A European Comparison of ICT Qualification Strategies in Training Institutions, Colleges, Universities and Vocational schools

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Abstract

This paper describes and analyses practical implementation of ICT (Information and Communications Technology) training profiles and ICT qualification strategies in training institutions, colleges and vocational schools for some European countries: Czech Republic, Germany, Netherlands, Portugal and Romania. This work is part of EUQuaSIT (www.euquqsit.net) - a European project that aims at contributing to the transparency of ICT work and qualification, funded by the European Commission, Leonardo da Vinci II project, 2001-2004. The project also intends to analyze the specific demands of companies within their ICT workforce and to what extend different vocational training strategies in partner countries fulfill their needs.

Fields of study: VET and CVT training institutions, colleges, universities and vocational schools that plan and undergo ICT qualifications. Objectives: Systematic processing of vocational education and training profiles in ICT. European comparison of the practical implementation of training profiles and ICT qualification strategies in VET and CVT training institutions, colleges and universities.

1. EUQuaSIT – a European Project in ICT field with Romania as partner

EUQuaSIT – European Qualification Strategies in Information and Communications Technology (www.euquasit.net) is a transnational project being carried out since 2001 involving partners of five European countries: The National Institute of Technical and Vocational Education, Weilova, Praha, Czech Republic, http://www.nuov.cz; Berufsbildungsinstitut Arbeit und Technik, University Flensburg, Germany (project coordinator), http://www.biat.uni-flensburg.de; Bundesinstitut für Berufsbildung, Bonn,Germany http://www.bibb.de; VEV International -Nijkerk, Netherlands, http://www.vev.nl; Tecnoforma, S.A. Almada, Portugal, tecnoforma@mail.telepac.pt; Central Systems, Foundation for Promoting ICT, Constantza, Romania, http://www.central-systems.ro, http://fict.ro; Danubius University, Galati, Romania, http://www.uni-danubius.galati.ro. EUQuaSIT is funded by the European Commission, Leonardo da Vinci II project, 2001-2004.

The project is aiming at systematic collections of structural material, statistical data and empirical analysis of various national ICT qualification strategies within the system of initial and continuing vocational education and training (VET, CVT) taking into account possibilities in higher education (HE). Major objective is finally an international comparison of national qualification strategies within the systems of initial and continuing vocational education and training aiming at the identification of synergies and alternatives from a European point of view.

Correspondingly there is a need for investigations, evaluation and international comparison on ICT working areas and its interaction with the practical organization and implementation of qualification strategies and training in companies and training institutions in the field of ICT. The objective of the project is to focus on this interaction in order to allow comparable research outcomes in a European context that sufficiently consider companies' demand of ICT specialists and professionals and acceptance of corresponding ICT qualification profiles. Although, however, used ICT technologies are supposed to be similar in most of the European countries it can be presumed that work processes are organised in more or less different ways, depending on the country, the region, the size of companies etc., probably especially in the field of ICT. Furthermore various results of studies carried out in the past indicated that the systems and therefore qualification strategies in European countries differ considerably.

Based on the objectives and the partnership of EUQuaSIT the following target and beneficiary groups are addressed: companies of various sectors and size, especially small and medium sized enterprises (SMEs) vocational schools, colleges and other training institutions committed in ICT qualification and training, ICT professionals and specialists as well as students, trainees and apprentices, institutions and individuals committed

in ICT training for disadvantaged groups, European, national and regional policy makers in vocational education and training in the field of ICT, social partners and other organisations related to vocational education and training in the field of ICT, e.g. Chambers of Commerce.

2. Education and vocational training in Romania

2.1. Basic principles concerning education

According to Education Act 84/1995, education is a national priority and should contribute to a free and harmonious development of the individual and of students' autonomous and creative personality development. In 1995 Romanian Parliament adopted a new education law, designed to offer the legislative framework necessary for an overall reform of the education system in Romania. The reform aims at two components of the system: primary and secondary education - on one side, higher education - on the other side. The Teaching Staff Regulation, promulgated in June 1997 by Romanian Parliament regulate the appointment, transfer, dismissal and retirement of teaching and non-teaching staff, completing the reform in this respect. The basic structure of the Romanian education system is presented in Figure 1.

