrated in a dual bachelor's study program, with a study term of about four years, participants would have to complete:

a) dual vocational training, in a company and in a vocational school, usually lasting 3 to 3,5 years, including the option of reduction by about one to one and a half year, if the participant has a high school degree and can prove particularly excellent educational achievements,
b) a vocational master training, lasting in a full-time mode at least eight months, but for many professions longer than one year,
c) a complete bachelor's degree program, usually lasting at least three years,
d) training and professional activities in a company, comprising at least 50% of the total training time for dual study programs, during the entire four-year qualification period.

If all three parts are not to be integrated into one training programme, there are four alternative ways to complete vocational training or to fulfil the requirements for admission to the vocational master examination.

Several years of professional activity or study

With any vocational training at all, conditions for admission to the vocational master examination are equally fulfilled:

a) in case of evidenced professional activity of at least five years in the relevant or in a related profession, or
b) upon completion of a bachelor's study in a subject relevant to the respective profession of vocational master training.

The dual bachelor's degree program fulfils these admission requirements.

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Completion of vocational training prior to commencing a study

Prior to commencing a study, participants complete a dual vocational training course, which upon presentation of a middle school leaving certificate, high school diploma and good grades during vocational training, usually lasts two years. This path is especially recommended.
Successful completion of the journeyman or skilled worker exam, plus several years of professional experience also entitle candidates with no university qualification to admission to a subject-related study at a technical college (German *Fachhochschule*).

External journeyman or skilled worker examination

Participants without any formal vocational training can apply during their study as extraordinary applicants for admission to a journeyman or skilled worker examination[11]. The decision on admission is with the competent examining board or competent chamber.
If the required knowledge and skills were not part of the dual study course at the university or in the partnering company, they shall be acquired in self-study.
This approach involves some legal uncertainty for candidates, making it impossible to know in advance, whether they will get admission to a journeyman or skilled worker examination, and whether their knowledge and skills acquired are sufficient to pass the exam.

Admission to the master´s examination without any prior vocational training

One final option is the possibility of admission to the vocational master examination without any prior professional training[12]. Decision regarding such exceptions is with the competent master craftsman examination board.
However, this pathway involves the legal uncertainty that it is not certain in advance, whether admission to the master´s examination will be granted. For dual study programs, chances for admission to the master's examination without prior vocational training are high due to the occupational activity and training in the partnering company during the study period.

For dual bachelor's degree programs, the first option seems particularly appropriate. However, given the significance of vocational training and experience regarding master craftsman training and subsequent employment in small and medium-sized enterprises, participants should also be recommended the second option, with prior vocational training. By contrast, option three and four should remain exceptions. However, the final decision is to be made by the participants, because they shall decide for themselves. But in neither case, successful completion of vocational training shall

[11] External Examination acc. § 45 German Law for Vocational Training and § 37 German Carts Code.
[12] See § 49 German Crafts Code.

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constitute a condition for admission to a dual bachelor's degree program with integrated vocational master education.

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5.2 Concept of study-integrating vocational education and training

The following overview provides a summary of the different formats for dual study programmes.

Individueller Bildungsabschnitt		Beziehung der Lernorte: verzahnt	Beziehung der Lernorte: parallel
Erstausbildung	mit Berufsausbildung	ausbildungsintegrierend (Bachelor)	ausbildungsbegleitend (Bachelor)
Erstausbildung	mit Praxisanteilen	praxisintegrierend (Bachelor) gestalteter Ausbildungsanteil beim Praxispartner	praxisbegleitend (Bachelor an FH oder Uni) mit obligatorischen Praktika in Unternehmen
Weiterbildung	mit Berufstätigkeit	berufsintegrierend (Master/Bachelor) mit gestalteten Bezugnahmen	berufsbegleitend/berufsintegrierend (Master/Bachelor) ohne gestaltete Bezugnahmen
Weiterbildung	mit Praxisanteilen	praxisintegrierend (Master/Bachelor)	praxisbegleitend mit Praktika oder praktischen Anteilen (Master/Bachelor) ohne gestaltete Bezugnahmen

Wissenschaftsrat (2013): Empfehlungen zur Entwicklung des dualen Studiums -Positionspapier. https://www.wissenschaftsrat.de/download/archiv/3479-13.pdf?__blob=publicationFile&v=4

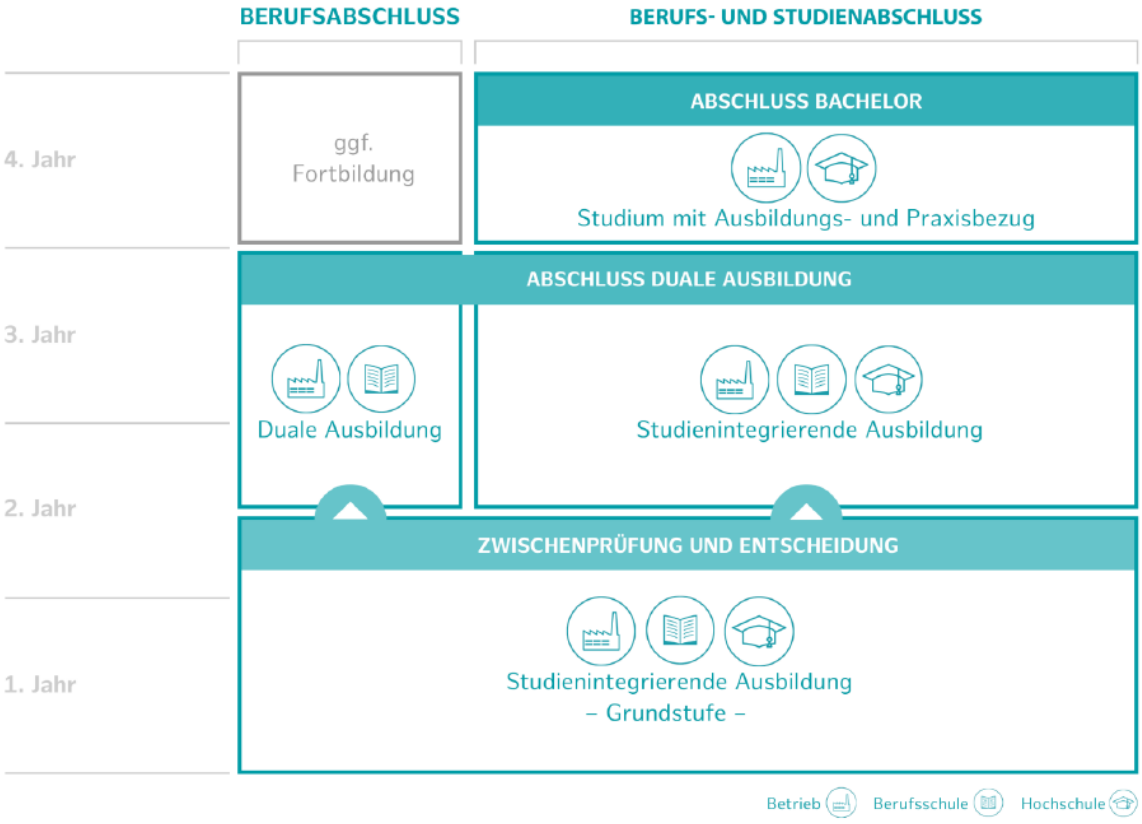
For the integration of vocational training in bachelor's degree programmes, a distinction must be made between
a) training-integrated format, which provides for an interlocking of vocational training and bachelor's study.
b) training-integrated format, which conducts vocational training and bachelor's studies in parallel.
In the present project, initial vocational training, master craftsman training and a bachelor's degree course are to be developed and realised in one training course. Both concepts are suitable for this demanding project, especially the training-integrating model.

The concept of study-integrating training comprises the following key points:

- The starting point for the considerations is dual training, study content is linked to the acquisition of competences in dual training
- Equal learning venues: company, vocational school, university
- Recognition of achievements at non-university places of learning
- Interlinking of curricula in terms of content and personnel
- Orientation of the annual workload to a 40-hour week to ensure studyability
- Experience-based decision on continuation of studies after 1.5 years with coaching support

The diagrams below provide an overview of the structure and model of the integrated degree programme.[13]

Structure of the study-integrated training



Training and study model

[13] Prof. Dr. Joachim von Kiedrowski, Berufliche Hochschule Hamburg, 2022

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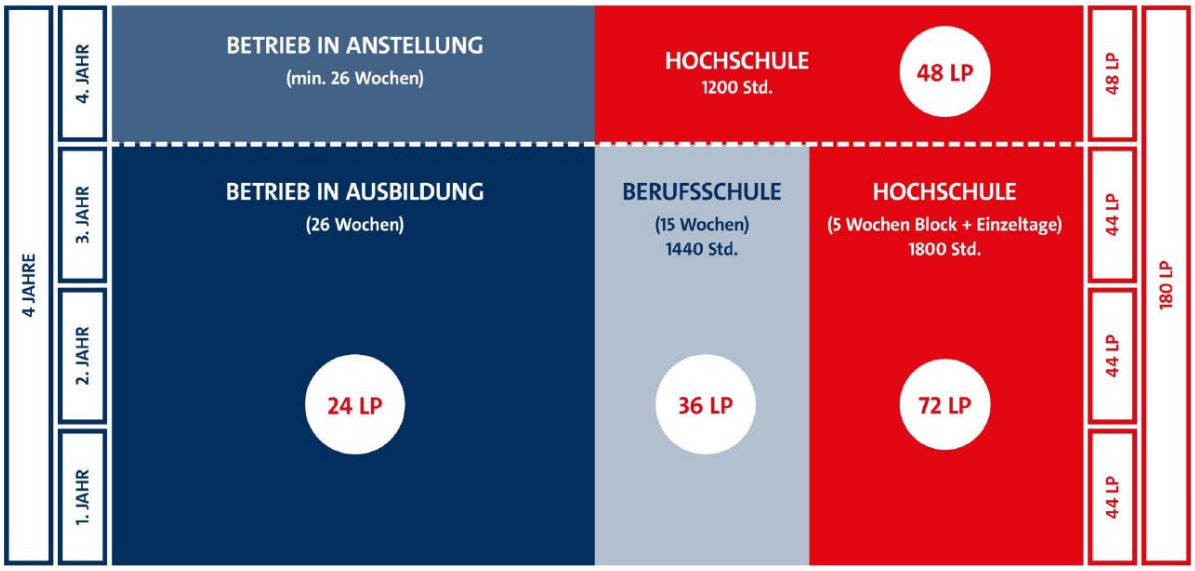

5.3 Occupational activities following vocational training

In the past, in Germany, a three-year professional activity in a learned or related profession, following successful completion of vocational education, was a prerequisite for admission to the master craftsman examination. This condition was eliminated by the amendment to the Crafts Code. Now, admission to the master craftsman examination is granted immediately upon successful completion of the journeyman or skilled worker examination.

Some countries with an officially recognised master craftsman qualification still follow the rule of demanding several years of professional experience as obligatory prerequisite for admission to the master craftsman examination. Following the vocational training period, two years must be evidenced in Norway, three years in Poland and three to four years of professional experience in Latvia. These conditions are sufficiently met under the dual study programs with a total of four years of professional activity.

In other countries with no regulated vocational master training, examination regulations can be designed in a way to meet the requirements of dual bachelor's programs with integrated vocational master qualification. For example, under the project "Common Vocational Training to Master in the Baltic Sea Region (Master BSR)"[14], when introducing a master craftsman training in Lithuania, no professional experience was required upon completion of vocational training. Instead, relevant conditions for admission to the vocational master examination were set as follows:

- successful completion of at least three years of vocational training in the respective or related profession. Evidence of occupational activity for shorter training periods, so that a total of at least three years can be evidenced, or

[14] Hanse Parlament: Common Vocational Training to Master in the Baltic Sea Region (Master BSR), Baltic Sea Academy, Hamburg 2018.

- at least five years of professional experience in the relevant or related profession, or
- Bachelor's study course in a specialisation related to the respective profession and a completed vocational master training.

In the present project initial vocational training is integrated within the framework of the four-year dual study programme, so that the participants acquire three recognised educational qualifications:

✓ Journeyman or skilled worker
✓ Vocational Master in the learned occupation
✓ Bachelor in the chosen field of study

6. Vocational training, professional master craftsman training and field of study

The following must be selected for the implementation of this project:
a) a field of study with a focus for the bachelor's degree
b) occupations for initial vocational training
c) a vocational master's degree in the profession learned (see b)), the content of which corresponds to the bachelor's degree (see a)).

These decisions must be made against the background of tomorrow's world of work and according to the conditions and needs of the younger generation and companies. These aspects are summarized in the following excursus.

6.1 Excursus: Tomorrow's world of work

Division of labour

To be able to cope with the high and rising costs of increasing prosperity and social security, it was necessary to rationalize to a large extent, to condense work and to make it more and more joyless. The result is an economy in which work is increasingly seen as a necessary evil of earning a living, and this evil should be kept to a minimum: Achieving continuous productivity progress is the basis of the economy and has so far enabled steady growth. Increasing productivity is achieved through division of labour and specialization. At the same time, division and specialization must be driven forward in accordance with the system to enable productivity growth until the individual person only performs the smallest excerpts, can no longer establish the overall context for himself and loses a strong degree of wholeness. For the narrow specialist, it is then

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hardly possible to find meaning in working life. At the same time, the tactility is lost: the individual can recognize the effects of his actions less and less.
Far-reaching division of labour leads to a loss of quality; the sum of the individual parts does not result in a living whole.
Progressive division of labour leaves behind uncoordinated states that require control. Inevitably, this is associated with more and more unproductive action in the intrinsic sense; the effort for coordination and control is increasing rapidly. Coordination and control take place once with the help of power apparatuses of the different hierarchical levels. A constantly increasing external determination is the inevitable consequence.
Even more effectively, however, the control is carried out by self-manipulation of the individual. Idealistic values such as wholeness, self-determination, influence, co-creation, finding meaning, etc. are suppressed and material values come to the fore one-sidedly. Work is then perceived as a necessary evil to achieve growing material prosperity. The decade-long suppression of essential values leads to long-term consequences that we are experiencing today: alcohol and drug abuse, ideals of fascism and accumulation of mental illness.

Cooperation

The negative consequences of the division of labour, such as loss of meaning or increase in social costs, are overcome through comprehensive cooperations that enable further productivity progress at a high level of quality.
Cooperation requires outstanding and new qualifications; personal-social skills are gaining a significant increase in importance. Internal, inter-company and international cooperations are based on the principle of combining individual or operational strengths: Everyone does what they do best and is an integrated member of a team of holistic work. Through these paths of "cooperative specialization", higher qualities, lower costs and great productivity advances are achieved.
Cooperation requires the highest degree of decentralised availability and intensive exchange of information. Information technologies are ideal problem solvers for this. They make information available decentrally and in the future the living room will also become the workplace. Information advances are becoming smaller, which is accompanied by a gradual disempowerment of the headquarters.
Cooperative forms of work must be created within the company. Employees are no longer reduced to their employment contract and the "sale" of their labour. As part of their remuneration, they will receive co-ownership rights and participate financially in the company's success by contributing their manpower and personality. Material and intangible employee participation are experiencing a rapid increase in importance. The boundaries between specialists and managers and between employees and entrepreneurs are blurred. Everyone becomes a co-entrepreneur.
The highest levels of innovation and creativity are required. Every head is needed and must be involved in independent thinking and acting responsibly. Changed value weightings have an effect now with an increase in the importance of previously

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suppressed values, such as self-determination, influence, co-creation, holisticness, manageability, etc. Independence is becoming an important determining factor.
Internal and inter-company as well as international cooperation requires the highest degree of trust. This is an economically indispensable principle. The only cultural feature for securing the prosperity and competitiveness of a company and of a society is trust. Responsible action is required in all areas.
Holisticness, cooperation and personal responsibility based on trust creates an almost inexhaustible free energy in all areas of work and life. Trust motivates people to the highest degree and is at the same time the most important organizational principle and control instrument, especially in cooperation.

Decentralization

Changes in the framework conditions favour decentralisation and the development of smaller units. New and additional jobs will be created almost exclusively in smaller companies. The economics of scale are declining.

