

# **ICT-Skills Certification in Europe**

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## **Acknowledgements**

The authors are grateful for the contributions of experts and stakeholders from 21 European countries to this survey by responding to the questionnaire and by making additional comments.

## Foreword

This study on “**ICT-skills certification in Europe**” was launched by Cedefop in early 2004 with the intention to help animating and promoting European level discussions and exchanges:

(1) Within the eSkills Forum set up by the Commission in spring 2003 created to support cooperation between stakeholders and experts on ICT- and E-Business skills;

(2) With the European and International Training industry and social partners engaged in ICT certification issues;

(3) To prepare a next phase of the CEN/ISSS (European Committee of Normalization/Information Society Standardization System) ICT-Skills workshop in order to elaborate a European meta-ICT skills or qualifications framework.

This issue has to be seen also in relation to current discussions on European level initiatives on Transparency (Europass), Credit Transfer and overarching European skills and qualification frameworks in view of realising wider policies linked to the Lisbon goals and agreed education and training objectives.

The nature of the activities required specialist knowledge, skills and services in order to meet the demands of animating a continuing exchange and generating, reviewing, analyzing and reporting on thematically organized information and knowledge for underpinning the policy-making process in line with the European Union’s eEurope action plan (in partnership with the industries’ own efforts) as well as to identify and promote training solutions and certification in the area of ICT and E-Business skills and last but not least to further contribute to the implementation of the e-Learning Action Plan of the European Union.

Cedefop’s overarching strategic objective is to promote a European area of Life-Long Learning (LLL) in an enlarged European Union, to support the European Union’s aim to increase cooperation in VET (Vocational Educational and Training) and LLL and to contribute to the implementation of the objectives for education and training in 2010 (see report from 2002 of the Commission).

These activities fit perfectly into the context of Cedefop’s Medium-Term Priorities 2003 – 2006 and its active support for policy and action at European level. These Medium-Term Priorities set the strategic objectives for Cedefop’s activities as follows:

- improving access to learning, mobility and social inclusion;
- enabling and valuing learning;
- supporting networks and partnerships in an enlarged European Union.

The contractor was engaged by Cedefop above all to support three European level activities launched on ICT- and E-Business Skills

- work of the European Commission's E-skills forum, constituted on the 27th of March 2003, under the responsibility of the Directorate General Enterprise
- the preparation of inputs to the work of the CEN/ISSS ICT-skills workshop (phase 2) sponsored inter alia by Cedefop,
- and the organisation/implementation of the e-Skills Conference in September 2004 which was organised in Thessaloniki with the European Commission (see [www.eskills2004.org](http://www.eskills2004.org)).

**The study covered three main issues:**

**1. ICT certification on the International and European level and potential solutions and recommendations to current problems, which included:**

- analyzing existing modes, procedures, methods, institutions and aims to eSkills certification as well as their current impact on the International European debate;
- pointing out approaches to public or private certification, which intend to be valuable on the international and European level;
- elaborating different options for European level actions referring to the e-Europe action plan and agreed education/training goals in view of 2010, linked to matters of recognition, comparability and transparency of certificates, diplomas or other evidence which assist in promoting a European-wide skills development and mobility;

**2. Propose ways to permanently informing on and exchanging experience through existing and future networks by:**

- elaborating a coherent approach to European level certification and accreditation, permanent maintenance, quality control and public - private cooperation;
- verifying a possible approach to standardisation of European certification procedures and outcomes;
- discussing the linking of ICT certification problems and issues with current EU initiatives on the technical and political level concerning EU education and training objectives and cooperation in the light of the Lisbon goals set for 2010;

**3. Verify the role and contribution different European level bodies (e.g. Cedefop, CEPIS and CEN/ISSS) could play in future in promoting the issues further by:**

- exploring a potential role and task of a permanent body which could be set up if convenient in relation to more sustainable EU level activities.

We do thank the authors for their work performed under tight deadlines in 2004. The extremely useful outcomes delivered by the contractor will be further assessed and discussed by the advisory expert group on e-skills. It is also very useful for the ongoing and future work with CEN/ISSS on ICT skills and respective frameworks. The recommendations made do need further reflection and may impose a more formal consultation of stakeholders and Member states. They are currently binding only the authors and will be further explored in view of possible actions by both the Commission and Cedefop.