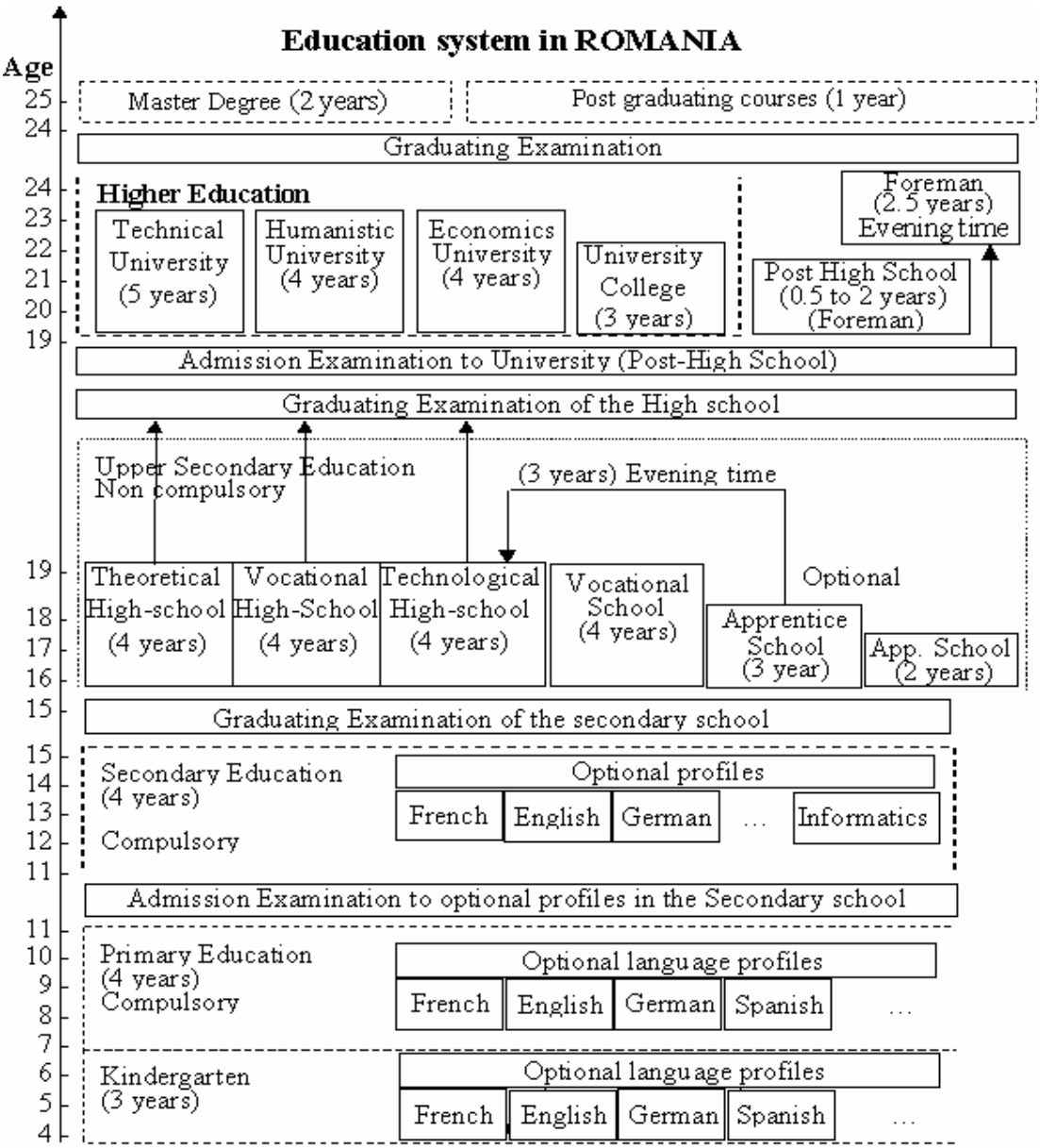


Figure 1. Education System in Romania

2.2. Vocational Education and Training

VET in Romania is developed according with the requirements of a democratic society, of the market economy, based on regional and local labour market needs and a purpose to facilitate the economic restructuring process. The strategy for VET development takes into account the best practices and the tradition in Romania, as well as the achievements and the development tendencies of these forms of education in the European Union countries and in the word.

According with the Law of Education, the VET takes place in: vocational school, apprentice school, technological high school, post high-school and foreman school.

The vocational and post-high schools have been reformed within the Phare VET RO 9405 Program developed in 25 pilot schools and 50 demonstration schools for 20 occupational families that cover all the economic sectors. Starting with the 1999-2000 school year, the achievements of this program were generalised in the whole national system of education. At beginning of 1998, it was for the first time that the reform of the technical vocational education was systemically approached. Therefore, the high school and the apprentice school were adjusted, according with the overall educational system aims, based on the VET reform program principles. Consequently, 1999-2000 school year represented a milestone in the implementation of the reformed VET system, with the related institutional arrangement.

The involvement of social partners in the development of training standards, local developed curriculum, information and career counsel, certification and educational planning are major achievements in the field of social dialog in VET. For the social partnership in VET were set up National Council for Vocational Education and Lifelong learning and Local Development Committees of the Social Partnership in VET, the latter being organised at the county level, as consultative managerial structures of the School Inspector Body. The sustain ability of above mentioned decisions is ensured by the revised Law of Education No.84/1995, adopted by the Parliament in 1999.

2.2.1. Bodies for standardised qualification. The standardised qualification levels are the first step of the curriculum reform. The standardisation of the qualifications actually represents the occupational analyse of the trades and professions followed by a description on discrete competency units. Responsible for the achievement of occupational analyse is Council for the Occupational Standards and Evaluation (CSOE/COSA) – which has worked at a series of qualifications and professional specialisation, on the basis of the Romanian Occupations Classification (COR) and sector investigations on recent specialisation, ignored by COR (in the revised work). The Occupational Standards (OS) are the configurations of occupational tasks that are to be evaluated at the work place, and are mainly addressed to the employers (evaluators). The OS represent, at the same time, the valuable structure of contents and capacities that can be used as basis of a continuing education curriculum. The Vocational Training Standards (VTS) adopted in Romania have a mixing formula of the modular occupational model. The construction of the learning process is achieved through the description of the discrete units of each global competencies' unit, taken from the occupational standard.

The VTS describe the fundamental competencies which are essential (core competencies) for gaining the vocational qualification. These competencies are actualized during the school vocational training and are expressed in three categories of integrated capacities (theoretical and practical):

a. Of knowledge;
b. Of practice;
c. Social (individual and team).
d. Creativity and entrepreneurship abilities, critical thinking, the consciously assumed responsibilities, the civic and community sense, the communication abilities, the team work abilities, the skills needed when solving the problems/conflicts, the ability to develop self and professional capacities which are specific for trades/specialisation represent the key capacities achieved through the VET. The capacities described in the VTS are the subject of the final evaluation and examination.

Development of VET is ensured by the setting up, starting with January 1st, 1999, the National Centre for the Development of Vocational and Technical Education. The Administrative Board of this public institution is formed of representatives from governmental institutions at national level. The consultative managerial structure at national level is formed of the representatives of the social partners.

2.2.2. Places of the VET

1. Vocational School

Starting with the school year 1999-2000 there has been generalized the training model developed within the Phare VET reform program, financed by the European Union; vocational school provides VET for future qualified workers in relevant trades on the labor market. Former narrow trade qualification is counteracted through education, by the tree-like structure of the training and the modules like organization of the specialized training, namely:

a. Certifies qualification level 2 admitted in the European labor market;

b. The first year: the basic education provides knowledge and functional knowledge and social capacities, as well as general operating capacities, unspecialized;
c. The second year: the general education provides knowledge and integrated capacities of scientific, social and technical culture, as well as half-specialized operating abilities (for the profiles where the specialization begins in the second school year);
d. The third year: the specialized education provides knowledge and specialized abilities, as well as the particular behavior of social integration and career purchase, for the relevant trades form the national and internal European points of view and for other prior occupations, from the local perspective. The occupational mobility is assisted by the curriculum at the level of the optional training areas; the cross- curriculum areas, which provide the overall vocational behavior (communication, marketing, legislation, European markets, technology's dynamics) and the optional technical areas or for the specialization of the abilities for the basic trade;
e. The fourth year (rare cases): the specialized education provides knowledge and specialized technical abilities for the basic trade (this is only the case of specific trades).
f. Its training structure and content provides flexibility and mobility on the labor market;
g. It ends up with the graduation diploma and the vocational competencies certificate;
h. Graduates of vocational school could continue their studies through high school based on a credit scheme.

2. Apprentice School

a. Is a pre-qualification level 1 admitted in the European labor market for the students who do not pass the capacity exam or drop the compulsory elementary school and take part in remedial or compensatory educational programmers;
b. Is a vocational education system with a status of community administration and development which educates workers-apprentices in the traditional occupations, groups of occupations or trades which are prior to the social and economical development of the local and regional markets;
c. Provides mainly occupational practical education;
d. The apprentices classes are organized in the schools that, by law, have the recommendation to have contracts of co-operation with the economic agents or at the working place;
e. It lasts 1-2 years, or a non-modular structure, the duration and the school year organization being established together with the economic agents;
f. It ends up with a certificate issued after evaluation based on specific occupational standard competencies.

3. Technological High-School

a. Is a scientific-type educational system that follows a tree-like structure, focused on prior technological fields, providing a general specialization corresponding to a pre-qualification for level 3, as admitted in the European labor market;
b. The frame-curriculum of this branch respects the elaboration principles of the frame-curriculum of the overall high school: cultural hierarchy and selection, functionality, coherency, equal chances, flexibility and curriculum decentralization, social reliability, and decongestion;
c. The school-based curriculum becomes in the framework of this branch a local developed curriculum, being elaborated with the participation of the social partners. Based on the local and regional labor market needs;
d. Enrolment in this type of education is possible for those having capacity certificate or for the graduates of vocational schools, according with a methodology approved by the Ministry of Education and Research.
e. The 9-th year completes the guiding cycle of this stage's career development;
f. The 10-th year provides general training for one of the following profiles: services, resources and techniques as general culture knowledge and includes a core-curriculum for the technical knowledge, which should reflect the contemporary orientation of the high technologies;
g. The 11-th, 12-th and 13-th (rare cases for daily courses and always for evening classes) years provide knowledge and specific abilities, as well as the particular behavior of social integration and career purchase;
h. It ends up with a baccalaureate diploma and a certificate of competences; the baccalaureate diploma gives the chance of continuing the studies in higher education without any access constraints that regard the field of studies.