Control and guidance

In the working world of tomorrow, the self-coordination of the individual as well as over-visible groups will gain in importance and increasingly be controlled by lived value cultures. The individual companies must become one with their moral substance. They will form a kind of "faith community" in which the employees are intensively involved and find what they really need in terms of material and idealistic values.
The previous economy has primarily demanded functioning technocrats and washed them to the top of the companies. In the future, corporate management will again need much more personalities who have mastered the art of leadership – people of the type of artist or visionary as well as the original German master craftsman.
While the employees develop into co-entrepreneurs, the employers become the meaning of the work. This frees up free social energy in companies, the enormous potential of which has so far remained largely untapped in most companies. The reserves in this regard are so considerable and the economic effects so far-reaching that the associated economic gains are greater than the international differences in the level of labour costs.
Work undergoes a decomposition again. Perceived personal responsibility and intensive self-coordination create the economic freedom for this. In the old economy, a high effort must be made for control and coordination, which must be estimated at over twenty percent of the total costs in the construction sector, for example. In the future, these unproductive costs will be converted into productive activities within the framework of cooperation and self-control and will also densify work, reduce error rates and allow higher qualities. Work will also slow down.

Flexibilization

In the future, work will not be less, rather more – but also worked differently. Rigid boundaries will fall, and extremely flexible working hours will be created. Work is done

when work is available in the company. In this way, various other activities are carried out or learning or leisure time is taken.
The far-reaching flexibilization concerns daily, weekly, annual and lifetime working hours. The hatchet of retiring at a certain age will lose its sharpness and make way for smooth transitions even beyond the age of seventy. The strict separation between leisure time and working time is a thing of the past; work tends to become a hobby and a hobby becomes work.
People will engage in several activities at the same time; at least 75 percent will feed their income security from three or even more sources. The dependence on only one source of income and on only one company is significantly reduced. For many people, multidimensionality is becoming the norm not only for economic constraints, but also for reasons of independence, finding meaning and joy.
The market power of workers will grow, as the number of persons in employment will decline dramatically in the vast majority of EU countries due to demographic factors. Companies will enter fierce competition for "co-entrepreneurs"! Labour force participation will increase significantly, for economic reasons, to counteract the shortage of labour. On the other hand, however, higher employment rates for all age groups are also a clear expression of the new importance of work as a source of meaning. Women are experiencing an intense increase in importance, not only for economic reasons (because of a lack of workers), but especially because a new economy depends on their specific characteristics and qualities.

Culture of working life

Determining the substance of one's own culture is the all-important prerequisite for shaping the working world of tomorrow. It is about answering individual questions: "What do I do in this world? What is important to me? Which principles are sacred to me? What values do I pursue that should determine my life?"
Only through the process of an individual redefinition of values and cultures a good future of the working worlds can be shaped. It is a spiritual process: If you want a better world tomorrow, you should not start with the material, but with new thinking. It is crucial that employers and employees see themselves as equal partners and interact with each other on an equal footing. Companies must treat their employees as responsible co-entrepreneurs; give them all support and help.
A basic evil is the devaluation of others to enhance oneself. Such behaviour requires rigorous eradication.

The working world of tomorrow already clearly characterizes the conditions and requirements for the future actions of entrepreneurs. Further conditions and needs for the entrepreneurship of tomorrow can be derived from today's economic and social bottlenecks.

6.2 Excursus: Needs of the economy

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Today's bottlenecks in economic and social development always characterize the growth areas of tomorrow.

Energy and environment bottleneck

An outstanding bottleneck of today concerns energy, environmental and climate protection. The emerging solutions mainly place particular emphasis on eco-efficiency. However, the principle of eco-efficiency has a fatal disadvantage: it leaves the basic concept of industrial production unchanged. Reduction, re-use, and regulations reduce environmental impacts and slow down the loss of natural resources; however, these processes do not attack the conceptual errors at their root – they are dead-end solutions. As important as eco-efficiency is now, it must not be overlooked that it only pushes the limits of environmental pollution and resource consumption. Basic innovations with new leading technologies must design products in such a way that they do not become waste but can be used as 100% as possible after use. The development of such a circular economy requires the highest level of innovation with far-reaching rethinking and redesign.

Bottleneck health

Another bottleneck area today and thus an increasing growth area concerns the healthcare sector, which must not be understood solely as a cost burden on the economy. The potential of an above-average growth sector of the economy would thus be viewed negatively and possibly suppressed. A growing health sector is a sign of increasing prosperity, which gives rise to a greater willingness individually and socially to invest in the good of health. The higher appreciation for health, a strong ageing of the population and a dramatic increase in the number of people in need of care will lead to significantly increased expenditure on medical services, care and support. Medical-technical and organizational innovations in the healthcare industry are of great importance and are growing.

Bottleneck of skilled workers and organization of work

A third bottleneck area, which is still little discussed today, concerns the organization of work and the design of processes to manufacture products and the production of services. The growth field of education requires a high degree of innovation and investment. Through far-reaching innovations in personnel and organizational development, companies will have to intensively awaken and use social energy. The broad field of education and organization of work is a first-class growth area.
Closely related to this, information processing and problem-solving capacities have increasingly emerged as a further new limitation, which require intelligence-saving or expanding progress through technical and organizational innovations. In the global world, which is strongly divided by division of labour, ever-increasing amounts of information must be exchanged. On the one hand, the basic innovations of information and communication technologies come as called for, on the other hand, they trigger huge avalanches of information waste. In addition, the abundance, and turbulent

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dynamics of the tasks to be mastered at the same time reach the limits of the problem-solving capacities of a leadership layer that is too thin. Much more all minds must be involved in the acquisition and processing of information. Intensive education must increase the capacity for problem solving and teach the use of technologies created for this purpose.

Mastering the challenges of overcoming the narrow areas reflects the needs of the economy. To meet these challenges, corporate cultures must be realigned.

Art of Leadership

Productivity growth is stagnating or increasingly reaching macroeconomic limits. Through self-motivation and passion for action, more and new energy can be achieved for more productivity. Today's business administration includes technology in management, but not the art of management.
In economic life, values, emotions, and intuitions have so far been strongly ignored. However, they describe the power behind the processes, namely the social and personal energy that grows through joy, love, and spirit. Business models cannot capture these extremely important factors. They are always an abstraction and pretend that this abstraction is already reality.
This is not against business administration. It is about achieving holistic management with business administration and new orientation, a new culture and radical humanity. Business success is achieved through mental development and lived morality. Spirituality becomes a competitive factor of the first order. The superiority of a company depends on lived spirituality. Written corporate culture, corporate identity, etc. are pointless if they are not exemplified by the managers and supported by everyone. No company can maintain identity and quality in the long term without becoming one with its moral substance.
What is needed is leadership through visions that convey worthwhile goals and generate the same will in the company. The visions will be reflected in the company in the strategic goals, but also clearly in the lived values. The "hardware" of corporate management such as project plans, budgets, performance evaluation, controlling, etc. will continue to be indispensable in the future. Of at least equal importance, however, is the "software", the lived value attitude, which is expressed in the corporate culture with the promotion of identity and enthusiasm, with motivation, generation of the same will, etc.

New rationality

With strong turbulence and rapid pace of change, our world gets into disarray. It becomes inscrutable, and the developments are characterized by a decreasing strength. The complexity is increasing so rapidly that the decision-making centres are increasingly overwhelmed and the greatest bottlenecks in problem-solving capacities arise.

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The processes can no longer be rationally justified alone. A good feeling that many things are no longer true with our environment, for example, is enough to act without waiting for scientific explanatory contexts.
A new rationality is required, because:

1. the rationality of facts decreases. Companies will therefore increasingly move from an internal orientation to an environmental orientation. In doing so, they will involve as many minds as possible for information acquisition and processing.
2. The strategic rationality is decreasing. The markets are becoming more and more fidgety. In a very turbulent world, it will be less and less about realizing plans once created. Rather, any increase in flexibility and creative and innovative potential is required.
3. Cadre rationality is decreasing. People no longer simply obey orders and instructions. They want to use their own minds; they want to be involved. What is needed is a powerful leadership without leading in the sense of orders and commands.

Only with such corporate and management cultures the needs, wishes and values of the younger generation can be met.

6.3 Excursus: Needs of the younger generation

A central question that concerns many companies even before the corona pandemic is:
What human resource management requirements will SMEs have in terms of recruiting suitable trainees and skilled workers?
From a scientific perspective, some considerations can be made, and findings can be shown.
Dealing with Generation Y and especially Generation Z plays a major role in attracting young people to small and medium-sized companies. Generation Z (people born around the end of the 1990s - 2010) sometimes focuses more on different values regarding professional requirements than previous generations. They attach great importance to a healthy lifestyle and have grown up with mobile devices (especially smartphones), which are everyday companions for them, whether in their professional or private life.
For companies and especially for personnel management, leading members of the different generations is a special challenge. Different values and attitudes in the generations of employees lead to different behaviours and actions and often cannot be managed productively with a “one fits all” idea without creating tensions and conflicts.
Therefore, in the more recent discussions on the role of personnel management, great importance is attached to taking the different needs of employees from all generations

(X, Y and Z) into account. Regarding Generation Z, their expectations of a future employer are particularly emphasized due to the shortage of skilled workers.
Above all, recruiting is about changing its perspective. The company applies to potential applicants or future employees, this is the reverse of the earlier idea when there was no or only a minor shortage of skilled workers.
The special needs of Generation Z can hardly be consistently identified for all young people belonging to this generation. In one of the first comprehensive studies (Gen Y vs. Gen Z Workplace Expectations), the differences between Generation Z and Generation Y were particularly highlighted. The key messages and recommendations for executives in this study are as follows:

„Gen Z has more of an entrepreneurial spirit.
17% of Gen Z vs. 11% of Gen Y wants to start a business and hire others.

For Gen Z, it's not about the money … yet.
Only 28% of Gen Z said money would motivate them to work harder and stay with their employer longer, as opposed to 42% of Gen Y.

Gen Z prefers face-to-face communication over technology.
Gen Z grew up with technology, yet 53% percent prefer in-person communication over tools like instant messaging and video conferencing. (…)

If you're the leader, be honest!
Take note business leaders:

- One-half (52%) of both Gen Z and Gen Y state that honesty is the most important quality for being a good leader.
- The generations agree that after honesty, leaders should exhibit a solid vision (Gen Z 34%, Gen Y 35%), followed by good communication skills (Gen Z 32%, Gen Y 34%).

Let's talk. In person.

- Contrary to the assumption that younger workers want "constant connection" to technology, most Gen Z respondents say they prefer in-person communications with managers (51%), as opposed to emailing (16%) or instant messaging (11%).
- The same trend applies to Gen Y: in-person (52%), emailing (18%), instant messaging (11%).
- And few believe that technology enhances personal relationships with co-workers (Gen Z 13%, Gen Y 14%).

Technology is a distraction

- Slightly more than one-third (37%) of Gen Z ranked instant messaging as the biggest work distraction, followed by Facebook (33%) and email (13%).
- Gen Y reports being most distracted by email (31%), Facebook (28%) and instant messaging (25%).

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And not all of us like to multitask, after all

- When asked if they like to multitask, just over one-half (54%) of Gen Z responded in the affirmative, while two-thirds (66%) of Gen Y said yes.
- Gen Z is not as inclined to work in a fast-paced environment: 59% of Gen Z report liking a fast pace, while 68% of Gen Y says the same."

In a further comprehensive study, the following characteristics of Generation Z were identified with reference to various studies:

Characteristics of Generation Z

- According to the Institute for Emerging Issues (2012), the Gen Z is the most ethnically diverse and technologically sophisticated generation.
- Gen Z has an informal, individual, and very straight way of communicating and social media is a vital part of their lives.
- They are a Do-It-Yourself generation.
- In the study conducted by Dan Schawbel (2014), Gen Z tends to be more entrepreneurial, trustworthy, tolerant, and less motivated by money than Gen Y.
- They are more realistic about their work expectation and more positive about the future.
- Based on the findings of Generational White Paper (2011), Gen Z tends to be more impatient, instant minded, lacking the ambitions of previous generations, have acquired attention deficit disorder with a high dependency on the technology and a very less attention span, individualistic, self-directed, more demanding, acquisitive, materialistic, and entitled generation until now.
- Max Mihelich (2013) describes that the Gen Z are very much concerned with environmental issues, very conscious of looming shortages and water shortages which indicates that they have a high sense of responsibility towards the natural resources.
- Amanda Slavin (2015) finds that Gen Z wants to be heard irrespective of their young age.
- Technology is a part of their identity, and they are tech savvy but lack problem-solving skills and have not demonstrated the ability to look at a situation, put it in context, analyse it and decide (Joseph Coombs, 2013).
- They also appear to be less inclined toward voting and to participating in their communities than earlier generations (Institute for emerging issues, 2015)."

As a further and at this point the last look at Generation Z, the results of a study that compiled some findings about recruiting and retention that can be found in other studies in this way or similar.

The Gen Z is ready to perform but also has clearly defined desires:

When choosing an employer, the company's image is less important than recommendations about personal surroundings and social media. Overall, the working atmosphere is the most important criterion. Clear tasks, clear boundaries and a strict

separation of professional and private life are important. Incidentally, this seems to be a difference to Gen Y, which is more inclined to mix professional and private life.
Also, unlike Gen Y, for whom desk sharing is not a problem, Gen Z seems to want its own, well-equipped workstation.
The possibilities of flexible working hours from home office, job sharing, part-time work (...) remain attractive for Gen Z.
Equipped with a healthy self-confidence in their own technological abilities and awareness of the importance of rapid knowledge acquisition, Gen Z expects that their expectations will be met.
They are largely resistant to pressure - such as internal competition - (“If I don't like it, I'll look for something else”). The mobility of young workers is likely to surprise conventional companies. It is therefore to be expected that companies will increasingly have to apply for young employees.
Companies must ask themselves how they manage and motivate these people, how they optimally use their performance potential and how they reward them for it.
Once again, the mindsets and behaviour of Gen Z are likely to rub off on other generations with only a short delay.

Conclusion

Recruiters are advised not to post any employer branding empty phrases on poorly maintained company Facebook accounts. Gen Z expects a highly personal person-to-person dialogue. Companies that do this awkwardly have to expect to give up on social media. "
Special attention to the different expectations and ideas of Generation Y compared to Generation Z for the recruiting process.
With a view to the information and results of the preceding studies, it can be stated that some fundamental differences between the generation and other generations can be seen, which also affect the way in which this young generation should be recruited by the company.
In this context, the topic of digitization plays a very important role in the lives of this generation. Even if it is not to be expected that this generation will have acquired extensive, professionally usable competencies in the field of computer science and digitization technologies due to their previous life, it can be assumed that many private or professionally relevant information and knowledge components are used about digital technologies.
In this context, it is also known, based on the above-mentioned findings, that there is a particular expectation of receiving relevant authentic information via digital media and thus satisfying many needs using digital media.
This plays a crucial role in the exchange between companies and potential applicants and employees and sometimes poses very great challenges for personnel management in companies. Because the expectations of Generation Z outlined above also apply to all processes and activities related to getting to know and receiving authentic information from a potential employer.

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This is an essential reason why companies should deal with the topic of digitization of personnel management tasks in relation to recruitment activities. Because in the worst case, they will not reach the interesting target group of Generation Z and / or they will not be able to meet their expectations regarding the digital exchange of authentic information about the workplace, development and career opportunities, the actual working atmosphere, and many other topics. The topic of digitization is therefore directly related to a central task of personnel management.

Conclusion for companies

The following non-selective questions could be considered in the analysis of companies for the recruitment of Generation Z:

- Are we making Generation Z aware of our company with the appropriate (digital) information?
- Are the job profiles in our company also suitable for people from Generation Z or would they have to be adapted once?
- Do we consider Generation Z in our recruiting activities in the company and their expectations of employment?
- Do we have suitable digital information from the company that is interesting or important for Generation Z, e.g., lived values, actual leadership culture, dealing with feedback and criticism, consideration of individual needs for flexible working hours, etc.
- Are our personnel selection procedures suitable for identifying good applicants from Generation Z?
- Does our company have a personal contact for applicants from Generation Z?
- Do we have a suitable generation management system that considers the different needs of the employees of generations X, Y and Z during their employment in the company?

6.4 Choice of professional training, professional master training and field of study

Branch of study

Based on the conditions of the working world of tomorrow as well as the needs and conditions of the economy and the younger generation, various courses of study for a dual bachelor's degree program were analysed for the present project and intensively advised in the consortium. The development and implementation of the course of study was decided.