Done in Thessaloniki, March 2005

Burkart Sellin, Project Co-ordinator



## *Executive Summary*

A great variety of certification schemes and systems are known in the ICT field throughout Europe. Certification and quality assurance in ICT education and training are extremely important for both employment in the ICT industry and as a basis for a sustainable professional career. CEPIS<sup>1</sup> studied and compared, on behalf of Cedefop, existing approaches to e-skills certification [in 21 European countries]. The survey intends to contribute to the current debate on the promotion of e-skills, to economic competitiveness, better jobs and social cohesion. It is supporting the current debate on skills frameworks, quality standards and the necessary increase of attractiveness of this labour market segment.

These objectives are being pursued under the auspices of the European Commission and Cedefop since 2002. Within Europe there still exists a lack of labour mobility due to a lack of recognition and transparency of qualifications. Education authorities, training providers and certifying bodies should be enabled to more closely cooperate, exchange experience and build mutual trust in order to contribute to closing these gaps.

The study focusses on the investigation of existing modes, procedures, methods and institutions responsible for e-skills certification and on their interests in sharing experience or increasing co-operation. It should support and recommend joint actions in order to allow for a European wide policy and practice for certification, quality assurance and standardisation.

This European study compares and analyses e-skills certification systems. It wants to compare and categorise the identified systems, underlying models and approaches, providers and procedures. The survey investigates the whole range of approaches: public and private, commercial and voluntary standards for e-skills certification. The focus lies on most widely applied systems in the respondents'

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<sup>1</sup> Council of European Professional Informatics Societies

countries on the one hand and takes into consideration their potential with regard to their possible contribution to convening and implementing standards throughout Europe on the otherhand.

A questionnaire was established and agreed with CEDEFOP, which received a reasonable response from high level stakeholders and experts representing 21 countries. While showing a well balanced European coverage the total number of responses was with 40 not as high as expected. However, the origin and character of stakeholders and quality of experts has to be taken into account. The quality of these responses seems to be convincing despite the lack of a broader representativeness.

A total of 106 e-skills certification systems were listed by the respondents, only a few of these, however, are being widely applied in their corresponding countries. Certification systems made available by ECDL and ICT vendors from the industry, and especially Microsoft certifications were most often quoted. Certifications and formal qualifications provided by public education and vocational training providers played an eminent role too. All these approaches were considered for a future convention or potential actions in view of voluntary approaches and options for agreeing European quality standards.

The majority of respondents (73%) feel that fewer, but more relevant e-skills certification schemes would be required. Eighty per cent (80%) of returned questionnaires indicate that Europe is confronted with a too high number of e-skills certification systems and schemes. The majority of respondents say that the current market place is characterised by a focus on vendor-specific (industry) certifications. Based on the answers received, it is recommended that vendor-independent approaches should get much higher importance. These may form the most appropriate basis for a European e-Skills Quality and Standards Framework. For this purpose a vendor-independent voluntary European level organisation or body is strongly supported by the respondents. Such a body ought to be open to all kinds of modes and schemes, whether public or private, commercial or industry

specific under the condition that minimum quality standards are met, agreed and continuously maintained.

Answers received do support the general perception that transparency, portability and comparability of e-skills certifications should be reached by means of co-operation and joint activities of relevant stakeholders (73%). A European approach to e-skills certification should be based on learning outcomes which ought to be described in relation to an agreed European-wide meta or reference skills and qualifications framework. This should allow allocating all kinds of different certification schemes, whether national or international, regional or local, company or sector specific. New approaches to improved accreditation, validation and certification of non-formal learning ought to be addressed as well.

A possible way forward for the ICT sector is proposed including the establishment of a central body. The respondents showed strong support and agreement, which however will have to be verified through more formal consultation by the European Commission and Cedefop. Such a central body should aim to establish and maintain common quality standards for ICT training and certification and be based on an agreed European reference framework for both ICT skills and qualifications. It should not only support mobility European wide but also on an international level.