4. Post High-School

a. Develops, by in-depth study and specialization, the training fields of the technological high-school: techniques, services, natural resources and environment, or other non technological fields;
b. It certifies qualification level 3 (technicians) admitted in the European labor market;

c. The course of this type of school are financed by the beneficiaries, either juridical or physical entities, by contract with the school provider;
d. It ends up with a certificate of vocational competencies.

5. Foreman School

a. It is organized observing the legal framework in force that specifically regulates the foreman profession as a profession;
b. This type of schools is financed by beneficiary, either company or individual, through a contract with the course provider; it ends up with a certificate of vocational competencies.

2.3. Continuing vocational training

As the purpose of continuing vocational training is to harmonize labor market needs with those of the social partners (employers, employees, and job seekers), in the dynamic field of IT&C it is most encountered form of education. There are two major categories of providers of such programs in Romania.

2.3.1 Public sector providers. These include centers subordinate to the Ministry of Education and Research (concerning postgraduate training and master degree in ICT field), and training, retraining and continuing training of unemployed people organized by Ministry of Labor and Social Welfare or by certain institutions of different other ministries in Romania.

ITC courses organized by such institutions regard qualifications that in Romania are not yet standardized by COR, most of them for applications in the economic field, various assisted design fields, also in networking, software applications' maintenance and development, data communication and Internet.

In this respect, post-graduate training in ITC is opened for those coming from no matter what high education field attended: mechanical, electric, economic, and so on. Near most of important universities in Romania appeared centers for "continuing long life training" which one of education direction is ITC.

The courses provided last three semesters and finish with diploma exams and projects. The diploma granted are issued by Romanian Ministry of Education and Research and they are recognized by the Ministry of Labor and Social Welfare (e.g. for those willing to teach IT in theoretical or technological high schools).

Such universities are those from Bucharest (Polytechnic University, Bucharest State University and the Academy of Economical Sciences), Iasi, Galati, Timisoara, Cluj, Craiova and Constanta. For example, the number of those attending IT postgraduate courses at "Dunarea de Jos" University from Galati grows from 50 per semester to 250 per semester between 1999 and 2001, in 1 to 4 lines of study (each line comprising around 65 trainee). The courses are not only held locally but also in other major towns of the South-Eastern region of Romania (6 counties).

2.3.2 Private sector providers. These include trade unions, foundations, non-profit NGO's, enterprises and chambers of trade and industry. Romanian legislation does not require that companies allot funds for their employees' continuing training, nor are there any financial or managerial incentives to encourage companies in this direction. There are, however, numerous forms of co-operation between training program providers and companies. These relate, on the one hand to components of company development strategies and on the other hand, may sometimes be generated by unforeseen requirements due to market developments.

In broad terms, the following scenarios may be identified:

a. Some ministries or institutions may set up or finance their own continuing vocational training structures (specialized services, centers, programs). Participation in such continuing vocational training may be conditions for professional promotion, a requirement for confirmation in a managerial position or a prerequisite for adapting to new social and economic conditions.

b. Foreign companies, which have bought state enterprises, establish their own continuing vocational training structures. Almost without exception, after downsizing and restructuring, foreign companies own immediately invest in training and retraining their workforce. In some cases these companies sent their staff to training courses in the country of origin.

c. In general, state or private enterprises facing financial difficulties or bankruptcy are not interested in continuing vocational training. Instead, employees with workplaces in threat try to enrich their qualification attending courses organized by local training program providers.

In many cases continuing training courses provide ITC components in their curriculum, focusing on applications specific to the given domain.

2.4. Vocational school certification

The Romanian Government initiated in 1999 the Council for Occupational Standards and Attestation (COSA), to organize CVT in Romania (to serve first of all unemployed people) observing European

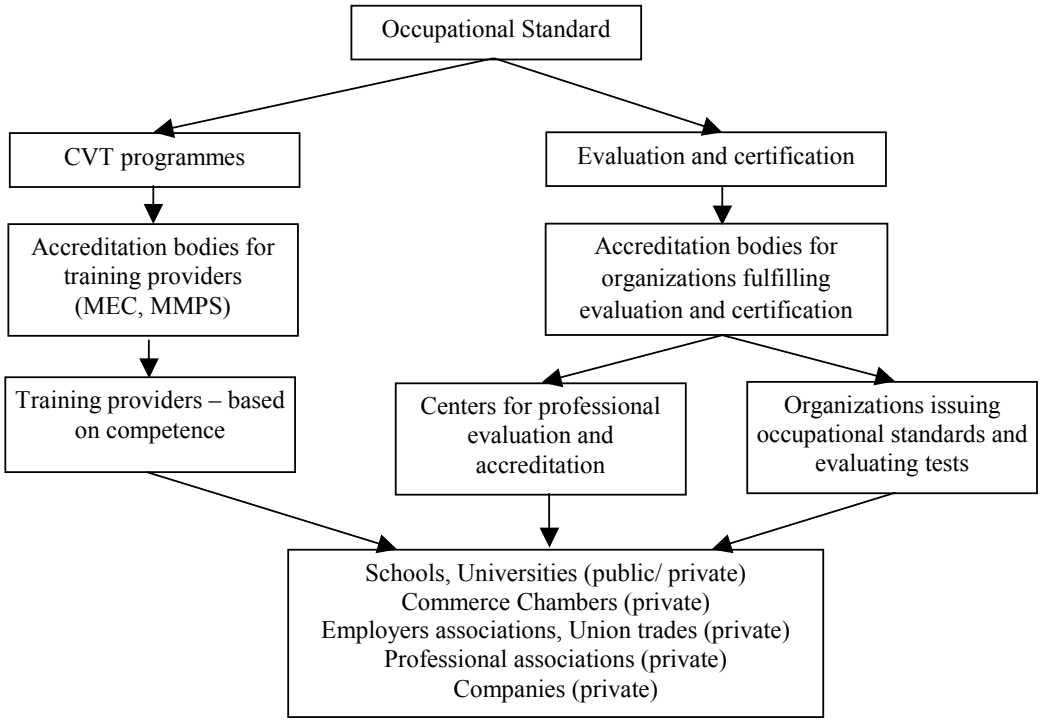


Figure 2. Occupational accreditation and certification.

occupational standards and certification under those standards. The continuous training system, observing occupational standards, is presented below, where MEC is Ministry of Education and Research, MMPS is Ministry of Labor and Social Welfare.

Training providers from public sector are: National Agency for Occupation and Training (ANOFP) – which has subsidiaries in all counties, Centers for Continuous Training near public Universities or Group of schools. Training providers from private sector are: private Universities, Chambers of Industry and Commerce, employers and professional associations, companies and NGOs. Standard courses duration is up to 9 months, in IT and related fields they are shorter (20 days to 6 months).

3. Overview on ICT Education in Romania

ICT courses are delivered beginning with gymnasium, according with the future specialization provided by the schools.

