

A COMPARATIVE ANALYSIS ON DEMAND OF ICT PROFILES IN EUQUASIT COUNTRIES

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Abstract: The demand of ICT qualifications in nowadays Information Society was studied for Europe in the frame of the EUQuaSIT project, during the years 2001-2004, for the five European countries: Germany, Netherlands, Portugal, Czech Republic and Romania. The main project results were submitted as recommendations made to EU member and candidate countries governments regarding the general European policy to be developed for the creation of a proper spectrum and for training for various ICT qualifications profiles and levels. The paper presents a comparative study on the demand of certain classes of ICT profiles in the Euquasit countries above based on real data obtained in case studies.

1 Introduction

In recent years the spread and dynamic of ICT in all European countries have been continuously increasing. Today the high importance of ICT for the entire economy in all areas - including business, services, domestic and leisure activities, which obviously extensively use data processing. Computer technology is broadly used in appliances, elements of process control equipment, and it also appears on almost every professionals' desks across Europe as well as a multitude of smaller computerized devices in handbags or jacket pockets.

The EUQuaSIT project is promoted by the Flensburg University - Germany, and “Danubius” University participated as a partner (see www.euquasit.net). The project aimed to issue recommendations to the EU member and candidate countries on the strategies to follow on ICT qualifications at all levels and forms of training: VET – Vocational Education and Training, HE – Higher Education, and CVT – Continuous Vocational Training). During the project the EUQuaSIT team developed analysis studies, case studies and reports on ICT qualifications from the point of view of companies and training institutions and contributed to the debate on increased European transparency and mutual strategies of prospectively improving vocational education and training structures and supply.

The results presented by the author of the present work are part of the final report of the project and they are obtained based on real data acquired by the Euquasit team in the partner countries: Germany, Netherlands, Portugal, Czech Republic and Romania.

2 ICT qualification profiles

As conceived by the Euquasit team, ICT profile should address the specificity of a target domain, but it is impractical to deal with too many domains. EUQuaSIT promoter proposed 6 Generic Work Areas focused by the ICT education – see , while first results with regard to the structure and the contents of ICT business processes (work flow) have been leading to the assumption that ICT business processes can in general consist of certain distinguishable items.

A qualification profile should address one of the work areas above, where the code colour of the work area indicates the nature of specific work processes the practitioner performs, as follows:

- the yellow colour for ICT work processes with more economic technical oriented phases of activity and work tasks, like ICT marketing, sales etc.,
- the blue colour for ICT work processes with more informatics technical oriented phases of activity and work tasks, like ICT system development, soft- and hardware development, administration etc.,
- the red colour for ICT work processes with more technical informatics oriented phases of activity and work tasks, like ICT system integration, installation etc.,
- the green colour for ICT work processes with more ICT service oriented phases of activity and work tasks, like ICT service, troubleshooting, maintenance etc.

ICT Marketing, Consulting and Sales
ICT Business and Project Management
ICT Systems and Application Development
ICT Integration and Administration
ICT Infrastructure and Installation
ICT Support and Systems Service

Fig. 1 Six Generic Work Areas for ICT qualification profiles.

ICT education observes specific methods and instruments that the work area requires in the phases of activity and the work tasks; education should refer to theoretical and working details needed to complete the work tasks meant for the skill level and the area of the trainee.

3 Evaluation of ICT profiles demand and assessment

ICT profiles under investigation in companies were indicated by their specific names, so the collected data refer to each ICT profile and each of them was evaluated. In the sequel, the most demanded pair of ICT profiles are evaluated for each of Euquasit countries, indicated each by the colour of the area they belong:

- Yellow (called Management) refers to “ICT Marketing, Consulting and Sales” and “ICT Business and Project Management” areas;
- Blue (called Development) refers to “ICT Systems and Application Development” and “ICT Integration and Administration” areas;