Smart Building Technology – Energy Technology and Building Automation

with a focus on:

1. For everyone:

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- Integral planning of buildings (with a focus on energy efficiency and renewable energies), including BIM and 3D printer technologies
- Electrical engineering
- Industrial electronics
- Control technology
- Software for Engineers
- Facility Management
- Energy

2. Specialisation in installers and heating engineers,
   - Heat supply
   - Regenerative heat utilization

3. Specialisation in plant mechanic for sanitary, heating and air conditioning technology; Plumber; Mechatronics technician for refrigeration technology
   - Ventilation, air conditioning and refrigeration technology
   - Gas and fire protection technology

4. Specialisation in roller shutter and sun protection mechatronics; Technical system planner; Electronics technician for building system integration; Electronics technician
   - Energy and environmental technology
   - Lighting and lighting technology

5. Compulsory elective modules of the vocational master craftsman training
   - Business administration
   - Vocational and occupational pedagogy

This course of study largely corresponds to the conditions of the working world of tomorrow. Graduates are enabled to work cooperatively in construction teams, to experience the construction process holistically and to realize a high degree of independent action.
The growth field "Energy, Climate and Environment" is addressed, in which on the one hand there is a very high need for action with excellent prospects for companies and on the other hand a particularly high shortage of qualified managers and specialists can currently be observed.
Activities in the energy and environmental sectors and the use of modern technologies also correspond to the ideas and wishes of the younger generation. By carrying out such tasks, graduates of the dual study program can earn a very good income and at the same time gain meaning.

Occupations for initial vocational training

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In principle, for vocational training many different professions can be integrated into the dual course of study. However, a master craftsman's training, which is also to be integrated into the dual course of study, is only possible in the profession learned. In this respect, within the framework of the chosen course of study, the vocational training courses are primarily implemented, which correspond to the content of the course of study and in which preparation is also made for the completion of the master craftsman's examination. In this respect, the following training occupations are included:

- Electronics technician for building and infrastructure systems
- Electronics technician for energy and building technology
- Electronics technician for building system integration
- Plant mechanic for sanitary, heating and air conditioning technology
- Gas and Water Installer
- Mechatronics technician for refrigeration technology
- Refrigeration and air-conditioning technicians
- Technical System Planner

The project will focus on installation and building technology with the electrical professions in industry and crafts.

Training as a professional master

A vocational master examination can be taken in the profession or in related professions for which a completed vocational training is available. In the dual course of study, a vocational master training is included in the professions that correspond in content to the chosen field of study and its focal points. These are primarily the following vocational master trainings:

- Master electrician
- Industrial master - Specialising in Electrical Engineering
- Master installer and heating engineer
- Master for Energy and Building Technology
- Master in the refrigeration system construction trade
- Industrial master for automation technology

Within the framework of the project, a focus is placed on vocational master training in electrical installation and building automation technology.

Innovation support and R&D projects for SMEs

7.1 Promoting innovation and SME needs

Small and medium-sized enterprises are the backbone of the economy. At the same time, they stabilise the development of the society. They are anchored in their region and can use the possibilities of international cooperation and strengthen their position

without relocating their workplaces abroad. The economy will be shaped mainly by small and medium-sized enterprises, which provide over 99% of all enterprises and about 70% of all workplaces. The project countries, with its efficient SME economy, have excellent opportunities for economic strengthening and mastering international competitiveness.

The countries featured have excellent potentials at its disposal in the field of knowledge economy, university education, as well as research and development. Employees are the most important asset especially in small and medium-sized enterprises. However, in this respect significant shortages are looming for the future. Securing the inflow of trainees to excellently qualified enterprises, management, and labour force, as well as significant innovations decide about the future of small and medium-sized enterprises, and therefore, they are the most important support task for SMEs and crafts.

Mastering the future requires intensive cooperation: “links are more important than products”. Information technologies come as problem solvers when needed. Cooperation’s concentrated strengths, however, they preserve independence. Trust and cooperation management is sought after. Successful enterprises and cooperative cultures must be based on strengths, encompass integration of employees, and use the creative potential of all minds. And indeed, SMEs require specific assistance for the use of opportunities and minimising the risks.

- ⇨ Effective innovation strategies must extend region-specific strengths, support spatial cooperation of strong points and the division of labour, as well as using cultural differences as a potential for creativity.
- ⇨ Excellent fields for innovation for the SME economy apply to all domains which are currently shaped by shortages. Within the shortage areas of energy, climate and environmental protection, health, information processing and problem-solving capabilities, electronic production, and communication systems, as well as personal and organisational development, the three countries have distinguished learning and research capabilities, as well as large entrepreneurial potential at its disposal, so that especially promising starting points for targeted innovation policy could emerge here.
- ⇨ Support for research and development by universities and colleges must turn towards the SME economy in a more intensive and consistent way. Promotion of some clusters of high-tech development is an important part of the present innovation policy. However, a specific innovation promotion for small and medium-sized enterprises must be particularly developed and intensively realised. Customer-oriented definition of innovations and a more concise policy of support is therefore important here and it can allow for example the development of adjusted techniques and new products, new forms of organisation and the involvement of employees in the process of innovation or the transfer of technology.

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- ⇨ Colleges and universities must assume the transfer of innovation, which is an essential task for small and medium-sized enterprises, as a binding and obligatory task. Study and graduation activities should consistently incorporate the development tasks of small and medium-sized enterprises.
- ⇨ Cooperation between colleges and universities, as well as small and medium-sized enterprises must be strongly improved and expanded. Therefore, chambers and prominent support institutions of the SME economy can assume the economic communication functions.

Promotion of SMEs must be given highest priority. Particularly important for small and medium-sized companies are long-term strategies that are implemented consistently and reliably. SMEs need a reliable framework in which they can orient themselves and conduct safe planning.
Smaller companies cannot have corporate staff functions at their disposal, as large companies do, that would cover a variety of management tasks. In the case of medium-sized businesses those staff functions and support functions need to be rendered outside within the framework of universities and economic self-government. The universities are the key innovation service providers giving small and medium-sized enterprises the necessary tools and guidance, company specific and reliable, and offering them monetary benefits. Relate highest policy priorities for the promotion of SMEs:
a) the area of education, innovation, and internationalization, since for many regions the largest growth opportunities and resources for the SME sector are found here.
b) any forms of intra-and inter-company and international co-operation of SMEs, which should be systematically sourced from the chambers.

Specific innovation support for small and medium enterprises must be developed and implemented consistently. There is a need for user-and demand-driven innovation and broader support policies that actively consider, for example, social and organizational innovations, development of appropriate technologies and new products, new forms of organization and employee involvement in innovation processes and the transfer of technology. Companies do not necessarily have to invent something themselves but could take good ideas and new technologies and modify those for themselves. Funding for the implementation of innovations in enterprises should therefore be increased.
There is an urgent need for a broad concept of innovation that is geared specifically to the needs of small and medium enterprises. Promotion of innovation should involve development of new technologies, high-tech and appropriate tools, new discoveries, and honing product-, process-, and organizational and social innovations. A very significant added value must be sourced from all innovation subsidies, the one affecting the growth of the "human resources and organizational development" and including education, organization of work, development of partnerships etc.

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The promotion of research and development by colleges and universities must turn more intensively and consistently to medium-sized businesses. Colleges and universities need to be given a mandatory task to serve as an important innovation transfer medium for the economy. During studies and thesis papers the issue of development of small and medium enterprises should be brought up consistently. According to the principle of "region as a living laboratory" research institutions need to achieve a variety of measures to promote innovation with and for medium-sized businesses, such as tailored research and development projects, effective knowledge sharing, development, and transfer of adapted examples of best practice or the implementation of demonstration projects.

In a comprehensive study and survey of SMEs from Germany, Lithuania, Norway, Poland and Russia, the need for innovations in SMEs and their promotion was examined. The results of the study are summarised below.[15]

The role which SMEs play in the economy makes creating adequate conditions for their innovation and competitiveness growth a key challenge. For this reason, it is vital to broaden our knowledge of the level of SMEs innovation and to gather data on a demand for innovation support in SMEs.

In the study, entrepreneurs have been asked to specify a kind and a degree of intensity of innovation changes implemented in their companies. It turns out that marketing and product innovations are most frequent. Moreover, an innovation climate based on openness in organization culture in these companies has proved to be an important factor in innovation implementation in most of the analysed SMEs. SMEs in general have a bad opinion about the innovation climate in the country in which they operate. A difficult access to financing innovation activities by financial institutions is a common problem with building a friendly innovation climate in all the analysed countries. Major problems which SMEs struggle within innovation implementation are lack of financial resources, complicated legal procedures, and a deficiency of adequately qualified staff.

Cooperation with scientific and R&D circles and other institutions designed to increase SMEs innovation level is vital on account of the specificity of SMEs, which generally have limited human resources and a low financial potential. The results of the analysis indicate that local authorities including chambers of crafts and commerce and entrepreneurs' associations are major partners in innovation cooperation for SMEs.

As far as an SMEs cooperation with R&D institutions is concerned, a leader-role is generally played by universities. Moreover, the intensity of this cooperation is quite high. The percentage of SMEs cooperating with R&D centres amounts to 50% in Germany, 64% in Norway, 75% in Lithuania and 90.9% in Russia. Only the Polish SMEs declare a very low intensity of contacts with R&D sphere (only 16.37% of the

[15] Development and Demand of Innovation Support in the Baltic Sea Region, Baltic Sea Academy, Hamburg

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Polish SMEs can boast of such contacts). The intensity of cooperation with R&D institutions does not translate into R&D projects, however.

In most of the Polish, German and Norwegian SMEs, there have not been any R&D activities, when the study was conducted. The Russian and Lithuanian SMEs are exceptions to this rule, because 9 out of 10 analysed enterprises have been involved in R&D projects. Product and service enhancements are a predominant type of R&D activities.

Moreover, the study has shown that about 90% of the analysed SMEs can see barriers impeding cooperation with scientific institutions. The major barrier SMEs encounter is insufficient proper funds to finance R&D and difficulties with access to external financing. However, according to the SMEs, the reasons for low intensity of cooperation with R&D sphere are scientific institutions themselves - SMEs report difficulties with initiating cooperation with scientific institutions, a lack of interest of these institutions to involve in such a cooperation, and ignorance of the economic subject matter on behalf of these institutions' representatives.

Barriers preventing cooperation between SMEs and R&D institutions (in %)

	Poland	Norway	Lithuania	Germany	Russia
Substantial costs, financial barriers	41	76	50	38	55
difficulties with starting a cooperation	29	32	33	31	36
lack of interest of R&D institutions to start a cooperation	20	28	42	19	19
legal barriers	18	4	8	X	X
R&D representatives do not understand the issue	18	64	46	25	27
communication problems with R&D representatives	10	36	29	13	X
no barriers	11	8	X	6	18
other (if so, what kind of barriers)	2	x	8		x

An attempt has been made to assess the demand for innovation in SMEs when analysing the Baltic Sea Region SMEs' innovation potential and their cooperation with the R & D sphere.

It turns out that SMEs from all the countries indicate a high demand for R&D activities. Polish SMEs are an exception in this respect, because only 1 in 3 of the analysed enterprises shows interest in R&D activities. Unfortunately, a high demand for R&D is not accompanied by SMEs' intentions to conduct such research in the future. The study shows a high degree of uncertainty among SMEs as to satisfaction of their R&D needs.

The demand for specific types of support from universities has been much lower than the analysed above demand for periodical R&D. The entrepreneurs have been mostly interested in periodical training and workshops for enterprises which were preparing, or which were involved in innovative projects, as well as information meetings on specific types of and kinds of innovations. Such a low level of demand for support from universities is because most analysed SMEs cannot see any potential benefits resulting from cooperation with scientific institutions.

SMEs demand for innovation support from universities (in %)

	Poland	Norway	Lithuania	Germany	Russia
information meetings on types and kinds of innovations	30,7	41,6	37,5	33,3	72,3
periodical trainings and workshops for persons preparing and realizing innovative projects	35,5	58,3	50	20	36,6
allowing access to practical training and didactical materials	22,6	16,7	16,7	20	36,4
individual consulting directly in the company	22,6	37,5	62,5	26,7	18,2
individual consulting by phone	7,3	20,8	16,7	x	x
individual consulting via e-mail	11,5	16,7	16,7	x	x
other	2,94	x	4,2	x	x

The only positive effect of such a cooperation, which most of the analysed SMEs from all the countries have agreed upon, is "launching new products and services". However, the analysed SMEs have declared a very high demand for training and consulting services from the scientific environment. Services, products, and new technologies are desired fields of a possible cooperation.

Finally, cluster involvement in innovative projects of the SMEs as well as their intentions to engage in future cluster cooperation have been analysed. It turns out that most of the companies have not been involved in a cluster so far. Unfortunately, most of the analysed SMEs do not have any intention to start cooperation with any cluster.

The above results show that it is necessary to start intense activities destined to increase the SMEs' understanding of benefits resulting from cooperation with scientific institutions, and the involvement in a cluster venture. Moreover, abolishment of the barriers identified in this study (mainly financial barriers) limiting both innovation implementation processes and SMEs' cooperation with scientific sphere is recommended.

Expected benefits SMEs can get because of their R&D cooperation with universities (in %)

	Poland	**Norway**	**Lithuania**	**Germany**	**Russia**

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launching new products/services	38,1	44	62,5	50	81,8
enhancing products/services quality	21,3	60	54,1	50	63,6
optimalization of organization operations	20,1	20	37,5	43,7	45,4
improvement of cooperation with suppliers and customers	30,7	48	25	31,2	27,3
sales increase	33,8	52	58,3	25	27,3
improvement of competitive position	17,7	28	58,3	32,5	45,4
costs lowering	27,1	56	75	31,2	27,3
increase of ecological activity	7,8	24	41,6	18,7	x
increase of company's prestige	27,3	52	45,8	37,5	36,3
access to latest know-how	17,9	44	25	50	27,3
possibilities of new innovations implementations	16,1	16	62,5	31,2	27,3
possibilities of HR development	9,6	16	33,3	25	9,09
gaining new customers/increasing market share	30,2	40	45,8	25	45,4
increase of company’s profitability	17,2	52	45,8	25	27,3

In summary, innovation support measures for small and medium-sized enterprises must meet specific conditions of SMEs, in particular:

- SMEs do not have any in-house staff; they require comprehensive services that equal the staff performance of large enterprises, which would offset the size-related disadvantages.
- Services must be provided in closeness to companies and accurately according to specific needs.
- Services must be accessed by the SMEs precisely at the point in time when they are really needed. Services and information on stocks are not helpful to SMEs.
- SMEs suffer from bureaucracy, they are time- and expense-sensitive. All the necessary services must be provided without red tape, from a single source and must be cost-effective.
- Continuous exchange of information, stable foundation of trust, high reliability and continuity are important. This requires a permanent contact person.
- Services must be provided in the language of the SMEs and offer financial benefits to enterprises.
- Services must be of outstanding quality, match individual needs and need to be provided exactly at the right time.
- Services must encompass different areas like business administration, engineering, marketing, human resources, sales, etc. Of prime importance are measures which promote international cooperation because they create great potential, especially for SMEs.

When universities cooperate with SMEs within the framework of dual courses of study, this results in particularly intensive networking, direct technology and knowledge transfer and excellent opportunities for tailor-made research and development work, which is carried out in the company by students supervised by professors and lecturers.

7.2 Promotion of innovation in conjunction with dual study programs

The innovation capacity of SMEs is most limited by the availability and skills of entrepreneurs, managers, and professionals. Due to a lack of skills, entrepreneurs and employees, innovation in SMEs is already much lower than it could and should be. Except for Sweden, the number of younger people of working age in all Baltic Sea countries will fall by up to 25% over the next 15 years. At the same time, qualification requirements are increasing; human resource and social skills are becoming equally important alongside specialist knowledge. Improving qualifications and eliminating the shortage of skilled workers are the most important promotional tasks and the key to sustainably strengthening innovation, competitiveness, and growth in SMEs. The realisation of further trainings and dual bachelor's degree programmes, in which the studies are combined with relevant vocational training, makes a decisive contribution to mastering this challenge to attract the high demand for junior staff in innovative entrepreneurs, managers and professionals for SMEs and at the same time to emphatically strengthen innovations in SMEs.