3.1. Gymnasium Level

Teaching Computer Science in gymnasium began in 1993. It was agreed that studying Computer Science in gymnasium must have a prevalent *practical character,* ensuring the pupils with the minimum computer knowledge and skills. For each form (year of study) there are 68 classes allotted, that means 2 classes per week (60 classes for teaching/ learning and 8 classes for revision). The main topics are:

a. Basic knowledge about computers, including general description of the hardware device, operating systems (e.g. Windows) and small applications (e.g. Paint, Word, Excel), communications (e.g. Internet);

b. A programming language, including graphic facilities. There is allowed to choose between the Basic, Logo and Turbo Pascal programming languages, depending on the teacher's training and on the equipment and software available in school;

c. Basic algorithms (numerical and graphical).

ICT disciplines are studied as optional in gymnasium beginning with the 3rd grade and as obligatory, starting from the 6th grade, in the "Technologies" curricular area.

3.2. High school Level

In high schools there are two ways for studying ICT disciplines:

a. in ordinary high schools, as an optional discipline;

b. in Computer Science high schools (or Computer Science classroom).

For teaching Computer Science in ordinary high schools 2 hours per week are allotted for each form (9th -to 12th). The schedule ensures on one side the development of an algorithmic thinking and on the

other side it endows the pupils with useful knowledge about computers, no matter what direction they will take afterwards. There are two main directions.

The *theoretical* one includes: The *Pascal and C++ programming languages; Fundamental algorithms,* including numerical and combinatorial algorithms; *General methods for developing algorithms* (Greedy, Backtracking, Divide et Impera).

The *practical* one includes the study of an operating system, a text editor, a spreadsheet and a database (for example by using Works 2000 for Windows).

In Computer Science high schools, 8 classes are allotted weekly for studying Computer Science disciplines, among which 4 for practical training. The basic objectives, which this educational system should achieve, are the following: *forming an algorithmic thinking; developing logic modeling abilities; getting familiar with simulation problems*; *forming the habits of independent work with computers; forming the necessary skill in solving the Computer Science problems; making openings to interdisciplinary; integrating the computers in current activities.*

After a basic training of 2 years, the present syllabus offers the possibility of choosing the instruction level for the next 2 years: *professional* (A level) or *non-professional* (B level) computer user.

For the 9th and 10th forms a unitary curriculum is suggested, containing basic notions, but at the same time preparing the two directions for the upper form.

The schedule for the 9th form includes: *computing systems, PC architecture and Windows operating system;* (1 class/week); *programming: algorithms, Turbo Pascal* and C++ - first part) (3 classes/week); while the schedule for the 10th form includes: *programming: Turbo Pascal and C++* - second part (2 classes/week); *methods and techniques in programming* (1 class/week).

For the professional level the schedule is as follows: *A level:*

For the 11th form: *object oriented programming: the C++ language;* (3 classes/week); *applied Computer Science: Windows;* (1 class/week)*; assembly language for IBM-compatible PC;* (1 class/week).

For the 12th form: *databases (FoxPro);* (2 classes/week); *applied Computer Science:* spreadsheets, editors, networks (1 class/week); *numerical analysis;* (1 class/week).

Unfortunately for the moment there are no teachers for disciplines (physics, chemistry etc.) able to use computers, so it is not possible to integrate now Computer Science in other disciplines, only one exception: mathematics.

The interest in ICT increased during the last years. More and more children are willing to study ICT disciplines in school and the their level of teaching is increasing too.

3.3. University Level

ICT courses are given now in all Faculties in Romania. They can be separated in 2 groups:

a. courses for students being not specialists in Computer Science

b. courses for specialists in computer data processing and control.

We present below separately these situations.

3.3.1. University program for the students being not specialists in Computer Science. Students in medicine, humanistic sciences (literature, languages, sociology, psychology, or law have courses in order to make students familiar with ICT and with the use of some of the existent software products in their particular area of interest.

More developed programs have the faculties where the mathematical ground permits the introduction of a wide range of notions: all kind of engineers (except electronic and automatic who have a special program provided), economists and mathematicians.

For the engineers a course on *Algorithms and Programming* is provided in the first year of studies. Techniques in programming with Pascal programming language are studied. Depending on their specialization, students have than courses being connected with professional usage of the computer (CAD/CAM, numerical methods, optimization, circuits designing etc.).

For students in faculties in which economic courses are taught, special programs are provided, the main topics including Databases principles and programming languages (SQL, FoxPro), spreadsheets, and other specific software tools.

3.3.2. University program for the students being specialists in Computer Science. Computer Science specialists are prepared in three kinds of Universities:

a. The Technical Universities *(Faculty of Automatics, Computer Science* and some sections inside *Faculty of Electronics and (Tele)Communications.* The program is structured on 5 years of study and finishes by the license exam. The mathematical background is assured by the courses delivered in the first two years (Algebra, Mathematical Analysis, Numerical Analysis and Differential Equations). During the first two years courses as "Programming languages" (C++ and Pascal) and "Techniques in Programming" are provided. Beginning with the 3rd year there are 2 sections: *Artificial Intelligence* and *Computing Systems.*
Courses of the *Artificial Intelligence* section include: Optical Processing of the Information;

Pattern Recognition and Artificial Intelligence; VLSI designing; Speech processing; Image processing; Wavelet analysis and mathematical modeling; Fault Tolerant Systems ; Networks and Open Systems; Software Engineering.

The *Computing Systems* section includes courses as: Networks; Neural Networks and Fuzzy Systems; Parallel and Distributed Architectures; System Engineering; Specialized Processors; Cryptography. About 30 hours of training/week are provided in both sections.

The aim of these programs is to prepare specialists in hardware and software, able to use and develop new technologies.

b. The Universities, which generally have *Departments of Computer Science* inside the Faculties of Mathematics or in the Computer Science Faculties. With one exception, (Iasi, where an independent Faculty of Computer Science developed), inside the Faculties of Mathematics (which belong to the Universities) there are Departments of Computer Science. The studies in these departments continue 4 years and finishes by license exam. A solid base of mathematics is assured by a lot of courses included in the first 2 years: Algebra; Mathematical analysis; Geometry; Complex Analysis; Differential Equations; Numerical Analysis; Probability theory and Statistics; Operation research and Optimization. The first year being common with the students in Computer Science course is provided: *Bases of Programming*. Elementary techniques of programming, C and Java programming language are studied. Beginning with the second year more specialized courses are included.

They can be split in 2 classes: Mathematical foundations of Computer Science; Programming and practical aspects of Computer Science.

In the first class *(Mathematical foundations of Computer Science)* we can include: Algebraic bases of Computer Science; Theory of programming languages; Theory of algorithms, calculability and recursivity ; Calculus complexity; Combinatorics and Graph theory.

The second class (Programming and practical aspects of Computer Science) contains courses, which usually have provided practical hours (2 hours/week for each course): Operating Systems (Unix, Windows); Windows Programming; Data Structures; Databases; Artificial Intelligence; Graphics; Networks; Parallel and Concurrent Programming; Neural Networks; Simulation models; Compilers; Cryptography.

Students graduating these sections can be teachers in gymnasium and high schools with the condition of following some courses as: Psychology, Pedagogy, Methods in teaching Computing, a month of practical in a Computer Science high school which finishes with a lesson that the student has to prepare and teach.