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## 1. Introduction

*"When planning for a year, plant corn.  
When planning for a decade, plant trees.  
When planning for life, train and educate people."*  
Chinese proverb: Guanzi (c. 645BC)<sup>2</sup>

### 1.1. Motivation

Developments in Information and Communication Technology (ICT) over the last 40 years have had a quite remarkable impact on our lives in general, but more particularly in our work. They have also resulted in the strong growth of a major new industrial sector, and the creation, in a number of countries, of hundreds of thousands, even millions of new jobs [9, p.3]. As this technology develops further, additional changes are to be expected. In spite of the recent downturn in the Information Technology and Telecommunications markets – this area continues to be expected to provide, in many economies, a large number of new jobs over the coming years. Today, ICTs are of high relevance and importance in nearly every business sector. Consequently, the demand on the labour market for ICT practitioners and employees with ICT end-user skills is continuously growing. Increasing pressures on businesses produce a shift of employment realities. This results in the need for people to recognise that they cannot rely on earning their living in one particular occupation throughout their entire life. These pressures are produced, amongst other things, by a combination of industrial structural change, the introduction of new technologies and tools in the workplace, and the growing

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<sup>2</sup> Source: Directorate-General Education and Culture,  
[http://europa.eu.int/comm/education/policies/III/life/index\\_en.html](http://europa.eu.int/comm/education/policies/III/life/index_en.html), last visit 17 June 2004.

competitive pressure on businesses of most kinds arising from the slow but steady movement towards the globalisation of markets [3, p.23].

Thus, employees must increasingly take responsibility for acquiring up-dated and often quite different skills, as their career progresses. This implies the necessity for sound career planning for employees, enabled by adequate information, regarding possible future career paths. The differences in characteristics of the national labour markets have to be realistically taken into consideration. However, the mobility of the workforce is increasing. Consequently the comparison, transparency and recognition of outcomes of relevant qualifications and related education and training courses are in the spotlight. Acquiring relevant competencies and thus “skills” becomes increasingly important and vital for ICT workers job prospects in the European labour market for the future economic development of Europe [2]. Therefore, policy makers in many countries are focused on the importance of e-skills and strengthening the opportunities for lifelong learning [3, p.22], [24, p.2]. The reason for this is that workers with sufficient up-to-date skills are expected to be more productive, have more potential to remain employed, and have better prospects for their individual career development [7]. Most especially small and medium-sized enterprises (SMEs) feel the increasing pressure on their future business due to a lack of available ICT workers with the necessary skills to enhance their electronic business, products and services.

### ***1.1.1. Changing Demands on ICT workers***

Employers are demanding skills in the field of ICT across all industries. Thus, new job profiles are arising in different business sectors which report a changing demand on the labour market. A good example of this development may be taken from the financial sector in Germany.

In Germany banks increasingly make high demands on their ICT practitioners. The transition in career from a bank clerk to an ICT expert is variable, because of the demand for a high level of ICT skills (e.g. business intelligence, data mining, etc.) and at the same time comprehensive competencies and skills in finance itself. The profession of a bank clerk increasingly shifts towards an enhanced use of ICT

in his/her daily work. At the same time, ICT practitioners need more and more enhanced skills in finance and reporting, in order to perform their jobs in banks. Driven by the various qualifications available and the individuals' interest to take responsibility for their own professional development, there is a clear tendency to acquire the necessary skills outside traditional vocational qualification and training systems e.g. by informal learning and "virtual" training. Often the vocational qualification and training system is not able to catch up with rapidly changing requirements and to respond to new job profiles. As a consequence, a new job profile, "bank engineer", was developed in the finance sector to communicate emerging new job requirements in order to adapt qualification and training courses.<sup>3</sup>

The scenario described above highlights the need for lifelong learning due to a changing labour market. However, at the same time, the example underlines the importance of this study task. New ways of learning, and skills acquisition, increase the demand created by ICT workers to document learning outcomes in the form of recognised credentials e.g. certificates or diplomas for an individual's career development and to increase the individual's labour market value. Additionally, employers have the difficulty of identifying which particular skills are missing from their work force, and have to be acquired, to supply the internal job requirements. The crucial question is, which learning and training courses are needed by the workforce in order to acquire the relevant qualifications in the form of competencies, and thus skills, to perform productively [58] in their occupational role.