Under dual study programs, close collaboration between academia and small medium-sized enterprises is achieved. In that regard, further welcome features are active exchanges of knowledge and experience as well as implementation of manageable research and development tasks for and by SMEs. Students will implement their semester or bachelor's theses at companies where they complete their practical

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training. They will select topics that are particularly business-relevant, thus ensuring notable benefits to SMEs.

A dual bachelor study program is composed of the following basic elements:

- Admission requirement: higher education entrance qualifications (i.e. A-levels) or advanced technical college certificate.
- Duration: 3 to 4 years maximum (depending on subject).

- About 50% of the educational period was practical training or professional activity in a company. Vocational education takes place in dual form in companies and vocational schools.
- About 50% of the educational period takes place at the university.
- Both parts of the training are coordinated with each other and are carried out in parallel. Theory can be taught in longer blocks (e.g., 3 months) or 3 days a week with shorter additional blocks.
- About 60% of the courses offered at the university are taught by full-time professors and lecturers and about 40% by practitioners from companies.
- The participants sign a contract for vocational education/activity with the company and a contract for study with the university.
- Degree: Journeyman/skilled worker and Bachelor.

The bachelor's degree also entitles the holder to follow a master's program at a university later. However, the aim is that at least 80 % of the bachelor's degree holders

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should remain in the small and medium-sized business sector as entrepreneurs, managers, or skilled workers and, building on their initial bachelor's degree, improve their skills within the context of ongoing continuing education.
The excellent qualifications acquired in the dual study programs are also decisive prerequisites for high innovations. In addition, the participating universities/colleges should also take part in practice-oriented research and development projects for medium-sized companies and thus promote innovations in the long-term. The study programs and innovation promotion are aimed at the identical target group, namely high-performing, medium-sized companies, and their management personnel. As companies are always included in the dual study programs, there is direct cooperation between companies and universities, which can be used for knowledge and know-how transfer as well as for research and development work by companies. Research and development tasks can be carried out in various ways, for example:

- Work as part of semester or bachelor theses of the participants/students
- Targeted individual assignments of the companies or consulting/know-how transfer by professors and teachers
- More complex projects with public funding (especially from the EU)
- Joint work on projects with several companies in one industry (industry association projects)

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Universities and companies are training partners in dual study programmes. About half of the entire training period takes place at the university and half at companies. Credit points required for the bachelor's examination are earned both during studies at the university and to a certain extent during training and work in the company. The change of qualification in the university as well as in the company can take place in block form (e.g., three-month blocks) or in daily form. The dual study programmes are Bologna-compliant and lead to a recognised bachelor's degree. The qualification in the company can be combined with a vocational training with the degree "journeyman" or "skilled worker".

The close cooperation between universities and companies in teaching offers optimal conditions for the promotion of innovation by SMEs through universities. The following starting points and funding measures are particularly relevant.

a) The professors and lecturers at the universities must see themselves as equal partners of the companies. They must regularly visit the companies, check their innovation needs, provide advice, transfer new technologies, best practices, etc. and accompany implementation in the companies. The more effectively companies experience such innovation support, the greater their willingness to participate as training partners.
b) In addition to personal exchange and transfer, universities shall maintain a comprehensive written and electronic transfer. For example, regular publication

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of newsletters, innovation platforms, publications of prepared research results, dialogue forums, etc.

c) Approximately 60% of the teaching at the university is carried out by the academic staff of the university and about 40% by practitioners from the companies. In connection with this, the practitioners should continuously bring the needs, topics, and tasks of the companies for innovation development into the research and development work of the universities, so that an SME-specific orientation can be achieved. At the same time, through the participation of practitioners in teaching, entrepreneurial thinking, modern management methods, etc. can be transferred to the universities and thus future-oriented organization, administration, work processes, etc. in the universities.

d) Since the students spend half of their time at university and half at the company, a personal transfer of knowledge, new technologies, best practices etc. from the universities to the companies can be optimal. Equally intensively, questions, concerns, tasks, etc. can be transferred from the companies to the universities via the students and the work of the universities in research and teaching can be stimulated and shaped in a way that is close to the company.

e) Topics and tasks for semester or bachelor theses should be formulated by the participating companies according to their innovation needs, which are processed by the students in the companies after review and approval by the university. This work process is accompanied by professors and lecturers in the companies who advise both the students and the companies on the development work and subsequent implementations. In this way, innovative tasks and manageable research and development tasks in the companies are realized in a targeted manner and without additional costs.

f) For the realisation of complex research and development tasks of SMEs, additional financial resources must be obtained. National, but also especially the EU innovation support programs are too bureaucratic for small businesses; the cost of application and project management is in disproportion to the potential outcome of the project and is too much for many companies. Another obstacle to innovation is that SMEs cooperate too little in research and development, in contrast to large companies. Universities must therefore develop their role as an innovative service provider for the SMEs. They can advise companies on formulating project proposals, or even serve as an applicant’s representative and project manager. Industry association projects with several SMEs should also be developed by the universities, applied for funding, and carried out by the universities as lead partners.

7. A basic model for a dual bachelor's study course with attainment of a bachelor's degree and a vocational master qualification

In the present project, a demanding qualification is developed and implemented that integrates three apprenticeships with three independents, recognised qualifications:

- ✓ dual vocational training (EQF Level 4)
- ✓ vocational master training (EQF Level 6)
- ✓ dual bachelor's degree (EQF Level 6)

In the first two years of the four-year training, participants are trained in a company, in a vocational school and in a college/university.
After two years, participants take an examination to become a journeyman/skilled worker and thus acquire an internationally recognised vocational qualification.
In the third and fourth year, the qualification takes place in the company and at a college/university.
Towards the end of the fourth year, the participants take a vocational master and a bachelor's examination and thus acquire the internationally recognised vocational master's and bachelor's degrees.
In the project's training programme, the vocational master's qualification is fully integrated in accordance with the framework of studies described in Chapter 4 Integral conveyance of vocational master and bachelor with-in the framework of studies.

During the entire qualification, approximately half of the training takes place at the company and half at the college/university. During the entire training period, the company pays the trainees a collectively agreed salary and annual leave in accordance with national regulations.

The integration of initial vocational training into the qualification programme has significant advantages, including:

- With the vocational qualification, the participants receive the admission requirements for taking the vocational master examination.
- Dropouts acquire at least a recognised vocational qualification.

This training can also be carried out without integrating the initial vocational training. Likewise, participants who already have vocational training at the start of the qualification can complete this training. In these cases, attendance of a vocational school is omitted, the training also takes place in the first two years only in the company and the college/university, no vocational training examination is taken, and the graduates acquire "only" a vocational master's degree and a bachelor's degree.

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8.1 Dual study course “Smart Building Technology – Energy Technology and Building Automation”

The entire study program comprises eight semesters and is structured as a dual study program with regular switching between theory and practice. Each semester contains a theoretical and a practical phase.
During the practical phases, practical assignments are accomplished, in close collaboration between students, involved companies and the university, drawing on specific teaching modules of the related preceding theoretical phase. The final practical phase is intended for the preparation of the bachelor’s thesis, which is to be written within a period of eight weeks and shall refer content-wise to the student´s activities in the involved practice company.
During practical phases, parallel to the regular work hours spent in the practice company, students elaborate on problems of the practice company in the form of a supervised practice-related assignment. The involved companies conclude a regular contract with the students, including stipulated remuneration details.
The course contents in the theoretical phases are oriented at the requirements of the professional environment. To prepare the students for their professional future, personal key qualifications, foreign languages and optional, yet obligatory courses in English are key elements of the study concept.

The study course curriculum is designed for a standard duration of eight semesters and has a modular structure. Each module constitutes a self-contained unit. Modular structuring allows for recognition of academic achievements at universities in Europe. Core modules, plus obligatory elective courses (German *Wahlpflichtfach*) enable early specialisations, while the involved companies are invited to co-determine course contents. Evaluation is based on Credit Points (CP), in accordance with the European Credit Transfer and Accumulation System (ECTS). The bachelor’s exam is rated with a maximum of 240 CP.

Educational objectives of the bachelor’s study program in electrical engineering: Key focus is on energy technologies Energy and Building Automation

The objective of this study program is the training of highly qualified, practice-oriented, and scientifically educated specialists and business leaders.
Energy and building technologies are of high social value. In the years to come, their importance will increase due to the significance of environmental issues. Both, the planning of new buildings and technical facilities, as well as rehabilitation and optimisation of existing buildings, require systems engineers, “tech professionals for the building envelope”. In this context, “systems” refers to the provision of all required forms of energy and media for heating, air-conditioning and refrigeration systems, gas, sanitary and water systems, as well as to disposal of media and infrastructure.

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Besides the need for increased efficiency and a rational use of energy, the use of new, alternative energy sources also plays a significant role. Continued technological progress and use of modern, renewable energy technologies, such as solar thermal power, photovoltaics, geothermal energy, combined heat and power plants, heat recovery systems and heat pumps constitute determinants for required occupational fields related to planning and commissioning of power and media supply systems. The design objects range from single-family homes to large industrial plants. Key concerns relate, not only to the reduction of operating costs, but also the emissions avoidance and to increasing in the utilisation quality and comfort.

The Building Services Engineering degree programme includes fundamentals from the disciplines of civil engineering and mechatronics as well as extensive specifics of building services engineering. Building technology engineers are specialists in the planning and design of technical systems in buildings. They develop economical, reliable, and environmentally friendly solutions. As specialists in an innovative and future-oriented field of work, they are sought-after employees in many companies. However, building services engineers also plays an important role in the development of new technical trends and are therefore indispensable. For example, the current megatrends "Industry 4.0" and "Internet of Things" are expected to bring about a further acceleration in building automation. It has become an important component of technical facility management and encompasses the entirety of monitoring, control, regulation, and optimisation equipment in buildings.
Another megatrend, the "smart home", has long since it found its way into our lives and presents the building services engineer with exciting challenges. For example, the control of ventilation systems, the regulation of lighting and heating systems or the linking of building services and appliances into an overall system are often already among the standards desired by building customers in the private and commercial sectors. Building technology is therefore not only relevant in large buildings but is also increasingly used in single-family homes.

Under the common system, the dual degree program integrally prepares for the vocational master examination and for the bachelor’s degree.

8.2 Vocational master training “Electrical installation and building automation technology”

The aim of the vocational master training is to autonomously manage a company, to perform leadership tasks in areas of technology, business and personnel management and development, to carry out vocational training and autonomously implement professional competence schemes, while adapting to new requirements in these areas.

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For all key tasks of the vocational master training, competences for the following joint activities, knowledge and skills will be acquired under a comprehensive qualification program:

- Determining customer requirements, advising customers, calculating services, and creating offers, negotiating contracts and setting order targets.
- Performing technical and commercial management tasks, company organisation, personnel planning, and personnel deployment, in particular, taking company training and continued education into account, quality management, liability and occupational safety, work safety, data protection and environmental protection; use of information systems.
- Executing orders, considering system engineering, maintenance alternatives, topographical conditions, job-related laws, standards, rules and regulations, personnel requirements and training; organising, planning and monitoring order processing and order control.
- Creating documentation using computerised systems.
- Considering material properties during planning, construction, and execution.
- Developing, planning, manufacturing, programming, parameterising, erecting and maintaining electrical equipment, taking into account health and safety-related precautionary measures; considering and applying techniques for rational use of energy.
- Applying, measuring, and testing techniques; assessing, and documenting results.
- Designing contracts; drafting and maintaining standard contracts, especially service contracts.
- Carrying out fault and troubleshooting, taking measures to eliminate faults and errors, evaluating and document results.
- Accepting and keeping records of services, passing them on to the customer, settling accounts and carrying out final costing.

Taking the example of master craftsman training in electrical engineering, competences for the following specific activities, knowledge and skills are to be acquired for each main task as part of a comprehensive qualification programme:

- Focusing on energy and building technology
  Planning, calculating, constructing, programming, parameterising, setting up and testing of systems and plant components for energy and building services engineering, in particular, for the generation, transmission, conversion and supply of electrical energy, earthing, lightning protection, surge protection and antenna systems, lighting, heating, cooling and air-conditioning systems, building automation, bus technology, signal transmission technology, techniques for the rational use of energy as well as their electrical and electronic operating resources.
- Focusing on communication and safety technology systems

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Planning, calculating, constructing, programming, parameterising, erecting, testing, commissioning and installing plant and system components for communications and security technology, in particular, telecommunications technology, electro-acoustic, data transmission and processing technology, telecontrol technology, call and signalling technology, alarm signalling technology, emergency warning system technology, video technology, hospital communications technology, access control technology and time management systems.

- Focusing on systems electronics, developing, designing, planning, calculating, constructing, programming, parameterising, erecting, testing, and maintaining systems and plant components for systems electronics, in particular, for measurement, control and drive technology, testing and counting technology, medical and laboratory technology, as well as methods of systems and software integration.

Integration of the vocational master education

The vocational master qualification and the bachelor's degree program are integral parts of a common system (see Chapter 4.). The vocational master exam consists of four parts:

- Part I: Occupation-related practical training, including the manufacture of a masterpiece
- Part II: Occupation-specific theory
- Part III: Business administration, law, and management
- Part IV: Profession and profession-related educational knowledge

The design of the bachelor's degree program with integral master´s qualification prepares students for all four parts of the vocational master's examination and fulfils all conditions of a bachelor's study program.

The study programme for all prepares students to take the Part I and Part II examinations.

Preparation for the Part III and Part IV examinations are integrated into the study programme as obligatory elective courses. These must be completed by all participants who wish to take a vocational master examination.

Part III "Business administration, law and management"

The training in Part III "Business administration, law and management" aims to pass on professional decision-making skills to be able to analyse and evaluate business, commercial and legal problems as an employee, business owner or manager and to identify and document possible solutions and incorporate current developments.

The competences to be acquired are:

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Evaluating the competitiveness of companies

The knowledge and skills needed to assess the economic, commercial, and legal prerequisites for a company's competitiveness and professional development potential as well as to be able to present decision-making requirements. In particular:

- Analysing company objectives and classifying them in a company target system.
- The importance of corporate culture and corporate image for operational performance and competitiveness.
- Analysing a company's market situation and establishing potential for success.
- Use accounting information from the balance sheet and income statement, to analyse the strengths and weaknesses of a company.
- Use information from internal and external accounting to prepare decisions.
- Apply legal provisions, in particular trade and craft law as well as commercial and competition law, in the analysis of business objectives and concepts.

Preparing, implementing, and evaluating start-up and acquisition activities

The knowledge and skills required to prepare, carry out and evaluate tasks within the framework of the foundation and takeover of a company, considering personal, legal and business conditions and goals, as well as to justify their significance for a business concept. In particular:

- The importance of personal skills for the success of self-employment.
- To present and evaluate the economic, social, and cultural significance of the craft and the benefits of membership in craft organisations.
- Demonstrate and evaluate the possibilities of using consulting services as well as promotional and support services for the foundation and acquisition of a company.
- Make and substantiate decisions on the location, size of the company, staffing requirements and the establishment and equipment of a company.
- Development and evaluation of marketing concepts for market introduction.
- Drawing up and substantiating the investment plan and financing concept; preparing profitability forecasts and carrying out liquidity planning.
- Take a business concept and establish it legally.
- Apply legal provisions, those of civil law and corporate and tax law, in connection with the establishment or acquisition of craft enterprises.
- Establish the need for private risk and retirement provision, point out possibilities.
- To present and justify the significance of personal aspects as well as business and legal components of a corporate concept in context.

Developing management strategies

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The aim is to acquire the knowledge and skills, considering company-related strengths and weaknesses as well as market-related opportunities and risks, to manage a company, to identify operational growth potential and to develop corporate strategies. In particular:

- Assessing the importance of the organisational structure and process organisation for the development of a company; making adjustments.
- Evaluate developments in product and service innovations as well as market conditions, also in an international context, and derive growth strategies from them.
- Establish opportunities for the use of marketing instruments for sales and procurement of products and services.
- Derive changes in capital requirements from investment, financial and liquidity planning; present alternatives to raising capital.
- Developing and evaluating concepts for personnel planning, recruitment, and qualification as well as presenting instruments of personnel management and development.
- Consider the provisions of employment and social security law when developing a corporate strategy.
- Opportunities and risks of inter-company cooperation.
- Controlling for the development, pursuit, implementation, and modification of corporate goals.
- Present instruments for the enforcement of claims and justify their use.
- Describe and justify the necessity of planning business succession, also considering inheritance and family law as well as tax regulations.
- Examine the necessity of initiating insolvency proceedings based on company data; identify the legal consequences for the continuation or liquidation of a company.