Some University has also short-term programs (3 years) in Computer Science (e.g. College of Informatics). The students graduating these studies are better users of different software tools than programmers, the number of practical hours being considerable increased.

c. Computer Science Programs for Economists. The program in the so-called Academies of Economic Studies is structured on 4 1/2 years of study and finishes by the license exam. There are two cycles: the first cycle includes the first two years of study, while the second one includes the last 2 1/2 years of study.

a. In the first cycle, the courses in Computer Science are: Bases of Computer Programming; Introduction in Operating Systems; Programming Languages; Introduction in Databases.

b. In the second cycle, a more wide range of courses in Computer Science are available, the students being allowed to chose a part of them: Operating Systems; Data Structures; Procedural and Functional Programming Languages; Analysis and Design of Economic Information Systems; Logic and Algorithms; Assembly Languages Software Engineering; Artificial Intelligence and Expert Systems; Multimedia Systems; Networks and Distributed Systems. The graduates of the Academy of Economic Studies are supposed to be able to work as economists in Industry and Companies. Some of them become teachers in High schools, were Databases are studied.

3.3.3. Computer Science program for the holders of Masters Degree. A number of students can continue their studies, after graduating their faculty. The master has a program of one and a half year and finishes with a dissertation. The admission is made on the results of an exam. The courses delivered are strongly dependent on the kind of the University are organizing them. Usually, this kind of studies is choose by students intending to get a Ph. D, degree and/or becoming learning staff in the Universities.

3.3.4. Post Graduate Courses. The new law of education kinds stipulates the possibility of organizing 2 kinds of postgraduate studies:

a. post-graduate courses for improvement of basic knowledge in Computer Science, lasting at most one year. The law stipulates that undergraduate staff should periodically attend such courses. An important role in organizing this activity is the one played by the specialized inspectorates, which monitor all activities related to the improvement of undergraduate staff;

b. post-graduate studies for specialization in fields like Computer Science, lasting at least one

and a half year. Graduates who benefit from this form of training receive a specialization in a new field. Organizing such Courses would allow people who have graduated faculties of mathematics, but not the Department of Computer Science within those faculties, to receive a specialization in Computer Science, as well as the possibility Computer Science in high schools.

4. Some of EUQuaSIT project results

4.1. Summary and comparison

In Romania, Portugal and Czech Republic compulsory full-time education starts at 6 or 7 years of age and ends at 14 or 16 years. In Germany from the age of 6 till 15 years old (10 years) full-time education, followed by a minimum of three years part-time or full-time education is compulsory. In the Netherlands full-time education is compulsory from the age of 5 till 16 years old (12 years) followed by a minimum of two years part-time or full-time education.

ICT-courses in Germany, Portugal and the Netherlands start from the age when learning (whether on a part-time or full-time basis) is compulsory.

Since vocational ICT-training in Romania and Czech Republic generally starts from the age of 14 till 16 years, the courses there are not compulsory.

The educational systems of the project partner countries have many similarities. One exception being Germany for which various school types already exist from the age of 10. In the Netherlands different school types are available only from the age of 12, (limited to 3 types). In Romania, Portugal and Czech Republic, students have, up till the age of 15, no choice of school type (not taking into account special programs for dropout students).

When comparing the teaching method for vocational education and training, differences become clear. In Romania, Portugal and Czech Republic the main method of teaching is according to a scholastic route, which does not always include a (short) vocational practice period within a company.

In the Netherlands and Germany a scholastic route, as well as a dual route, is available. In Germany however the largest group of youngsters follow a dual route, based on theoretical training of between 8 and 12 hours per week at a vocational school, together with practical training within a company for the remainder of the week. Training programs for a scholastic vocational training of 2 years are available in Germany, but have up till now, not attracted many students.

Students following the dual route in the Netherlands and Germany, have a working agreement. In the Netherlands they also have a learning agreement.

Within the initial education system of all partner-countries, Germany being partly the exception, the possibility exists for continuation of training in higher education once graduation from one of the vocational school types has been obtained. In order to enter higher (vocational) education in Germany (University of Applied Science), students must either possess a higher education entrance certificate (Hochschulreife) or have to go to a specialized upper secondary school for at least one year which is based on a certain type of vocational training as well.

Portugal, the Netherlands and Czech Republic have a wide offer of initial vocational training possibilities for students who wish to become an ICT-professional:

1. Portugal has three types of ICT-training, all giving a student the opportunity to enter higher education afterwards. The technical school spends only 20% of the three-year training on vocational subjects. Therefore it does not solely aim at providing ICT-professionals for the labor market, but more to give them a basis in which to continue their training at a higher level. The vocational school (Ensino Profissional) - a scholastic route of three years - also leads to ICT-professionals. There is a possibility to follow an apprenticeship (Aprendizagem) for three, sometimes four years, leading to a professional ICT qualification. All training types include vocational practice within a company.
2. The Netherlands has a very flexible system with four end levels and two teaching routes. As the system is quite complex actions are being undertaken to enlarge the transparency. All training types provide a vocational practice period within a company (at least 20%) and are available in scholastic (Beroepsopleidende leerweg) or dual routes (Beroepsbegeleidende leerweg). Starting from the age of 16, students can follow a two, three or four-year training to become an ICT-professional. A four year of training provides qualifications, allowing a student to enter into the labour market or continue on to a higher education level (Hoger beroepsonderwijs). Two and three-year training aims at providing ICT-professionals entry into the labor market. After a two or three-year training, follow-up training possibilities are available in order to reach the same level as the four-year training. With a certificate equaling the level of a four-year training, students can enter the labor market as well as enter into higher education.
3. Czech Republic has several training types in secondary vocational education offering training leading to ICT-professionals. Training to a level 2 or level 3 qualification starts after compulsory education. Level 4 training can be started once

level 3 training has been successfully completed. Vocational training at SEDOC level 2 (SOU) and level 4 (VOS) provides vocational practice within a company together with training. The possibility to continue training for higher education exist after graduation of training at level 3 or level 4.

Fewer possibilities in training types are offered by the educational systems of Romania and Germany. Nonetheless, this does not necessarily say anything about the offer of different profiles within this training types:

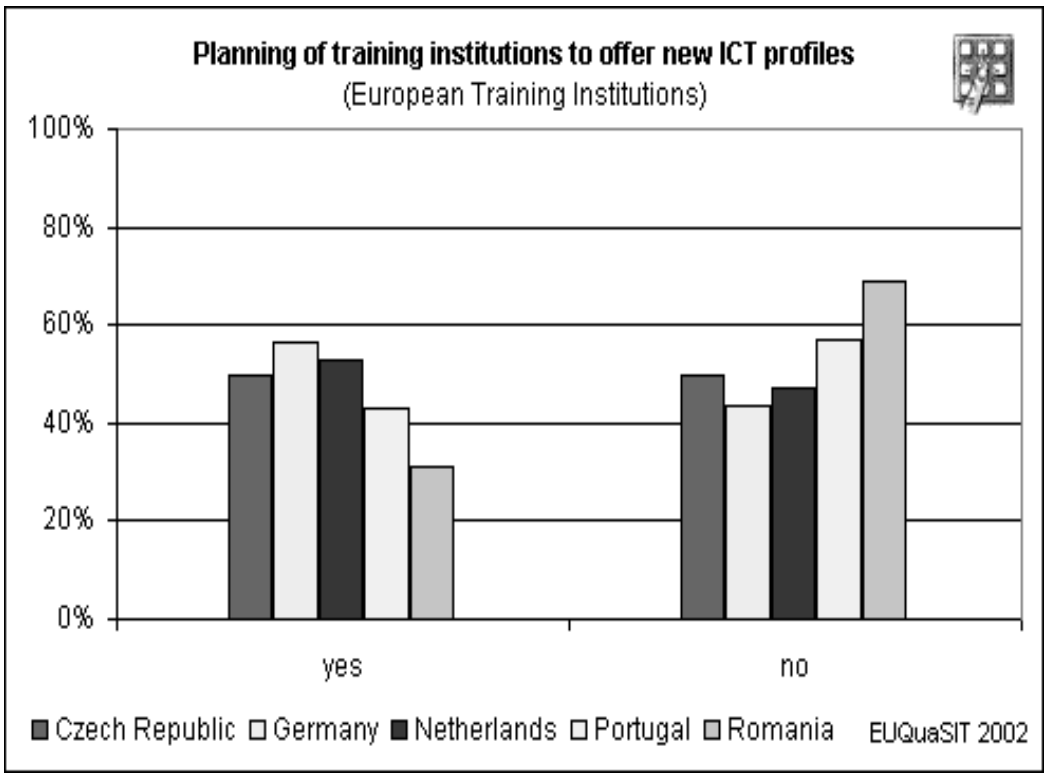
a. Romania offers only one - scholastic – vocational training type. This training does not however offer vocational practice within a company. After completing vocational training, continuation of study at a higher level is possible.

b. Germany has training types for both dual (Berufsausbildung) as well as scholastic teaching route (Berufsfachschule); however the latter lasts only two years and does provide only short vocational practice within a company, making it not as popular as the dual training path. The dual training method takes three to three-and-a-half years, leading to trained ICT professionals entering the labor market straight away. Also the two-year training aims at providing ICT professionals for entrance into the labor market, but with a lower level of qualification. Often trainees of the type do dual training afterwards which is also the precondition to enter further possibilities of training as a master craftsman or technician.

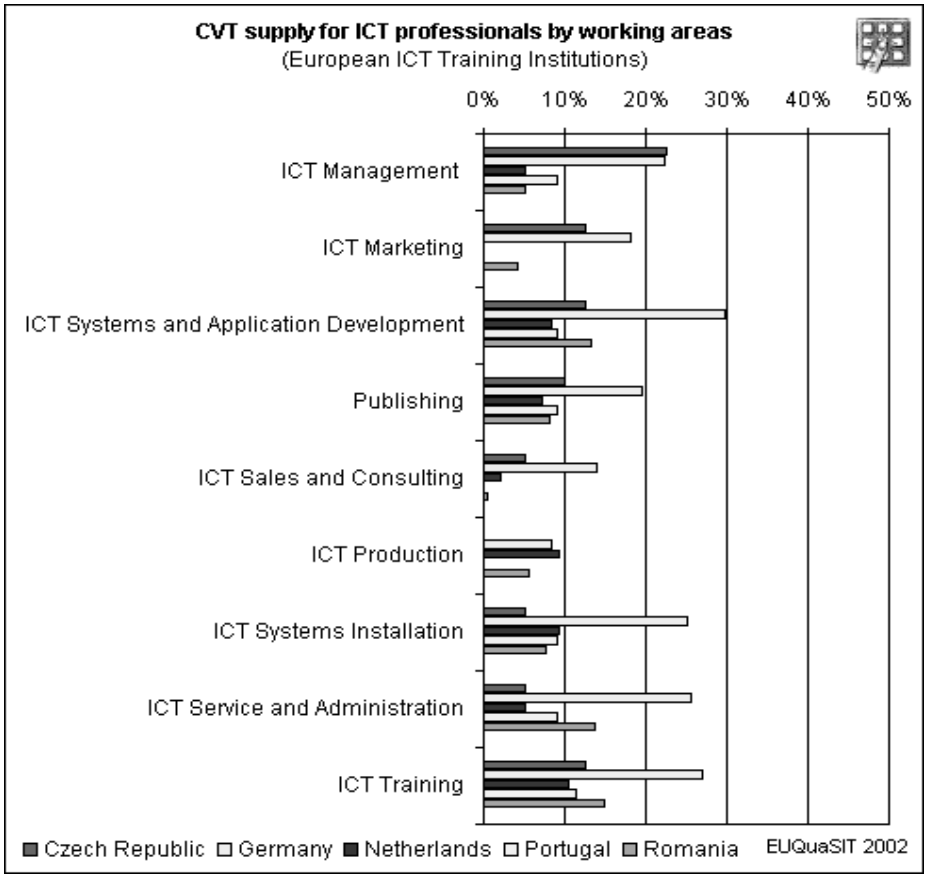
4.2. The on-line investigation

An important step of EUQuaSIT project was the investigation of available ICT profiles and the further training requirement in ICT. Some of the results offered by the analysis done on ICT training institutions are presented below. The graphs indicate the final results corresponding to the questions asked.

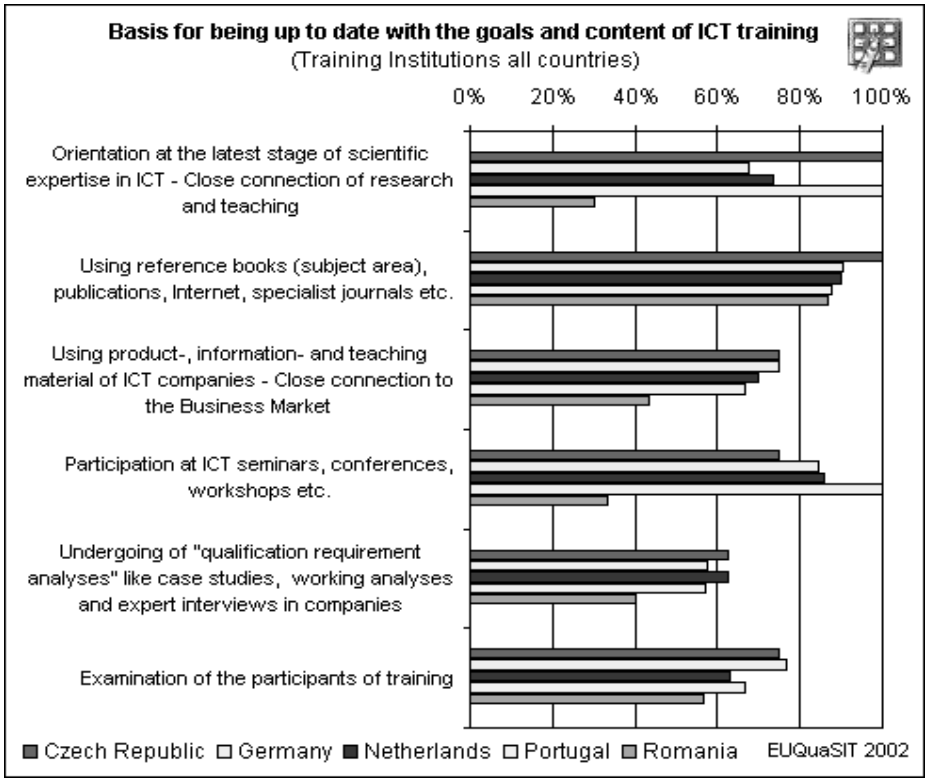
a. Do the training institutions plan to offer other new ICT vocational education and training profiles?