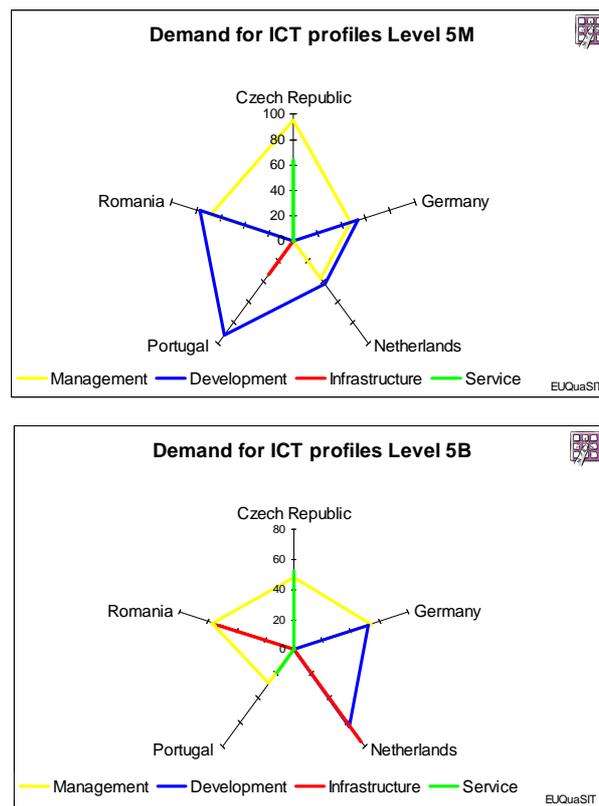


Fig. 2 Areas of the most demanded two ICT profiles in companies – Levels 5M and 5B.

- Red (called Infrastructure) refers to “ICT Infrastructure and Installation” area;
- Green (called Service) refers to “ICT Support and Systems Service” area.

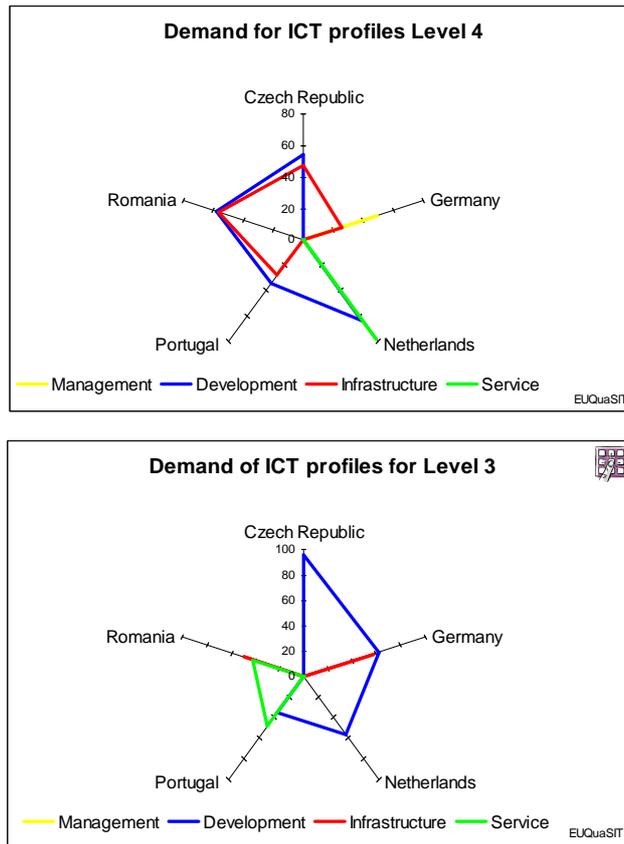


Fig. 3 Areas of the most demanded two ICT profiles in companies – Levels 4 and 3.

From the charts, presented in Fig. 2 to Fig. 4, result the following common trends for the European countries:

- Level 5M highest demand exists in economic and management (yellow) also in application development (blue) oriented ICT profiles; it indicates the needs of companies in ICT management and in developing new applications all over Europe.
- Level 5B highest demand is somehow distributed in all areas; a common demand exists in the economic and management (yellow) oriented ICT profiles, thus country specific. It is a relative shortage of Level 5B ICT profiles available.
- Level 4 highest demand (see Fig. 3) exists in ICT infrastructure (red) and in application development (blue) oriented ICT profiles; it indicates the needs of companies in ICT the practical initiative in ICT infrastructure and administration.