Recommended Lessons Part III Business administration, law, and management

Hours Recommendation Part III Business administration, law, and management	
Module 1: Action field "Determining corporate competitiveness"	84 hours
Module 2: Action field "Preparing, completing and evaluating start-up and takeover activities"	86 hours
Module 3: Action field "Developing corporate government strategies"	98 hours
Module 4: Action field "Basic computer skills, bookkeeping using commercial software"	60 hours
Total Part III Business administration, law, and management	**328 hours**

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Part IV: Profession and profession-related educational knowledge

The trained vocational master should have vocational and work pedagogical knowledge, so that he has the necessary competence for proper training of apprentices (trainees) to plan, carry out and control the vocational training independently. The competencies relate to the following fields of action:

Examine training requirements and plan training

The master craftsman must be able to examine and assess training prerequisites based on company, occupation-related and legal provisions and to plan training, also considering extra-company training periods. This is linked to the qualifications required to carry out the following tasks:

- To present and justify the advantages and benefits of in-company vocational training.
- Planning, preparing, and making decisions based on legal, collective bargaining agreements and company framework conditions.
- Present structures of the vocational education and training system and its interfaces.
- Select training occupations for the company and justify selection.
- Examine the company's suitability for training in the target occupations to be trained, considering training within the network, inter-company, and extra-company training.
- Examine and evaluate the possibilities of using preparatory measures for vocational training.
- Coordinate internal distribution of responsibilities for training within the company, considering the functions and qualifications of those involved in training.

Preparing training and hiring trainees

The master craftsman must have the necessary knowledge and skills to perform preparatory training tasks, define selection criteria for recruitment and carry out recruitment procedures, including consideration of company work and business processes as well as legal aspects. This is linked to the qualifications required to carry out the following tasks:

- Drawing up an in-company training plan based on training regulations, which is oriented towards work and business processes typical of the occupation.
- To present and justify opportunities for participation and co-determination of company interest groups in vocational education and training.
- Determining the need for cooperation and coordinating its content and organisation with cooperation partners, in particular the vocational school.
- Apply criteria and procedures for the selection of trainees also considering their diversity.

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- Prepare and conclude the vocational training contract and arrange for its registration with the competent authority.
- Check if parts of the vocational training can be carried out abroad.

Perform training

The master must be able to plan and control learning processes in an action-oriented manner and to promote independent learning. While doing so, work and business processes typical for the profession as well as the trainees' job opportunities and learning requirements must be considered. This is linked to the qualifications required to carry out the following tasks:

- Creating learning conditions and motivating learning culture, giving, and receiving feedback.
- Organise, design, and evaluate probationary periods.
- Develop and design learning and work assignments based on the company's training plan and the work and business processes typical of the occupation.
- Selecting training methods and media appropriate to the target group and using them in specific situations.
- Support apprentices in the event of learning difficulties through individual training arrangements and training guidance, use training support aids and examine possibilities for extending the training period.
- Examine and propose additional training opportunities for trainees, in particular additional qualifications; examine possibilities of shortening the duration of training and early admission to the final examination or apprenticeship examination.
- Promoting the social and personal development of trainees; identifying problems and conflicts in good time and working towards solutions.
- Develop learning and working in a team.
- Determine and evaluate the performance of trainees, evaluate performance assessments of third parties and examination results, conduct appraisal interviews, draw conclusions for further course of training.
- Promoting intercultural competences in the company.

Finish training

The master must possess the ability to lead the training to a successful conclusion and to point out opportunities for further learning and qualification paths. This is linked to the qualifications required to carry out the following tasks.

- Prepare trainees for the final examination or apprenticeship examination considering the examination dates and lead the training to a successful conclusion.
- Ensure that the trainees register for examinations with the competent body and draw their attention to any special features relevant for implementation.
- Create written certificates based on performance appraisals.

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- Inform and advise trainees on company development paths and vocational training opportunities.

Recommended hours Part IV: Vocational and occupational education knowledge

Hours Recommendation Part IV: Vocational and occupational education knowledge	
Module 1: Action field "Review of training requirements and training planning"	25 hours
Module 2: Action field "Training preparation and assisting in recruiting prospective trainees"	23 hours
Module 3: Action field "Conducting training"	52 hours
Module 4: Action field "Completion of training"	15 hours
Total Part IV: Profession and working-educational knowledge	**115 hours**

The final exam is structured as a single exam before a mixed examination board. Insofar as this is not possible, master's examination shall take place directly upon completion of the bachelor's examination.

Prerequisites

Prerequisites for admission are either a high school diploma or a vocational technical diploma or university qualification. Besides, various vocational qualifications, sometimes in combination with practical professional experience, facilitate access to higher education. Countries practise various admission requirements regarding admission based on vocational qualifications/degrees.

8.3 Vocational training Electronics technician

The competences, knowledge and skills are to be imparted in a process related manner. These qualifications are to be imparted in a way to enable trainees to exercise a qualified occupational activity. For the training occupation of Electronics technician the following skills shall constitute the minimum object of the vocational education and training:

- VET, employment, and collective wage agreement law,
- Structure and organisation of the company providing training,
- Health and safety at work,
- Environmental protection,
- Company and technical communication,
- Planning and organisation of work, evaluation of work results,

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- Assembly and connection of operating equipment,
- Measuring and analysis of electrical functions and systems,
- Assessing the safety of electrical plants and equipment,
- Installing and configuring IT systems,
- Advising and assisting customers, provision of services,
- Technical analysis of orders, developing solutions,
- Installing and putting electrical plants into service,
- Configuring and programming controls,
- Maintenance of plants and systems,
- Technical service & operation,
- Business processes and quality management within the field of deployment.

The skills are to be applied and deepened in one of the following areas of deployment:

- Power distribution facilities/networks
- Installations and networks in buildings
- Factory facilities, factory equipment
- Production and process engineering facilities
- Switch and control gear
- Electro technical equipment

The area of deployment is to be stipulated by the company providing training. Other areas of deployment are permissible, providing it is possible to impart the skills.

Successful completion of vocational training is not a prerequisite for admission to a degree programme. Completion of vocational training is an integral part of the overall training programme. Successful completion of vocational training is a prerequisite for admission to the vocational master examination. Participants who do not have a vocational qualification before the start of the study programme and do not complete vocational training during the study programme but nevertheless wish to take a vocational master examination must achieve vocational training by other means (see chapter 5).

8.4 Degrees and Accreditation

Participants in the integrated dual study programme can obtain three official, internationally recognised qualifications.

- Recognised vocational qualification in one occupation, e.g., Electronics technician
- Recognised master's degree in a profession, e.g., Electrical engineering master
- Bologna-compliant bachelor's degree: Building services engineer

The examination of initial vocational education and training is conducted normally in accordance with the respective national regulations.

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There are two different models for taking the bachelor's and vocational master's examinations
a) Taking the examinations in one examination cycle by an integrated bachelor's and vocational master's examination board
b) Two separate examinations by the bachelor's examination board and vocational master's examination board in accordance with the respective national regulations
Both models are possible and appear to be equivalent; the project will examine whether the respective national regulations allow for model a).

Credit Points (CP) are used for evaluation, in accordance with the European Credit Transfer and Accumulation System (ECTS). The bachelor's exam is rated with a maximum of 240 CP. The practical phases account for half of each semester and are likewise awarded credit points. The topic of the bachelor's thesis is co-determined by the involved companies and, as a scientifically supported project; it constitutes a considerable added value for the employers.

The accreditation process will be initiated immediately after completion of the module manual. It will not be possible in terms of time to complete this process during the project period. In any case, proper accreditation will be ensured after the end of the project.

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9. Implementation concepts

The project is being carried out in intensive cooperation between all five partners from Austria, Germany, and Lithuania. The preparations and coordination of key points for the individual activities take place in the consortium. On this basis, each individual partner takes on specific tasks, the interim and results of which are in turn discussed and agreed in the consortium. The individual partners take on the following specific tasks:

Wirtschaftskamer Steiermark

- Management and coordination of the entire project
- Testing and evaluation of individual technical modules of the study programme developed in the project

Hanse-Parlament

- Development of concepts and models for dual courses of study with integrated master's / bachelor's degree
- Advising the project partners on the development and realisation of dual courses of study in general and of integrated bachelor's and master's degrees, as well as the practical trials

Universität Graz

- Analysis of alternative ways of conducting the vocational master craftsman's examination and the bachelor's examination as well as the development of examination regulations
- Testing and evaluation of individual economic and pedagogical modules of the study programme developed in the project

Hochschule 21

- Development of the module handbook for the bachelor's degree programme with integrated vocational training and vocational master examination
- Testing and evaluation of individual technical modules of the degree programme developed in the project

Vytauto Didziojo Universitetas

- Analysis of Lithuanian vocational and higher education and preparation of the implementation of vocational master training and the dual study programme developed in the project
- Testing and evaluation of individual economic and pedagogical modules of the study programme developed in the project

The same modules are to be tested in two countries at a time, so that different national conditions can be recorded, and comparisons are made possible.

For the implementation of the specific tasks, short analyses of conditions and key points of the three project countries are summarised below.

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9.1 Germany[16]

9.11 Analysis of the vocational group: Construction occupations

The building industry provides trade occupations requiring an apprenticeship and engineering professions typically requiring a degree in construction engineering.

Trades

There has been a negative trend in trade occupations in Germany since 2007. This is shown by the level of trade apprenticeships and by the numbers of successfully completed final examinations at the end of trade apprenticeships. Numbers have been declining here since 1998 (see Figure1.1).

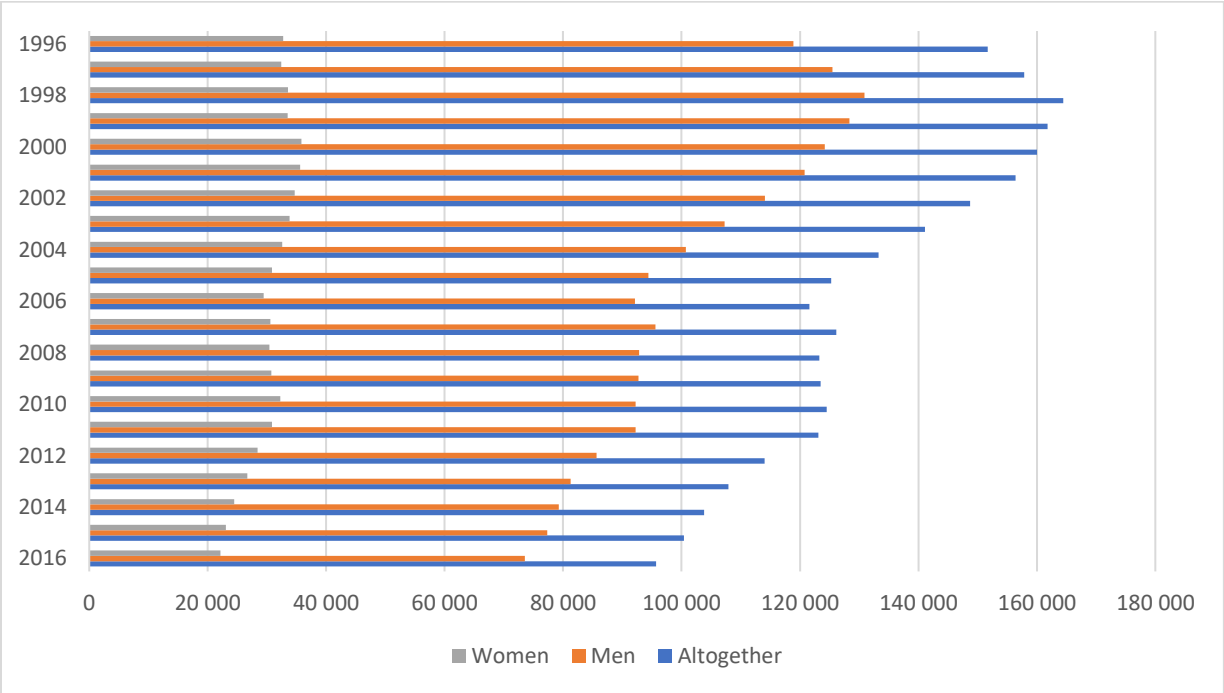

Figure1.1: *Successfully completed final examinations for trade apprenticeships up to 2016*[17]

23.2% of positions for trainees as steel and concrete constructors remain vacant. This shows an alarming trend for the occupations requiring apprenticeships, with a decline of 36.9%, which clearly indicates how unattractive these are.

The development is even worse for the number of master's certificates awarded in Germany. Because of the lower numbers of apprentices, there is also a clear drop in

[16] Prepared by Hochschule 21
[17] Statista, Bestandene Meisterprüfungen im deutschen Handwerk nach Ge-schlecht bis 2016, URL: https://de.statista.com/statistik/daten/studie/244558/umfrage/bestandene-meisterpruefungen-im-deutschen-hand-werk-nach-geschlecht/ (28.02.2018)

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the numbers of new trade masters. Whereas in 1996 there were 40,783 new masters, by 2016 the number had fallen to 21,266 (Figure 1.2). This represents a decline of 47.9%, which is even more drastic than for the completed apprenticeships.

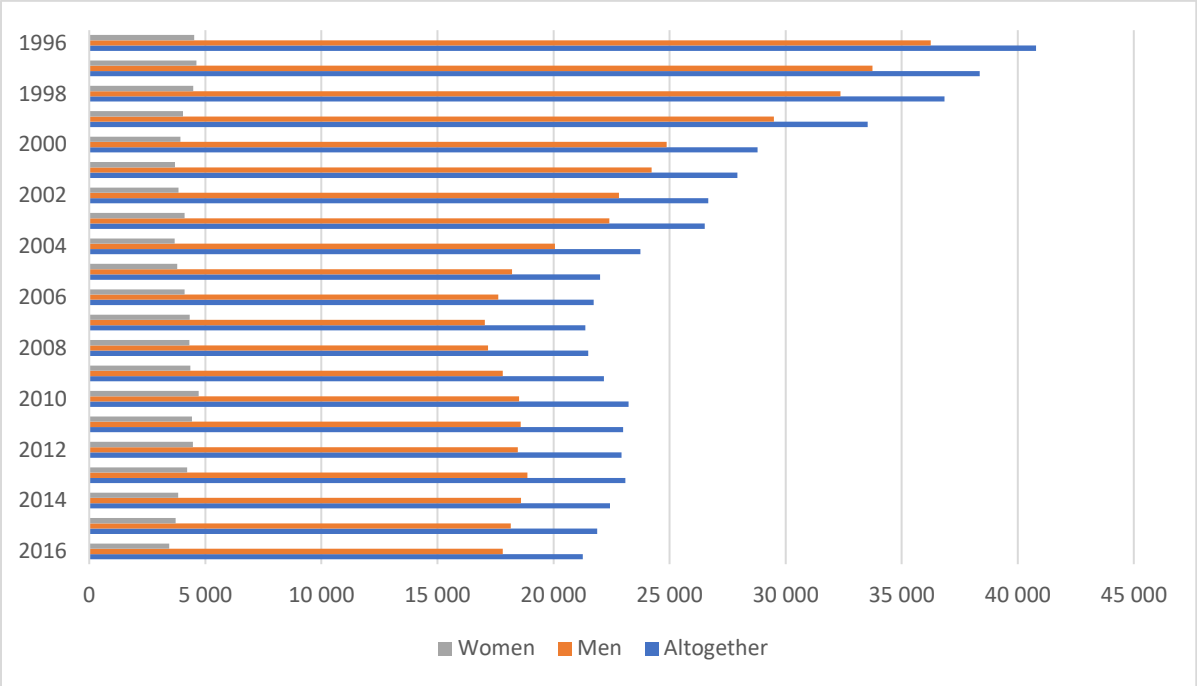

Figure 1.2: Master's certificates gained in trades in Germany up to 2016[18]

According to the authors Meier, Mulatz, and Pollack: "In 2020, the labour force (in Germany) will have fallen by nearly five per cent compared to 2010"[19]. In addition to the lower numbers of new qualified workers and masters in the trades, the baby-boomer generation is reaching retirement age, so that the supply of trade services will get gradually worse. There is an urgent need for action.

According to the EU classifications, there are five categories in the building industry:

- Preparatory site work,
- Building and civil engineering,
- Building installations,
- Other construction works, and
- Leasing of building machines and equipment with operating personnel.