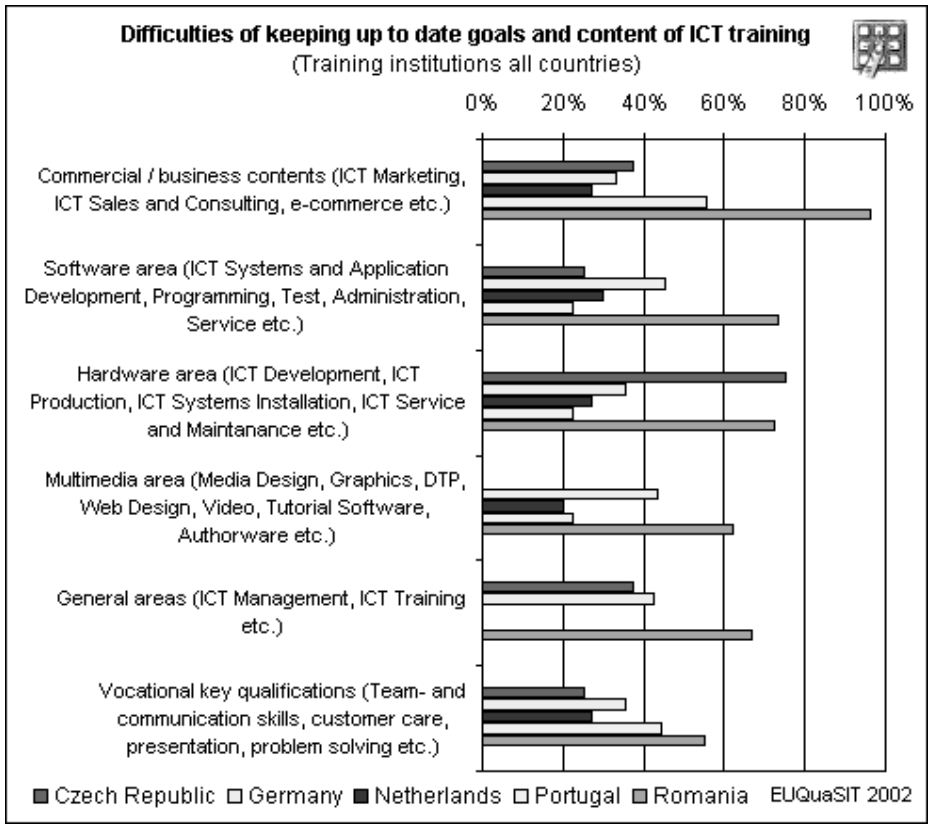
b. Which thematic fields are part and content of your further and continuing vocational training for ICT professionals and the ICT professional groups?



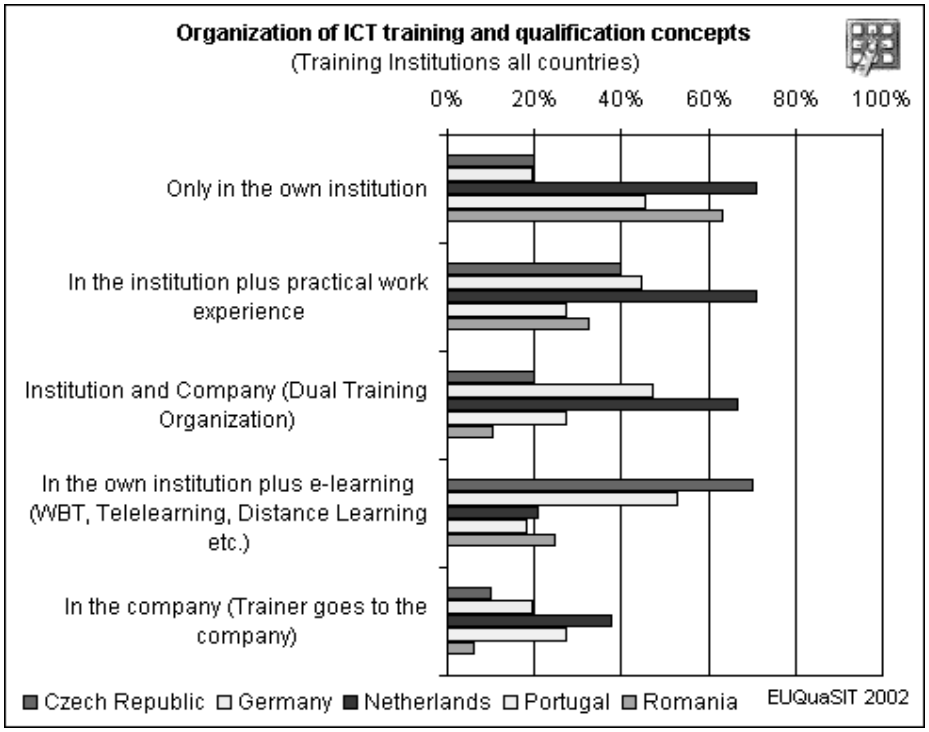
c. How does your institution keep the goals and content of ICT education and training up to date (thematic adaptation to the ICT development)?



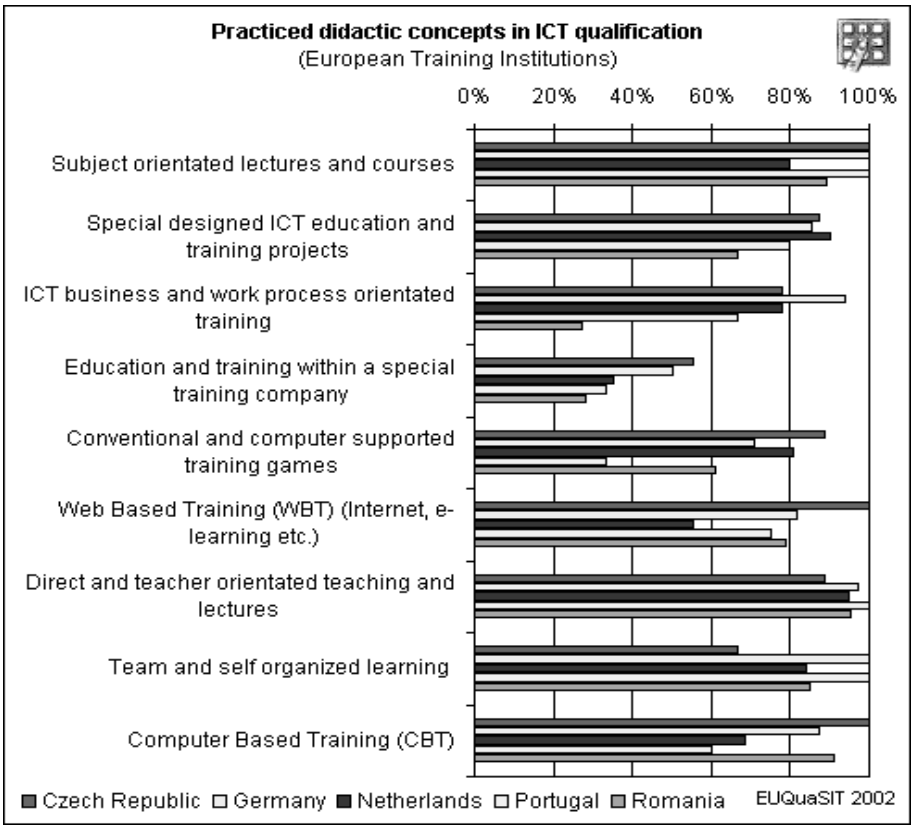
d. When you determine and update the content of ICT education and training, in which areas do you see the biggest problems and challenges concerning level, extension and delimitation?