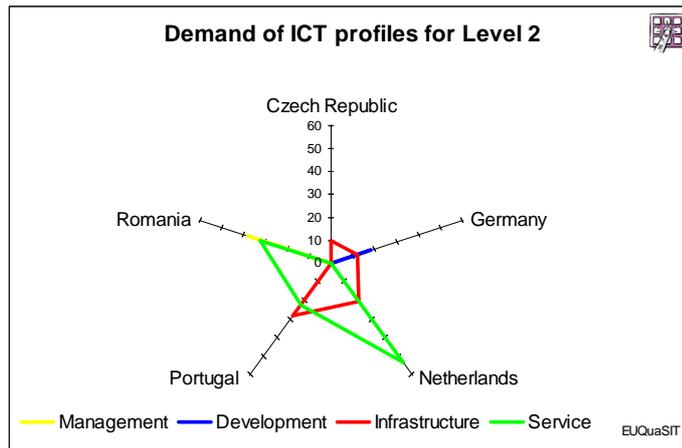


Fig. 4 Areas of the most demanded two ICT profiles in companies – Level 2.

- Level 3 highest demand Fig. 3 exists in application development (blue), ten in ICT service (green) and ICT infrastructure (red) oriented ICT profiles; it indicates the needs of companies in routine work of the skilled ICT practitioners regarding new technologies and instruments for application development, in administration of ICT resources and integration/installation of regular application.
- Level 2 highest demand (see Fig. 4) exists in service (green) and infrastructure (red) oriented ICT profiles; in indicates the need of companies in routine work for ICT service and administration.

The areas of the pair ICT profiles mostly requiring changes are indicated by area colour (as described above) in Fig. 5 to Fig. 7, and some comments follow:

- For Level 5M ICT profiles, important changes are necessary in economic and management (yellow) also in application development (blue) oriented ICT profiles (see Fig. 5 left – changes around 20%, and in Czech Republic around 70%); while those areas are the same with the highest demand, it is obvious that companies have specific activities not covered by training yet in those areas.
- For Level 5B ICT profiles, change (around 20%) is necessary in all areas (see Fig. 5 right), mostly because the shortage of Level 5B ICT profiles do not allow companies to find ICT practitioners skilled for their specific needs.

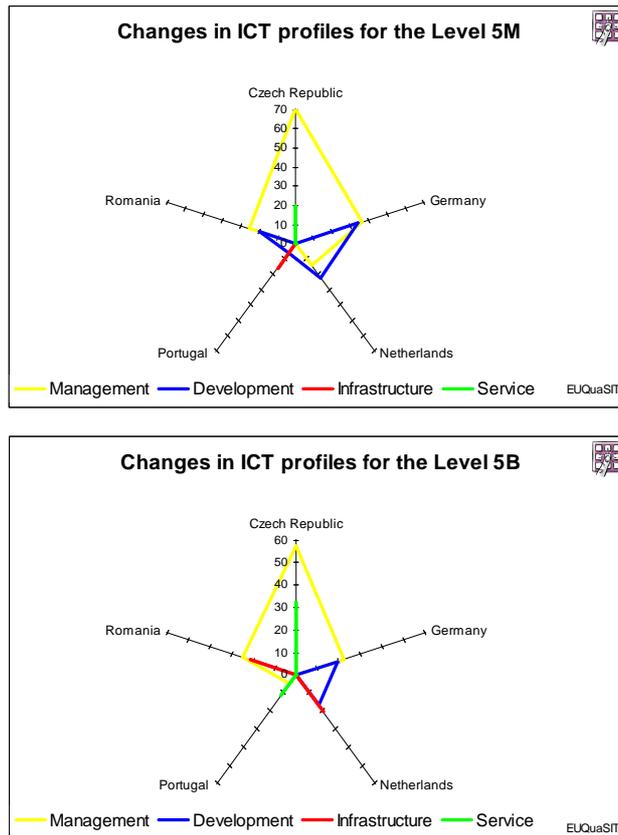


Fig. 5 Areas of the two ICT profiles most requiring change – Levels 5M and 5B.