[18] Statista, Anzahl der bestandenen Gesellen- bzw. Abschlussprüfungen im deutschen Handwerk nach Geschlecht von 1996 bis 2016, URL: https://de.statista.com/statistik/daten/studie/244759/umfrage/bestandene-ge-sellen-bzw-abschlusspruefungen-im-deutschen-handwerk-nach-geschlecht/ (28.02.2018)
[19] Meier, K.; Mulatz, R.; Pollack, F. Mitarbeiter: Schluss mit starren Zeitmodellen. URL: https://www.handwerk-magazin.de/mitarbeiter-schluss-mit-starren-zeitmodellen/150/378/260320 (20.1.2018)

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The focus here will be on the second category – Building and civil engineering. The numbers of apprentices in the construction and building sector fell from 57,490 in 2014 to 54,252 in 2016[20].

The trades requiring apprenticeships in the building and civil engineering sector are as follows[21]:

- Road constructor,
- Special civil engineering constructor,
- Supply pipeline constructor,
- Sewerage constructor,
- Well constructor,
- Railway constructor,
- Building machine operator,
- Joiner,
- Bricklayer,
- Concrete and steel constructor,
- Chimney and furnace constructor,
- Plasterer,
- Wood and building protection specialist,
- Tile and mosaic layer,
- Dry-lining installer,
- Cast stone and terrazzo makers,
- Thermal and acoustic insulation installer and
- Screed layer.

Figure 1.4 shows a decline for bricklayers and concrete workers from 240,900 in 2004 to 202,000 in 2011.

		2004	2005	2006	2007	2008	2009	2010	2011	2012*	2013*	2014*
Total (all occupations)		26,548,000	26,299,600	26,533,900	27,050,500	27,695,400	27,603,300	27,966,600	28,643,600	29,280,000	29,615,700	30.174.500
Non-academic building occupation.		1,050,000	969,800	967,000	973,600	963,400	953,600	966,300	982,500	-	-	-
of which	Building workers	666,600	607,800	609,700	609,800	601,300	598,300	611,600	622,700	-	-	-
	Bricklayers, concrete workers	240,900	216,500	214,700	207,800	202,800	199,300	200,900	202,000	-	-	-
	Joiner, scaffolders	143,500	133,000	134,000	138,600	135,700	134,400	141,100	145,300	-	-	-
	Road+ civil engineering workers	117,700	112,000	112,500	113,300	111,600	111,600	111,700	112,600	-	-	-
	Labourer	164,600	146,200	148,500	150,100	151,200	153,000	157,900	162,700	-	-	-

[20] Statista, Lehrlingsbestand im Handwerk geordnet nach Gewerbegruppen in Deutschland in den Jahren 2014 bis 2016, URL: https://de.statista.com/statistik/daten/studie/30500/umfrage/lehrlingsbestand-im-handwerk-nach-gewerbegruppen/ (21.2.2018)

[21] Zentralverband Deutsches Baugewerbe. Im Bauhauptgewerbe stehen 18 Berufe für eine qualitativ hochwertige und moderne Ausbildung. URL: https://www.zdb.de/zdb-cms.nsf/id/ausbildungsberufe-de (15.1.2018)

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of which	Fitters (general)	383,400	362,000	357,300	363,800	362,100	355,300	354,700	359,800	-	-	-
	Building fitters	111,100	101,900	100,600	102,900	101,200	100,100	100,400	101,700	-	-	-
	Interior fitters, upholsterers	44,100	41,400	39,800	40,300	39,900	38,800	38,200	38,800	-	-	-
	Painter	228,200	218,800	216,800	220,600	221,100	216,300	216,100	219,200	-	-	-
Academic building occupations.		122,200	117,200	116,300	117,600	121,100	122,500	124,700	128,100	-	-	-

Figure 1.3: Numbers gainfully employed in building trades, as of 30 June (rounded)[22]
*(Detailed data not available due to the introduction of a new classification system.)

The statistics for bricklayers for the period 2012 to 2016 show the same trend, with a 2.3% decline from 94,352 to 92,203[23].

Construction engineering

The development for engineers is very different. The numbers of gainfully employed engineers have been steadily increasing, as shown in Figure 1.4.

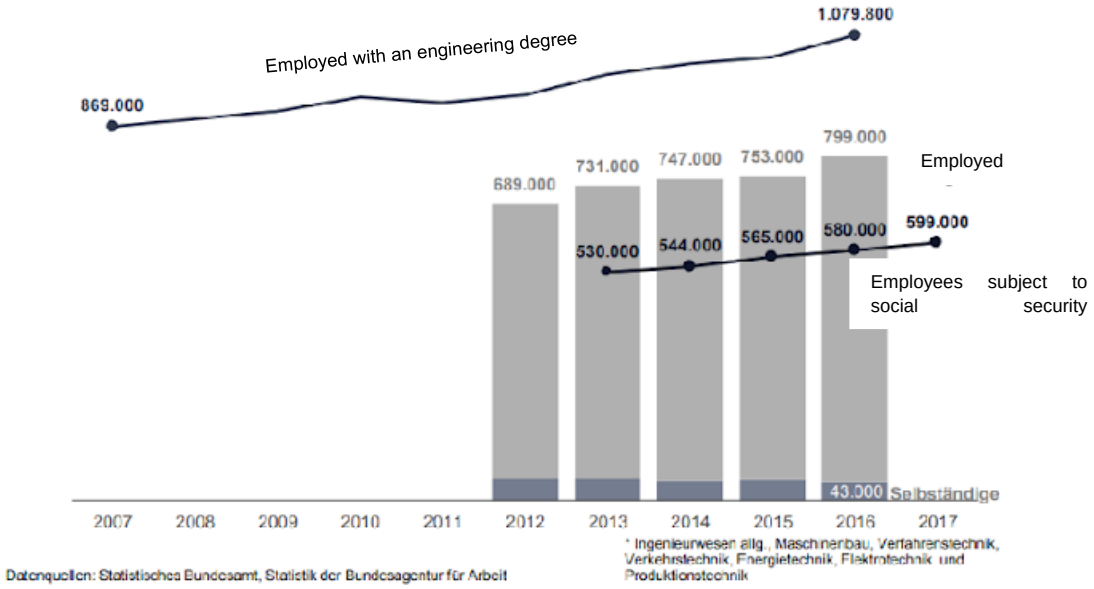

Figure 1.4: Engineering graduates in employment, employed in engineering, or self-employed[24]

However, not all engineering graduates go on to work in this sector. Some 280,000 engineers do not work in this profession. Nevertheless, there has been a steady 3% growth in the numbers that are gainfully employed.

[22] Arbeitsagentur, Der Arbeitsmarkt im Bausektor, URL: https://statistik.arbeitsagentur.de/Statischer-Content/Ar-beitsmarktberichte/Branchen/generische-Publikationen/Baubericht-2014.pdf (17.2.2018)
[23] Statista, Anzahl der sozialversicherungspflichtig beschäftigten Maurer in Deutschland von 2012 bis 2016, URL: https://de.statista.com/statistik/daten/studie/243149/umfrage/anzahl-der-beschaeftigten-maurer-in-deutschland/ (21.2.2018)
[24] Arbeitsagentur, Ingenieurinnen und Ingenieure, URL: https://statistik.arbeitsagentur.de/Statischer-Content/Ar-beitsmarktberichte/Berufe/generische-Publikationen/Broschuere-Ingenieure.pdf (17.2.2018)

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Figure 1.5 shows the age structure of the gainfully employed construction engineers in four years from 2000 to 2013. It is particularly noticeable that a large proportion of the construction engineers are above the age of fifty. This implies that in Germany more than a third of the jobs in this sector will become vacant over the next 17 years.

A good indicator for the level of demand for engineers is the vacancy period – how long it takes before a replacement is found for a vacant position. In 2017 this was 99 days. The comparable figure for 2010 was 70 days.

Considering the development of gainfully employed architects and engineers, there was decline through to 2005. In the following years the numbers of gainfully employed people increased from 373,600 (2005) to 496,100 (2014) [8].

Taking these three factors into account – vacancy periods, retirements, and increased numbers gainfully employed, the overall development is very similar to that of the construction trades.

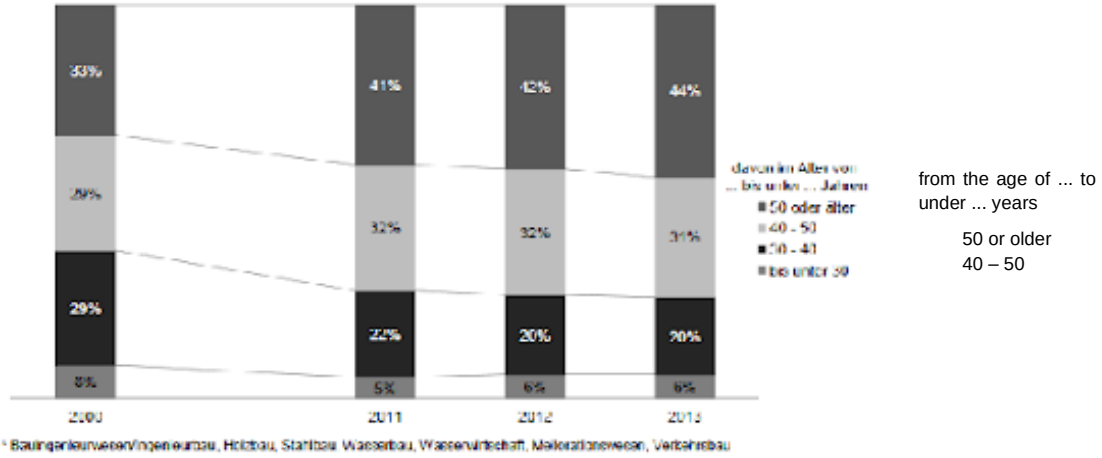

Figure 1.5: Gainfully employed graduates with a higher education qualification in construction engineering (in age groups)[25]

9.12 Meeting requirements for higher education qualifications in Germany

In the German Qualification Framework (DQR)[26], the qualifications are divided into:

- Specialist skills
  - Knowledge and
  - Abilities

[25] Arbeitsagentur, Der Arbeitsmarkt im Bausektor, URL: https://statistik.arbeitsagentur.de/Statischer-Content/Ar-beitsmarktberichte/Branchen/generische-Publikationen/Baubericht-2014.pdf (17.2.2018)
[26] Der Deutsche Qualifikationsrahmen für lebenslanges Lernen. URL: https://www.dqr.de/index.php (29.10.2017)

- Personal skills
  - Social skills and
  - Autonomy

The DQR Level 6 that applies for the bachelor's degree and the master's certificate (Table 1.1) describes the skills required for planning, implementation, and evaluation of comprehensive specialist tasks and for the independent control of process in a sub-section of an academic field or in a vocational field. The complex structure of the requirements is subject to frequent changes.

Table 1.1: Qualifications in terms of specialist skills (knowledge and abilities) and personal skills (social skills and autonomy) in accordance with DQR Level 6 for higher education institutions)

Qualification	Description
Knowledge 1	Have a broad and integrated knowledge, covering scientific foundations, the practical application of a science subject and a critical understanding of the most important theories and methods (equivalent to Level 1 = Bachelor level of the framework for German higher education qualifications)
Knowledge 2	Have knowledge of the further developments of a scientific subject or a vocational field and have relevant knowledge of the interface with other fields
Skills 1	Be able to apply a very broad range of methods for tackling complex problems in a scientific subject (equivalent to Level 1 = Bachelor level of the framework for German higher education qualifications)
Skills 2	Develop new solutions and assess these based on various criteria, also under frequently changing requirements
Social skills	Work responsibly in expert teams or lead groups or organisations and the specialist development of others and deal proactively with problems in the team
Autonomy	Define, reflect on, and evaluate targets for learning and work processes, and independently shape sustainable learning and work processes

Qualification goals/Intended learning outcomes

The demand for construction engineers has been very high for some years, and this is intended to remain the case in the coming years[27].

[27] Nachfrage nach (Bau-)Ingenieuren ist hoch – Interview mit H.-U. Kammeyer, Präsident der Ingenieurkammer Niedersachsen. Baurundblick, hrsg. vom Bauindustrieverband Niedersachsen-Bremen e.V., Ausgabe 2, Februar 2017

The bachelor's study programme "Construction engineering DUAL with master's certificate" is intended to prepare students for a qualified occupational activity in all sectors of construction engineering, i.e., planning, implementation, and supervision of building measures. The requisite learning results of the study programme are:

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Knowledge:	Graduates know the state-of-the-art in construction engineering. This includes basic knowledge of the subject to be able to solve engineering problems (conception, design, dimensioning and construction) in the field's framework design, geotechnics, hydro-engineering plants, and traffic installations. They are also able to use their basic technical knowledge to independently develop specialist knowledge from the literature, including industrial standards. Graduates can participate as a qualified specialist in both the planning and the implementation of all sorts of building projects, including maintenance.
Abilities:	Graduates use standard methods and techniques in the planning and implementation of construction work. They can adapt methods to specific projects and to develop these further. They can apply control methods and tools appropriately. They work independently, analytically, and constructively, and can handle instruments of project management and Building Information Modelling (BIM).
Specialist skills:	Graduates can criticise constructively both their own work and the work of others and can respond constructively to criticism of their own work. They use creativity and intuition and are problem- and goal-oriented. They motivate themselves and are prepared to bear responsibility.
Social skills:	Construction engineers are familiar with techniques for communications, mediation, and negotiations. This makes them able to coordinate and mediate in construction projects. They have a clear view of cultural, social, and ethical questions and have experience of inter-disciplinary project work. The inter-disciplinary education provides the basis for future leadership responsibilities.

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The study programme must comply with the recommendations of the German Association of Departments of Civil Engineering (FBT Bau)[28], which in turn is based on Level 6 of the German Qualification Framework (DQR).

The contents of the study programme are designed to have at least 70% STEM contents (STEM = Science, technology, engineering, and mathematics). This entitles graduates to receive an additional engineering certificate from the Chamber of Engineers of Lower Saxony[29].

9.13 Eligibility

Expected entrance qualifications

The legal requirements for admission to a bachelor's degree course in Lower Saxony is defined as follows in the state higher education act (Article18 NHG)[30]

- The general higher education entrance qualification,
- The higher education entrance qualification for a special field, and
- The entrance qualification for a university of applied science.
- A master's certificate or technician's certificate, or
- The completion of at least a three-year vocational training course in a relevant field with at least three years occupational experience (see the Admission and Matriculation Regulations (ZIO)).

Further requirement is

- The conclusion of a contract with a practical partner recognised by the university by the start of the first practical phase.

The requirements for the master's exam in accordance with Article 49 (4) of the Crafts and Trades Ordinance (HwO)[31] are as follows:

(1) A pass in the trade exam in the trade subject to authorisation for which the master's certificate is sought, or in a related trade subject to authorisation, or a corresponding final exam in a recognised vocation or an exam on the basis of a legal ordinance based on Article 45 or Article 51a Para 1 in combination with Para. 2, or holds an equivalent recognition in accordance with Article 40a for the trade subject to authorisation or a related trade subject to authorisation.

[28] Kenntnisse, Fertigkeiten und Kompetenzen im Kernstudium von Bachelorstudiengängen des Bauingenieurwesens an Hochschulen für angewandte Wissenschaften. Hrsg. vom Fachbereichstag Bauingenieurwesen, Stand April 2015
Oberbeck, N.; Werkle, H.: Kenntnisse, Fertigkeiten und Kompetenzen im Kern-Studium von Bachelorstudiengängen des Bauingenieurwesens an Hochschulen für angewandte Wissenschaften. VDI-Jahresausgabe 2015/16 der Zeitschrift Bauingenieur, S. 13 – 18

[29] Nachfrage nach (Bau-)Ingenieuren ist hoch – Interview mit H.-U. Kammeyer, Präsident der Ingenieurkammer Niedersachsen. Baurundblick, hrsg. vom Bauindustrieverband Niedersachsen-Bremen e.V., Ausgabe 2, Februar 2017

[30] Niedersächsisches Hochschulgesetz (NHG) in der Fassung vom 26. Februar 2007 (Nds. GVBl. S. 69), zuletzt geändert durch Artikel 1 des Gesetzes vom 15.12.2015 (Nds. GVBl. S. 384)

[31] Verordnung über die Lehrverpflichtung an Hochschulen (Lehrverpflichtungsverordnung - LVVO -) vom 2. August 2007 (Nds.GVBl. Nr.24/2007 S. 408), geändert durch VO v. 6.5.2008 (Nds.GVBl. Nr.9/2008 S.129)

(2) A pass in another trade exam or another final exam in a recognised vocation and work for a few years in the trade subject to authorisation for which the master's certificate is sought. Not more than three years shall be required for the period of work. Furthermore, the successful completion of the vocational school shall be considered with one year for a one-year vocational school course, or two years for a course of two or more years.