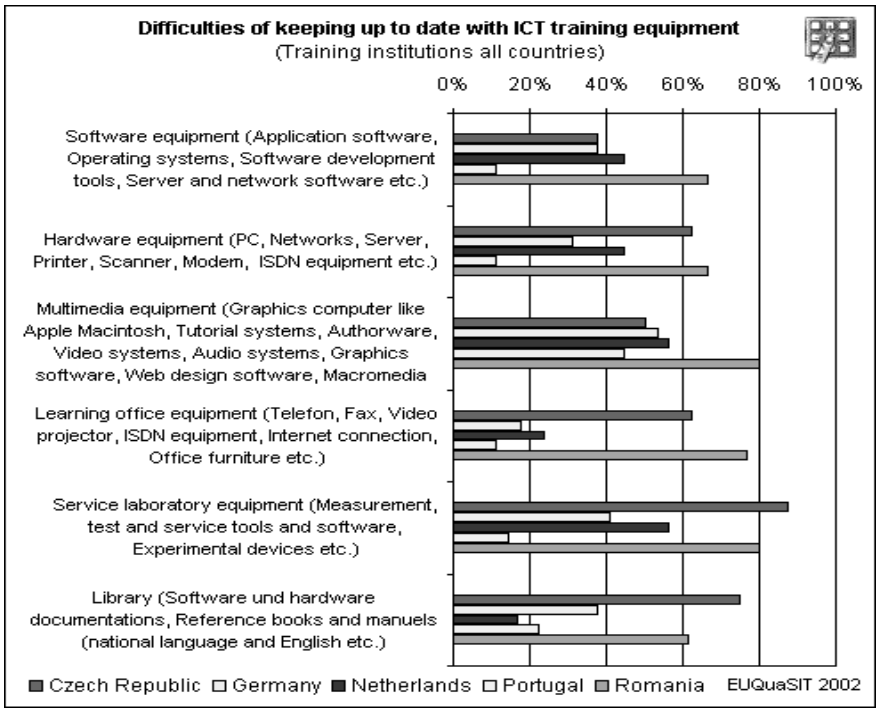
e. What is the structure and how is your ICT education and training organized? (more than one answer applicable)



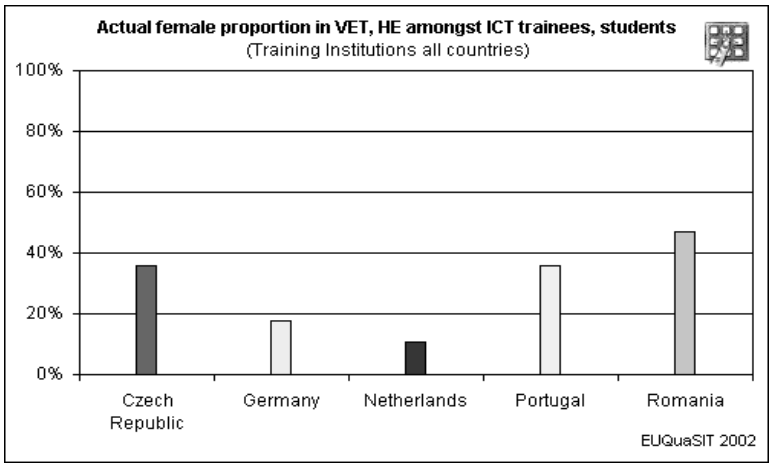
f. Which are the didactic concepts and methodologies your ICT education and training is based on and taught with?



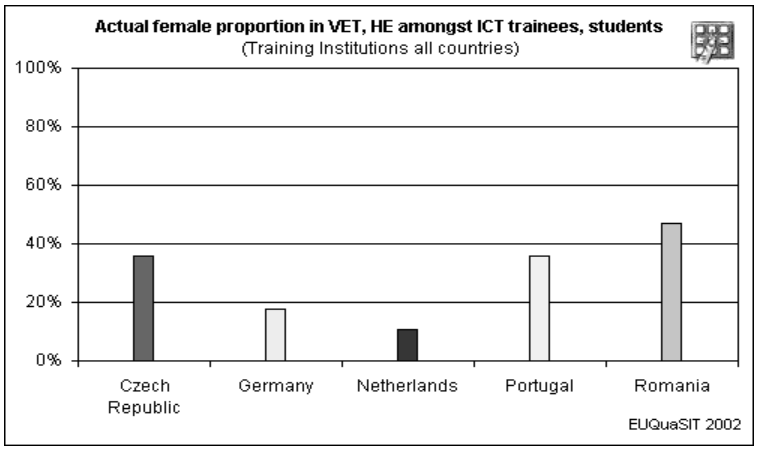
g. Learning and training equipment especially in the ICT field requires high relevance to the current situation. In which areas of media and requisites do you see the biggest problems and challenges concerning costs, procuring, running, administration and maintenance etc.?



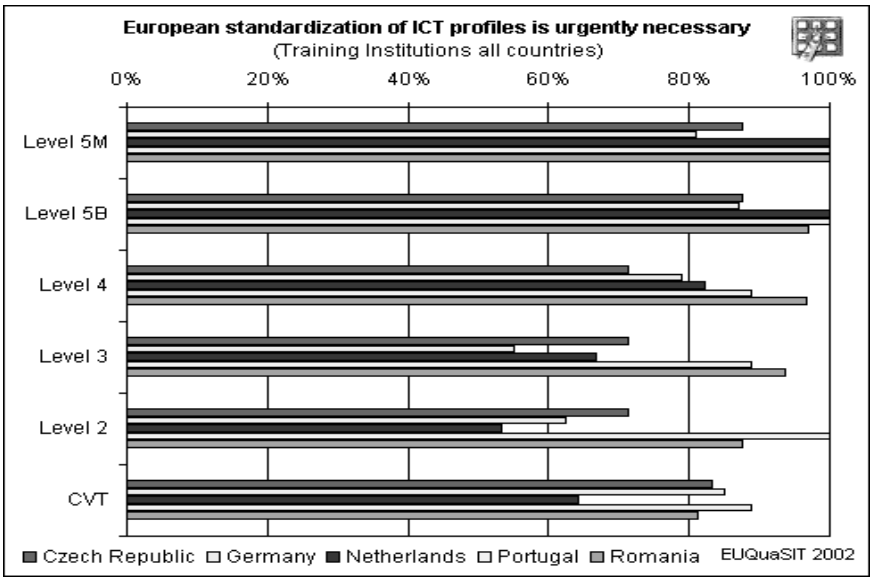
h. How do the teachers, trainers and lecturers in the ICT field keep their subject orientated and didactic qualification up to date? (more than one answer applicable)



i. What is the actual female rate of ICT trainees, students and participants in your institution?



j. What do training institutions think about a European standardization of ICT education and training on the different qualification levels?



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