- For Level 4 ICT profiles, changes over 25% are necessary in the infrastructure and administration (red) and in application development (blue) oriented ICT profiles (see Fig. 6 left); again, the most demanded ICT profiles need major changes.
- For Level 3 ICT profiles (see Fig. 6 right), changes are lower than 20%, in all areas. Each country specific qualifications on this level do not comply with the others so, the change is better made in the direction of the adequacy of training (as goals and contents) in all European countries.

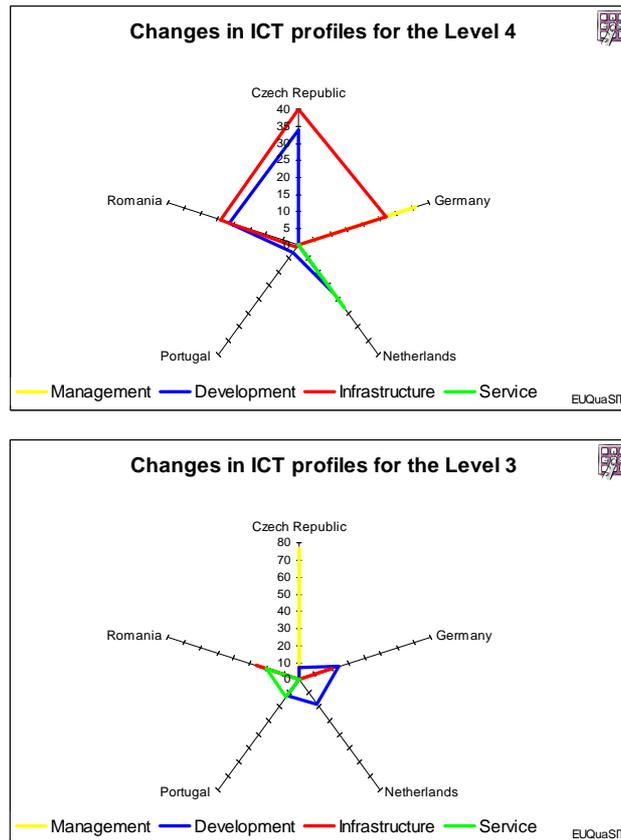


Fig. 6 Areas of the two ICT profiles most requiring change – Levels 4 and 3.

- For Level 2 ICT profiles (see Fig. 7), changes are yet very different from country to country, again due to so many differences encountered for that level. However, the areas requiring more change in European countries are the infrastructure and integration (red) and the service areas around 25%.

Changes in ICT qualifications regard the qualification features given to ICT practitioners by means of the training. It is clear that the training in a narrow specialization is made mostly at the working place and/or through CVT.

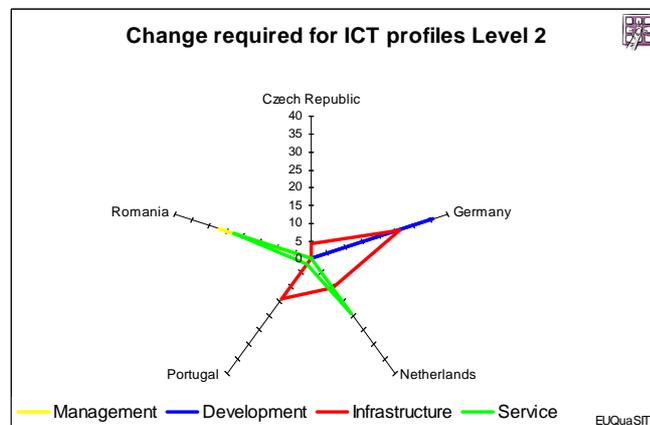


Fig. 7 Areas of the two ICT profiles most requiring change – Level 2.

However, VET and HE training have to keep pace with the dynamic changes of ICT qualification requirements that come from companies and job market needs of the time. It is therefore of great help for training institutions to know, or at least to have an idea, on the real features ICT qualifications should have to fit companies needs, and to adapt curricula accordingly.