(3) If the examinee is self-employed in the trade for which a master's certificate is sought, or has been a work's master, or has worked in a comparable position, or has gained practical experience comparable to that of a journeyman, then the period of this activity is also to be considered.

(4) On application the Chamber of Trades and Crafts may

(1) Shorten the period of vocational activity previously set as three years after taking into special account the vocational aptitude demonstrated in the trade exam and during the period of vocational activity,

(2) In exceptional cases, waive the requirements of items (1) to (4) in whole or in part,

(3) Taking into consideration foreign vocational qualifications and periods of vocational activity in other countries, waive the requirements of items (1) to (4) in whole or in part.

The Chamber of Trades and Crafts may consult the Master Examination Committee.

Student workload

The limit for the annual workload of a full-time student is set by the Standing Conference of the Ministers of Education and Cultural Affairs of the states in the Federal Republic of Germany (KMK) at 1,800 hours, and for the dual study programme this must be divided appropriately between the theoretical and practical phases. It is assumed that a credit point (CP) involves an average workload of 27.5 hours:

- From ca. 22nd September until ca. 22nd December there is a 13-week theoretical phase (Autumn Semester), and from ca. 22nd March until ca. 22nd June a 13-week theoretical phase in the Spring Semester (each including an examination phase).

A special case is when a student has passed the first level trade exam and wishes to obtain the second level in parallel to the study programme ("Dual²", Table 1.3). This highest level, the master's certificate consists of

- Part I (Proof of practical expertise in the special field),
- Part II (Proof of theoretical knowledge in the field),
- Part III (Proof of management skills) and
- Part IV (Proof of trade and work instruction ability).

Part IV corresponds to the instructor exam in accordance with the Ordinance on Trainer Aptitude (AEVO). As an alternative to the master's certificate, taking only the exams of

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Parts III and IV can lead to qualification as a “Business management specialist” (*Kaufmännische Fachwirt*).

Table 1.3: Parts of the master’s exam required in addition to the BAU study programme

Vocational training as	Study programme	Required parts
Bricklayer, concrete worker, joiner	BAU	III, IV [1]) [2])

[1]) Part III of the master’s exam can be waived for BAU students on graduation if they have additional taken the courses RWJ, WIR and PBR

[2]) Part IV of the master’s exam is regularly offered as a key qualification

Under the Cooperation Agreement with the Chamber of Trades and Crafts only the parts shown in Table 1.3 are required, so that the additional workload for the students is considerably reduced. Except for Part I of the master’s exam, which is no longer required in the main construction occupations anyway, the missing parts are offered in courses that are coordinated with the rest of the timetable. As a rule, the examination for Master/ Business management specialist does not lead to an extended period of study.

Quality assurance/Successful completion of the programme

The quality management of the University is process oriented and has been developed based on the “Student Life Cycle” in accordance with EN ISO 9001:2015 and EN ISO 29990 for learning service providers. The quality management has the key tasks of ensuring the quality of the study programme and the teaching and research. Details of the organisation are provided in a quality management handbook.

9.14 Implementation in Germany

During the project period, the complete module manual for the "Smart Building Technology" degree programme is being developed by Hochschule 21, which will also test and evaluate individual technical modules in practice.
The dual study program “Smart Building Technology – Energy Technology and Building Automation” developed in the project will be implemented in Germany by Hochschule 21. However, no initial vocational training is integrated here. Participants who wish to take a vocational master examination must obtain initial vocational training by other means to obtain the admission requirements (see Chapter 5. Alternative options for achieving vocational training and activities). As part of the dual study programme at the Hochschule 21, it focuses the integrated vocational master training on the professions of the electrical trade.

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9.2 Lithuania

9.21 Analysis of existing Situation in Lithuanian higher Education Institutions of Electrical Engineering professional Bachelor Training[32]

Summary of the situation

To determine the general situation of the preparation of electrical engineering specialists (bachelors) in Lithuania, Lithuanian higher education institutions (universities and colleges) were studied. To determine the possible need of bachelor-master's in electrical engineering, the discussion with main associations such as Lithuanian Builders Association, Lithuanian Railways, and Lithuanian Electricity Association as well as discussions with heads of individual companies (electrical engineering, construction) were held.

Table 1 presents the current numbers of the preparation of electrical engineering students in Lithuanian higher education institutions. During discussions with the above-mentioned entities, it turned out that the companies are interested in the preparation of such specialists (bachelor-masters). This creates favourable conditions for practical training in enterprises.
In the construction sector, such specialists (bachelor-masters) are very lacking. Due to the large shortage of specialists, it often happens that the self-study masters are working.
Thus, the current situation is favourable for the preparation of bachelor-master's in electrical engineering, as their need is felt.

Training of electrical engineering specialists in Lithuanian higher education institutions (universities and colleges)

The numbers of electrician engineering bachelor student preparation in Lithuanian higher education institutions are given in table 1.

Table 1. Preparation of the electrical engineers in Lithuanian universities and colleges

Position	***University/College***	***Program***	***Number of graduates per year***	***Notes***
Universities				
1.	Vilnius Gediminas Technical University	Automation	25	
		Electrical energy engineering	20	**New program**

[32] Prepared by Vilnius Gediminas Technical University

2.	Kaunas University of Technology	Automation and control	40-50	
		Electrical engineering	20	
3.	Klaipėda University	Electrical engineering	20	
				TotalH130
Colleges				
1.	Kauno Kolegija/ University of Applied Sciences	Automation and control	20	
2.	Kaunas University of Applied Engineering Sciences	Electrical energetics	25	
3.	Klaipeda state university of Applied Sciences	Electrical and automation engineering	15	**New program**
4.	Panevezys University of Applied Sciences	Electrical and automation equipment	15-20	
5.	Šiauliai State College	Automation and electrical engineering	15-20	
6.	Utena University of Applied Sciences	Electrical energetics	15-20	
		Automation and electrical engineering	15-20	
7.	Vilnius College of Technologies and Design	Electrical engineering	15-20	
		Electrical and automation engineering	15-20	
				Total H150

From Table 1, we can see that around 280 electrical engineers are being trained annually in Lithuanian higher education institutions. From this number 40 graduates can be discarded, as these programs are new, and the students will finish universities and colleges only in 4 years. So, in the current situation there are about 240 graduates each year. There are no statistics on how many graduates work in the field of specialization, but the actual situation in the first part of the report shows that not all do.

Orientation demand of the electrical engineering (Bachelor-Masters) specialists

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At present, in the Lithuanian electricity sector, according to the type of work, specialists in the following fields are required: electrical engineers operating users electrical devices; electricians working in power plants; electrical equipment operational personnel; operative repairers; electrical equipment installers; workers.
According to the data of the Lithuanian Department of Statistics, in Lithuania annually moderate 5000 electricity sector employees are certified. Because recertification is carried out every 4 years, there are currently about 20,000 certified employees in the electricity sector of Lithuania.
To say that the generation of people is renewed every 30-40 years, we will receive:

$$\frac{20000}{30} = 666; \frac{20000}{40} = 500,$$

On average, about 500-666 workers in the field of electrical engineering are required each year.
According to the data of the Lithuanian Department of Statistics, in the 4th quarter of 2017 there were 5700 vacancies in the Lithuanian industrial and construction sectors. Including about 10%, this is about 570 vacancies related to the field of electrical engineering. From this number about 2/3 could be bachelor-masters which will be about 342 bachelor-master specialists.

During discussions with heads of the companies who work in the field of electrical engineering it turned out that they are very interested in the preparation of such specialists (bachelor-masters). Many companies are absolutely satisfied with theoretical knowledge of the universities and colleges graduate students, but practical preparation does not meet their expectations. Most of the companies said that the practical skills of the new employees, which is the first job after graduating from the universities or colleges must be taught by themselves.
Also, it should be noted that the graduate students from the universities are more interested in design and management work in the field of electrical engineering, than in electrical installation. It shows that there is more need for bachelor-master specialists in the era of electrical engineering.

Construction sector

In the current situation Lithuanian construction sector requires dual use of the electrical engineering specialists: first, automation specialists; secondly, electrical installation specialists (works indoor and outdoor).
About 100 thousand people work in Lithuanian construction sector. Including about 12%, about 12 thousand are related to electrical engineering works.
If we accept that the generation of people is renewed every 30-40 years, then we will receive:

$$\frac{1200}{30} = 400; \frac{1200}{40} = 300,$$

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From the formula above we can say that on average, each year about 300-400 workers of this specialty are need. This number is distributed in this way: about 100-130 automation specialists and about 200-260 electrical installation specialists are needed each year. These are indicative numbers for professional schools.

Approximate demand for electrical engineering bachelor-masters

In Lithuania, today the construction sector employs about 18 thousand certified construction managers. Including about 12%, this is about 2160 workers who are related to the field of electrical engineering. If we accept that the generation of people is renewed every 30-40 years, then we will receive:

$\frac{2160}{30} = 70;\ \frac{2160}{40} = 50,$

From the formula above we can say that on average, each year about 50-70 bachelor-masters of electrical engineering are needed.

Lithuanian railways

Recently, the electrification and automation of the individual railroad sections are being carried out in Lithuania. The volume of these works will not decrease soon. Professionals from the field of automation and electrical engineering are needed to install railroad contact network service bases. For this purpose alone, about 60 high-tech electrical personnel are needed. About 2/3 could be bachelors-masters. It would be about 10 people per year. Doubling more needs to be done on electrification work on individual sections of the railway. So, each year, a total of 30-50 specialists would be needed.

Conclusions

1. Electrical engineering bachelors-masters in Lithuania's various profile companies are very necessary. Because they are lacking, in many cases the self-study masters are working.
2. There are currently about 600 shortages of employees in the field of electrical engineering in Lithuania. Therefore, the number of graduates with electrical engineering qualifications prepared by universities and colleges does not meet the current market situation.
3. Lithuanian railways have been modernized in recent years, which has led to a significant increase in the need for the specialists from the field of electrical engineering. Lithuanian railways each year will accept about 50 bachelor-masters.
4. Regarding the natural labour force renewal, the need for electrical engineering bachelor-masters specialists, having regard to the number of their training in Lithuanian higher education institutions, will be constant.

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9.22 Analysis and determination of required legal requirements and conditions for obtaining the master craftsman qualification and Bachelor 's degree[33]

General provisions

Study programs should be prepared based on the description of the qualification structure of Lithuania (Official Gazette, 2010, No. 56-2761), a description of the general requirements for the first cycle and integral study programs, which are approved by the Minister of Education and Science for 2010. April 9 Order No V-501 (Official Gazette, 2010, No. 44-2139, Official Gazette 2012, No. 21-977), Description of Continuous and Continuing Studies (Official Gazette, 2009, No. 59-2325), General Requirements for Joint Study Programs, approved by the Minister of Education and Science in 2011 July 29 Order No V-1468 (Official Gazette 2011, No. 99 4679), Description of the Study Degrees, approved in 2011 November 21 Order No V-2212 (Official Gazette, 2011, No. 143-6721), the Regulation on the field of study in the field of general technology science (engineering studies) and the Regulations of the Studies of the Vilnius Gediminas Technical University.

Definitions used in the description: 2.1. **Study credit** is a unit of study subject volume measuring the study results and student's working time. One academic year (1600 hours of contractual study) corresponds to 60 credits. One theoretical study week equals 40 contractual student hours and corresponds to 1.5 credits. One internship week is from 32 to 40 contractual student hours and corresponds to 1.2-1.5 credits.

The study module is an independent study subject covering various forms of study: lectures, laboratory works, exercises, seminars, students' independent work, design work, practices, other forms of study and combinations of study forms. The study program consists of a course or a part of the study course, a course project, a complex course project, internships, and a final project / work module. The minimum number of credits for the study subject module is 3 credits, while the minimum number of credits step is 1 credit. The recommended step number of credits for the study subject module is 3 credits.

Module is a part of the curriculum consisting of several content related subjects, which includes several study modules, having a definite purpose and focusing on certain student abilities; The minimum module volume is 12 credits. The step number of credits in the module is 3 credits.

General requirements for study programs

The volume of first cycle postgraduate study programs is 210 or 240 credits (depending on the study duration and internal university decision).

[33] Prepared by Vilnius Gediminas Technical University

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The duration of the first cycle of continuous university studies − 4 years. By the internal university decision, a permanent university study program can be established for 3.5 years with a volume of 210 credits.

The intensity of continuous studies - 60 credits per year. With internal university decisions, the intensity can be changed.

The program, after which the bachelor's degree is awarded, consists of three target parts: 6.1. **Part (A)** – general university subjects, covering issues of philosophical outlook and general erudition higher education, which are not directly related to the content of the studies of the regulated field. The subjects of humanities and social sciences and arts are chosen for the development of general erudition, and the subjects of physical and biomedical sciences are devoted to the studies of art and social sciences. The volume of general university subjects must be at least **15 credits**. **Part (B)** – covering theoretical and professional subjects, is obligatory for all study programs of the field and provides the knowledge and skills necessary for obtaining a bachelor's degree in the field. This part forms the core of study in each study program. This part also includes special subjects, practices, and final projects. The volume of the study fundamentals is at least **165 credits**.

Part (C) – The volume of this part is no more than **60 credits**. The part of the specialization may consist of 6.3.1. University-determined and student-selective subjects for deeper specialization in the same field.

Student-freely chosen subjects.

The volume of the practice must be at least **15 credits.**

The final project / work volume must be at least **15-18 credits**.

Fundamental worldview subjects covering the philosophical and historical foundations of physical and technological sciences.

Humanitarian, social, or artistic studies.

Specialty language, cultural studies.

Foreign language studies.

Division of study subjects in the field of engineering and technology (B) (study program core): 6.7.1. General Fundamentals of Technology. **At least 66 credits**: 6.7.1.1. general theoretical subjects in the field of technology science: mathematics, physics, and chemistry. Not less than 36 credits, of which mathematics are not less than 21 credits.

Other general subjects in the field of technology science: mechanics, electrical engineering, electronics, materials science, information technology, engineering graphics, environmental and human safety - at least 30 credits.

The main subjects of the study field are not less than 40 credits.

Subjects in social sciences: economics, management, law, and others - at least 12 credits.

Summary of general requirements for study programs

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A	**General university subjects**	**>=15**
A1	Fundamental subjects	
A2	Humanitarian, social or artistic subjects	
B	**Theoretical and professional subjects**	**>=165**
B1	General Theory subjects	>=30
B3	Main subjects of the study field	
B4	Subjects in Social Sciences	15
B6	Professional and Cognitive Practice	15-21
B7	Final Project	15-18
C	**Subjects of the specialization**	**<=60**
C1	Subjects for deeper specialization	
C2	Student-freely chosen subjects	
Overall:		**210or 240**

9.23 Implementation in Lithuania

In Lithuania, there is no vocational master training so far. Similarly, dual courses of study are still largely unknown in Lithuania. Therefore, the following work is to be carried out in Lithuania during the project period.

- Analyses of the Lithuanian system of vocational education and training, further education, vocational master training and higher education. Consultations with ministries, chambers and training providers on the interests, possibilities, and legal conditions for introducing vocational master training.
- Development of a strategy and action concept for the implementation of vocational master training in Lithuania
- Analysis and description of the Lithuanian higher education system. Consultations with ministries, universities, accreditation agencies and vocational schools on
  a) the interests, possibilities, and legal conditions for the realisation of dual bachelor programmes in Lithuania
  b) the possibilities and legal conditions for realising initial vocational training within the framework of dual study programmes.
- Development, consultation, and coordination of a realisation concept for the future implementation of dual study programmes in general and the integrated training programme with three degrees developed in the project in particular - including the conditions and requirements for accreditation.
- Preparation of the implementation of the dual study programme developed in the project in Lithuania.
- Testing and evaluation of modules "Business Administration" and “Vocational and Occupational Pedagogy".