4 Evaluation of ICT qualifications' curricula

The European company evaluation of the ICT training profiles and therefore of the ICT curricula have been highly important under aspects of the needs and revision. First of all, the evaluation results include the company needs of each ICT training profile respectively to what extent the profile meets the ICT skill needs in general. Secondly the results indicate especially under revision aspects a mismatch in regard to the ICT training goals and contents. Beside using these results to find out the needs and profile structure presented by the fourteen "Generic work area orientated ICT skills profiles", among other things, the evaluation results can be in the same context further interpreted as a mismatch to a certain extent and findings of the current ICT curricula e.g. in terms of curriculum examples of "good or bad practice".

In this sense and in relation of the current curricula of ICT training profiles - here e.g. especially in Germany, Netherlands and Portugal - and the generic work area orientated ICT skills profiles the evaluation results can be summarised as follows:

- curricula of "modern" ICT training profiles, launched or updated in the last years, are often relevant as curriculum examples of "good practice". To a high percentage they meet the skill needs and contents presented by the generic work area orientated ICT skills profiles, e.g. in Germany the four new ICT training profiles at level 3 and new work process orientated further ICT specialist profiles at level 4 or in the Netherlands the new BCP ICT training profiles or also in Portugal the new professional ICT training profiles at vocational levels,
- beside the curricula of "modern" ICT training profiles the problems are that often the "old" ICT training profiles further and parallel exist and in this context the corresponding ICT curricula and training profiles partly overlap significantly in skills and contents, but, however, this result partly applies to some new ICT training profiles as well,
- curricula of ICT training profiles that meet the skill needs and contents presented by the generic ICT skills profiles only to a lower degree, still often split and separate the ICT

skills and contents for instance in IT and CT, especially current ICT training profiles at VET level 2 and 3, e.g. in Germany "Telecommunication Facility Electronic Technician" and "Mathematical Technical Assistant" or in Netherlands "Craftsman Communications Networks",

- curricula that still partially but strongly split and separate ICT business, informatics (software) and electronics (hardware) skills and contents do not meet the work area orientated skill needs. These curricula are mostly strong subject or scientific discipline orientated without enough or none integrated or combined structure and contents, e.g. in Germany "Technician in Radio Communication" or in Portugal " Software Analyst",
- other curricula with a mismatch in general hardly consider any work area orientated skills and contents or cross section and basic work skills. These curricula also mostly strong subject or scientific discipline orientated and hardly include for instance business, customer and application orientated contents, work process and quality management contents or overall subject contents, and finally other curricula with a mismatch often stress too much the basic skills with predominantly scientific base and engineering theory contents like computer and technology science and mathematics orientated contents and, at the same time, too little basic skills with work, customer and application orientated contents.

On the one hand the results and findings of the current ICT curricula at sub-degree levels in relation to the skill needs presented by the generic work area orientated ICT skills profiles evidence that in European countries a couple of ICT curricula exist that may be named as curriculum examples of "good practice".

These curricula show various solutions related to the work area orientated ICT skills profiles wherefore there is no single way to develop the curriculum. On the other hand the results show problems and different maladjustments of the ICT curricula with indications to improve the common curriculum design.

Level	Demand is due to	Change is required for
Level 5M	<ul style="list-style-type: none"> • specialized profile in certain application area • knowledge and skill on matters in the application area • knowledge and skill on usage of instruments use specific to area • experience on low to high level tasks in the application area • practice in team working and human communication • knowledge and skills on work planning and 	<ul style="list-style-type: none"> • less ICT oriented but more application area oriented • less ICT theoretical but more working area oriented • more practice on up-to date technology in industry • more practice and projects but few lectures and theory • less individual but more group oriented education

	<ul style="list-style-type: none"> team co-ordination creativity and knowledge on meta level techniques 	<ul style="list-style-type: none"> fewer pure ICT but more work management matters less technical education but more research and design
Level 5B	<ul style="list-style-type: none"> basic and intensive knowledge on application area practical abilities and on techniques in application area abilities in work planning and team co-ordination 	<ul style="list-style-type: none"> less encyclopedic but more application oriented matters less theoretical but more area oriented education less individual activities but more team working
Level 4	<ul style="list-style-type: none"> knowledge and skills on up to date technology and tools knowledge on economic and management activities orientation on actual and technical context of problems knowledge and skills in work organization and coordination knowledge and skills on concrete production/service 	<ul style="list-style-type: none"> less theoretical but more working oriented matters more economic and management matters few technical but more strategic matters in the area less individual but more group and organizing tasks less research or design but more production/service tasks
Level 3	<ul style="list-style-type: none"> specialization on specific activities of the application area practical skills in working tasks specific of the application area team work and communication abilities 	<ul style="list-style-type: none"> less encyclopedic but more activity oriented in the area more working and less scholastic tasks less individual but more group oriented education
Level 2	<ul style="list-style-type: none"> basic knowledge on specific matters in the application area practical abilities in specific tasks of the application area 	<ul style="list-style-type: none"> less ICT general but more application oriented matters less theoretical but more working oriented in the area

Table 1 Assessment on curricula features that lead to demand and change of ICT profiles.

The Table 1 presents curricula features that give value to ICT profiles (for each skill level) from companies' point of view. The demand and changes of ICT profiles actually reflects existence or non-existence of those features in ICT practitioners' skills.

5 Generic work area orientated ICT profiles for the European countries

After the analysis of the demand and assessment of ICT profiles in the European EUQuaSIT countries, the project partners agreed a general structure for potential "EURO ICT Profiles", meant as a minimal requirement of the ICT education in the European countries (see Fig. 8). Minimal requirement means the minimal number and types of ICT profiles for each SEDOC Level that the training system should provide for ICT practitioners to fit the industry needs on ICT.

Starting from that structure, each European country may add new ICT profiles – according to country own economy needs or to specific labour policy of the country.

ICT Marketing, Consulting and Sales			ICT Marketing, Consulting and Sales	e.g. ICT Marketing Management (CS)
ICT Business and Project Management	ICT Commerce and Business	ICT Commerce and Business	ICT Business and Project Management	e.g. ICT Project Management (CS)
ICT Systems and Application Development			ICT Systems and Application Development	e.g. Software Architecture and Design (CS)
ICT Integration and Administration	ICT Application and Administration	ICT Application and Administration	ICT Integration and Administration	e.g. Integration & Test / Implementation & Test Engineering (CS)
ICT Infrastructure and Installation	ICT Infrastructure and Installation	ICT Infrastructure and Installation	ICT Infrastructure and Installation	e.g. Systems Specialist (CS)
ICT Support and Systems Service	ICT Support and Systems Service	ICT Support and Systems Service	ICT Support and Systems Service	e.g. Technical Support (CS)

Fig. 8 Generic work area orientated ICT skills profiles for each SEDOC Level.

So, for example the government of a country in Europe intends to provide more ICT working places to low level qualified persons then the number of ICT profiles at respective levels should be increased. However, after the investigations and the case studies performed through EUQuaSIT project, a clear conclusion resulted: companies are most interested in high level skill (e.g. ICT profile HE graduates or HE graduates CVT trained in ICT), simply because they can execute low level tasks (e.g. networking equipment installation) but also high level tasks (e.g. network administration, management and optimisation).

That is why, the compromise between the number of ICT profiles in a working area has actually a social and labour policy dimension that should be decided from the compromise made between the labour market (companies) and social actors (government, syndicates).

Anyway, from the technical point of view, there is a definite need of ICT practitioners in each working area - presented in Fig. 1 and reflected in the “Generic work area orientated ICT skills profiles”, while case studies in companies revealed actions that involve low level and high level tasks that extends ICT work processes to the target domain using ICT instruments. An illustration is the important demand and the change needed on “ICT profiles for ICT Marketing, Consulting and Sales” and “ICT Business and Project Management” working areas – which are Economic oriented not Informatics oriented areas.

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