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9.3 Austria[34]

Apprenticeship/dual training in Austria

In Austria the vocational training is carried out in a dual system. The places of learning are on the one hand the vocational school (20%) and on the other hand the training company (80%). The prerequisite for an apprenticeship is the completion of nine years of compulsory schooling. The duration is between 2 and 4 years, as there is also the possibility of a reduced apprenticeship. To make the apprenticeship attractive for school leavers or to enable people with an apprenticeship qualification to switch to another subject, a so-called shortened apprenticeship can be completed. The resulting increased choice makes it easier - with a variety of professional options - to start or change careers in business. The necessary pre-conditions are:
− a high school diploma of an AHS (higher general education schools) or BHS (upper vocational education schools) or
− the final examination of a BMS (vocational intermediate secondary school) of at least three years,
− a completed apprenticeship and final apprenticeship examination or
− successful completion of a skilled worker examination in an agricultural and forestry apprenticeship.[35]
The training for an apprenticeship is completed by a final apprenticeship exam. The following laws serve as legal basis: „Berufsausbildungsgesetz – BAG“, „SchOG – Schulorganisationsgesetz“, „Kinder- und Jugendlichen-Beschäftigungsgesetz – KJBG“.

Master training

The highest qualification that you can achieve after completing an apprenticeship in Austria is the master. To obtain a master's degree, you must successfully complete the master's examination. A master craftsman is professional training for professions that belong to the crafts. However, you do not necessarily need an apprenticeship qualification to complete the master’s examination. In Austria, people over the age of 18 can take the master craftsman’s examination, even if they have not had any specific training. However, since the master craftsman's examination is very practice-oriented, a completed apprenticeship or sufficient professional experience makes it easier to become a master craftsman.

[34] Prepared by WKO Steiermark
[35] Verkürzte Lehrzeit. URL: https://www.wko.at/service/ooe/bildung-lehre/verkuerzte_Lehrzeit.pdf (15.05.2023)

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In Austria, a distinction between industrial master craftsman and foreman is made:

- As an industrial master craftsman, you not only have excellent technical training, but you also have commercial training that enables you to run the company independently. To become a master craftsman, you must pass the master craftsman's examination and then enter the master craftsman's title in official documents.
- As a foreman, you will attend a foreman school and will be trained in two years to become a qualified manager for various trades and industries. You need an apprenticeship in the same or a similar subject. The difference to the master craftsman is that foreman do not take a major master craftsman's examination, but rather several smaller examinations during the training. However, since foremen do not take a master's examination, they are not allowed to state the title of master in official documents.

The master's examination consists of the following **five examination modules**:

1. Project-oriented technical practical examination: The project-oriented module consists of two parts, Part A and Part B. Part A is proof of your technical skills, but this is not required if you have already passed a final apprenticeship exam. Part B revolves around your organizational, planning, technical and executive skills. Samples of work or masterpieces are often required for this module.
2. Technical oral exam: The technical oral examination also consists of part A and part B. For part A you must prove your professionalism in the subject-oriented area. Like in point 1, Part A is omitted if you have already passed the final apprenticeship exam. Part B, on the other hand, includes a presentation of your skills in quality management and safety management. This is usually a conversation about your work practice and how you are now working.
3. Technical-theoretical written exam: For this module you must prove your technical, planning, mathematical and costing knowledge in a written exam. If you have already taken similar exams during your apprenticeship, these can be credited.
4. Instructor exam: The fourth module is the trainer examination, which imparts the pedagogical and legal knowledge for apprenticeship training. The trainer examination is necessary if you want to train apprentices in the company yourself. It can be omitted if you have already completed equivalent examinations or training courses.

5. Entrepreneur Examination: Your commercial knowledge will be put to the test during the entrepreneurial examination. The exam consists of a written and an oral part. With a positive entrepreneurial examination, you are qualified to

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practice a craft independently. A successfully completed entrepreneurial examination can replace the trainer examination and be credited for other master craftsmen.

In Austria, the chamber of commerce in each federal state (in the respective capital city) has a so-called master examination office and examination commissions for crafts and regulated trades, although the latter are not intended for every trade in every federal state. The legal basis for this is formed by: “Allgemeine Prüfungsordnung - APO”, “Gewerbeordnung – GewO”, as well as regulation by federal ministry.[36]

Bachelor

In Austria, you can earn a bachelor's degree at the following tertiary educational institutions: all types of universities, universities of applied sciences, teacher training colleges and private colleges. Prerequisites for this are:

- at universities and teacher training colleges: the general university entrance qualification & the special university entrance qualification.
- at universities of applied sciences: The general university entrance qualification or relevant professional qualifications.

You can achieve the general university entrance qualification[37]in 3 different ways:

- with an Austrian school leaving certificate (AHS, BHS, vocational exam) or
- a university entrance qualification examination.
- but also, with a so-called "IB Diploma"[38] (The International Baccalaureate (International Abitur, International Matura) is an international recognized Swiss school-leaving certificate awarded by the Geneva-based Organization du Baccalauréat International (OBI), english: International Baccalaureate Organization) or a European Abitur certificate.

In addition, all foreign qualifications can be considered as evidence if they open access to higher education in the issuing country.

The university entrance qualification examination[39] enables access to a specific university, college, or technical college degree, to a specific college or a teacher training college. The requirements are a minimum age of 20 years, citizenship of an EEA member state, proof of professional or non-professional training suitable for the desired course of study. The university entrance qualification only gives

[36] Der Meister: Definition, Gründe & Perspektiven. URL: https://hokify.at/karriere/ausbildung-lehre/der-meister-definition-gr%C3%BCnde-perspektiven (15.005.2023)
[37] Hochschulzugang in Österreich (allgemeine Universitätsreife). URL: https://www.bmbwf.gv.at/Themen/HS-Uni/Anerkennung/Universit%C3%A4tsreife.html#:~:text=Die%20allgemeine%20Universit%C3%A4tsreife%20ist%20mit,oder%20einem%20Europ%C3%A4ischen%20Abiturzeugnis%20erf%C3%BCllt (15.05.2023)
[38] International Baccalaureate. URL: https://de.wikipedia.org/wiki/International_Baccalaureate (15.05.2023)
[39] Studienberechtigungsprüfung. URL: https://www.bmbwf.gv.at/Themen/eb/zb/studbp.html (15.05.2023)

access to the type of training for which the university entrance qualification was specifically taken. Changing your degree is only possible to a limited extent. In the case of studies with admission procedures, the successful completion of the university entrance qualification test is not a guarantee for admission to the chosen study program. As a rule, the university entrance qualification test alone does not offer any direct career advancement opportunities. The university entrance qualification examination consists of 5 examinations, which are determined by the respective rectorate of the selected educational institution. The content of the exams depends on the intended course of study. Since October 1, 2010, the autonomy for the university entrance exam has been with the universities, which handle the university entrance exam very differently. The exam preparation takes place in self-study or as part of preparatory courses, at least one exam must be taken at the desired educational institution.
A special university entrance qualification[40] means that in the country in which you obtained your school-leaving certificate you have met all the requirements (e.g., entrance exams, interviews, etc.) that are required there for admission to studies in addition to the school-leaving certificate. Direct university access must be expressly confirmed by the accredited university (rector/dean/admissions office).

Depending on the educational institution, there may be so-called admission restrictions or admissions procedures for various studies.
The requirements for a bachelor's degree also differ depending on the educational institution. It is customary at universities to write a "larger" thesis, while at universities of applied sciences you must write two "smaller" bachelor's theses and take a bachelor's examination, which is usually not required to finish a bachelor study at university.

All of this is based on the following legal principles: “Universitätsgesetz – UG”, “Fachhochschulgesetz – FHG”, “Hochschulgesetz – HG” and “Privathochschulgesetz – PivHG”.

[40] Besondere Universitätsreife. URL: https://boku.ac.at/studienservices/themen/zulassung/aufnahmeverfahren/aufnahmeverfahren-bachelor-lebensmittel-und-biotechnologie/zulassung/besondere-universitaetsreife (15.05.2023)

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In Austria the occupational profiles in the building sector are divided primarily into skilled trade occupations and engineering occupations. The focus in this chapter will be on these two groups. Trade occupations require an apprenticeship, while engineering occupations require a course of study at a university or university of applied sciences.
The "dual system" for apprenticeships (dual VET-system) has a long tradition in Austria. It is based on the principle of "learning in practice – for practice", which requires a close cooperation between training companies and vocational schools, to guarantee a flexible system, which can be adapted to new requirements of the economy. In 2021, 107.594 apprentices trained in 212 different apprenticeship occupations.[41]

Figure 2 shows a decline in the number of apprentices as well as in the number of training companies. It is therefore particularly important to increase the attractiveness of apprenticeships to counteract the current shortage of skilled workers in Austria.

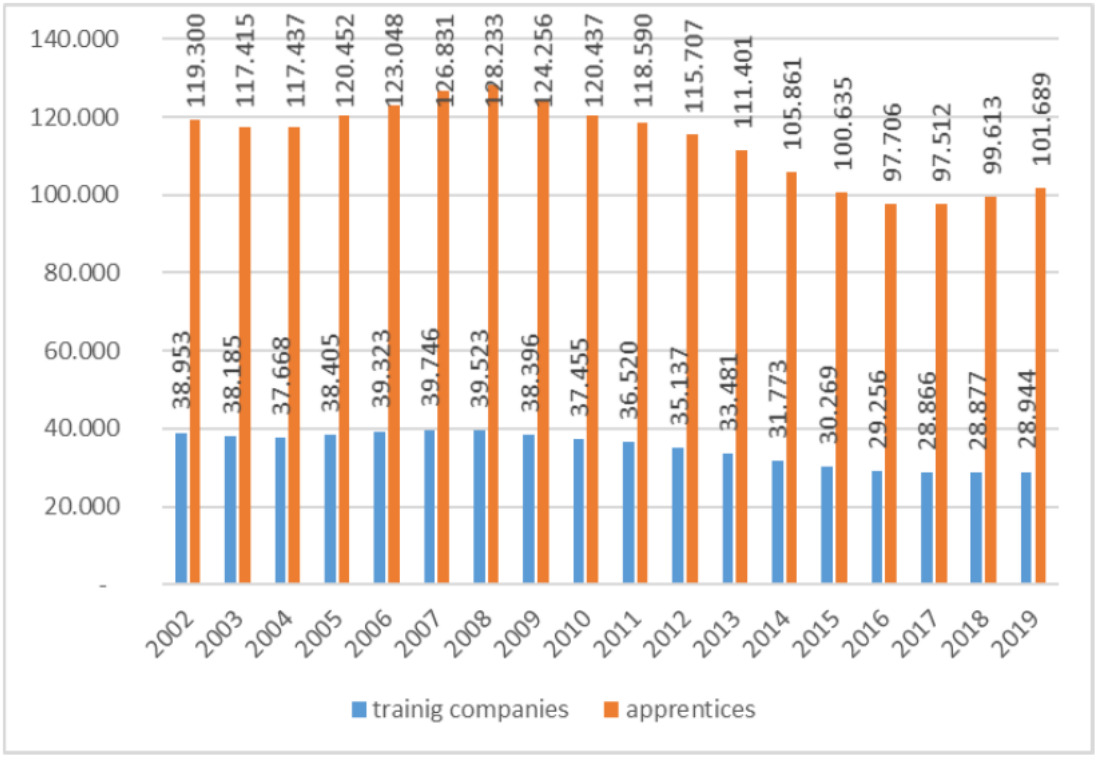

Figure 1: Development of training companies and apprentices (excluding inter-company training) in Austria since 2002; Source: Apprenticeship statistics 2019 of the Austrian Federal Economic Chambers (WKO); Vienna 2020

[41] Federal Ministry Republic of Austria – Labour and Economy, "Dual Vocational Training and Skills in Austria", URL: https://www.bmaw.gv.at/en/Topics/Vocational-Training-and-Skills.html

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9.3.1 Analysis of existing occupations in the Austrian construction sector

The following professions can be learned within the framework of an apprenticeship in Austria[42]:

- Construction technical assistant
- Civil engineering draftsman/draftswoman
- Building construction (successor apprenticeship of bricklayer)
- Bricklayer (entry only possible until 31.12.2022)
- Concrete construction (formerly formwork construction)
- Civil engineering
- Track construction technology

In addition, since 1.1.2020 there is also the possibility of a 4-year "cadre apprenticeship" for:

- Structural engineering specialist
- Concrete construction specialist
- Civil engineering specialist

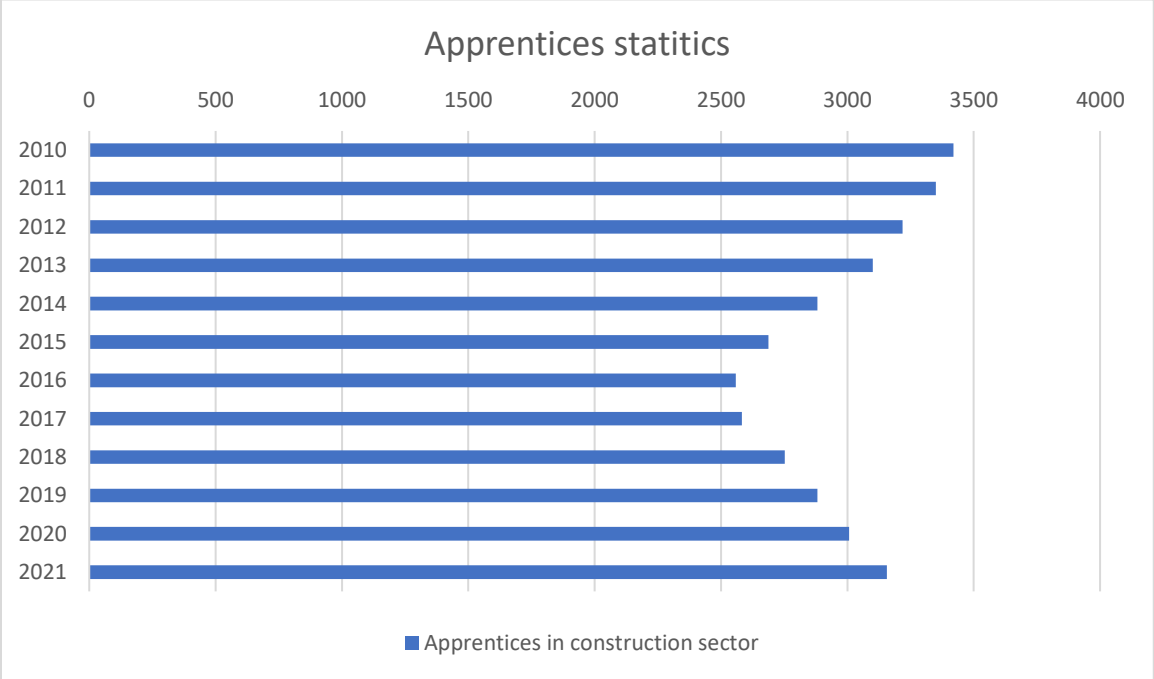

Figure 2: Austrian Federal Economic Chambers (WKO), Apprentice Statistics for the construction Sector, URL: https://wko.at/statistik/BranchenFV/B_101.pdf

[42] Austrian Federal Economic Chambers (WKO), URL: https://www.wko.at/branchen/gewerbe-handwerk/bau/baulehre.html

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Figure 2: Austrian Federal Economic Chambers (WKO), Apprentice Statistics for the construction Sector, URL: https://wko.at/statistik/BranchenFV/B_101.pdf shows a negative trend in the number of apprenticeships in the construction sector between 2010 and 2021 (-7,7%), even there a positive trend can be observed since 2016.

9.3.2.

Implementation in Austria

During the project, different possibilities for the implementation of a dual study course, with integrated craft master and bachelor, will be evaluated. A possible method of implementation can be carried out by the two Austrian project partners WKO Steiermark and the University of Graz. A successful implementation is largely dependent if a university can be found to carry out the bachelor program, at the best at the University of Graz. Courses in management, accounting and corporate governance can also be offered.

The practical part of the training will be conducted by the WIFI Steiermark, which is part of the WKO Steiermark. There is already a wide range of training courses in the field of building services engineering and air conditioning technology. In addition, there are facilities for the training of apprentices in the relevant areas of the construction sector.

Target group for the developed study program will be graduates with a high school diploma, because this is necessary for admission to a bachelor study programme.

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