### ***1.1.2. Skills Obsolescence and Lifelong Learning***

An important force driving the growing demand for continuous learning and related qualification and training courses is the shortening time-cycle of individuals' knowledge and skills. This phenomenon is also called skills

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<sup>3</sup> The example is based on the article "Banks make high demands on IT professionals" in Computer Zeitung No. 28, 5 Juli 2004, page 22.

obsolescence [7]. This can be either induced by changes in the workers themselves (for example, ageing) and/or skills obsolescence attributable to external developments (e.g.: technological change). Both scenarios emphasise the need to support lifelong learning for individuals. ICT related skills, generally summarised under the term “e-skills”, are especially subject to rapid technological change. In this context, two different views can be distinguished: employee’s and employer’s view. From an employer’s view human capital and related investments in education and training represent a continuous depreciation in value. In the ICT sector the technological life-cycles are short and therefore new skill profiles are emerging and being demanded by employers. Therefore, a continuous reinvestment in the form of training is required to compensate for skills obsolescence. However, the recent demand and supply – both in quality and quantity – of ICT workers did not, and still does not, adequately match. This situation is currently discussed by experts under the term ‘skills gap’ (quality) and skills shortage (quantity) [40], [2].

From an employee’s point of view it is important to react flexibly to changes demanded for a particular job due to technological and organisational developments (as highlighted in the above example of bank clerks in Germany) as well as to benefit from adequate individual career-path guidance and development [7, p.3]. Another aspect to be mentioned is that individuals on the one hand have to maintain those skills that they have previously acquired, but which are not, or are insufficiently, used in their current professions. On the other hand, individuals have to actively acquire relevant job skills, and/or company specific skills, to stay competitive and to achieve the mobility and flexibility required by the labour market (e.g. shift to other sectors, regions, etc.). Both of these outlined scenarios underline the need to initiate and make available lifelong learning processes within companies, in particular, and in society in general. As a result, both employers and employees show high interest in the availability of qualifications with high recognition as, for instance, offered by e-skills certification systems on a national, European and international level.

### 1.1.3. *Acquiring Relevant e-Skills*

Some of the normal routes towards acquiring e-skills are traditional e.g. formal education, work experience, training (on-the-job or external), self-training or non-formal learning (see Figure 1). The acquisition of e-skills relies on natural abilities (personal attributes). Traditionally, basic skills and qualifications necessary to compete in the labour market were acquired through the various stages of formal education, in schools, vocational training, universities, etc.



**Figure 1** Some of the routes how skills are acquired [8, p.13]

This sets the background for the career path to be followed during working life. The existing mismatch of supply and demand, caused by the fact that schools and higher education are not providing new job seekers with the right skills set, is something which is currently being explored by several initiatives in Europe such as ‘Career-Space’<sup>4</sup>. The result of this mismatch is that enterprises will have to take more responsibility for reskilling and retraining those people already in employment and will also have to employ new techniques for learning. In the workforce, training and working must, to some extent, take place in parallel, interacting with each other [8, p.12f.].

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<sup>4</sup> Career Space is a major industry-led initiative and with the participation of 11 leading ICT companies. It is developing job and skills profiles for main job areas in the ICT sector and curriculum guidelines for the participation of 25 European Universities. See: [www.career-space.com](http://www.career-space.com).

#### ***1.1.4. Diversity of Qualifications***

Ensuring that learning is visible and appropriately recognised is an integral element of the quality of the services provided by education and training systems and a core element of a successful lifelong learning process. One of the most significant structural aspects of lifelong learning is the issue of e-skills certification [6, p.66]. Consequently, this report focuses on e-skills certifications.

Beyond the obvious implications of a learner's motivation, effective and transparent accreditation and certification systems are of crucial importance for industry itself and any high level political planning. Looking at the supply of relevant qualifications and training courses, individuals face a variety and diversity of e-skills certification systems on the market. Obviously, this implies a growing demand for career guidance and the availability of accessible job requirements. The current demand is served by such a variety of certifications that they are virtually impossible to comprehend. As a result, European employers and employees face a diversified market with a multitude of training and learning services. However, the individual's decision for, and selection of, relevant training courses is influenced by several factors, e.g. market recognition, quality, price, etc. This sets the scene and is the motivation for this report which investigates and overviews the situation of e-skills certification in Europe.

#### ***1.1.5. Comparability of e-Skills Certification Systems***

In general, the mere existence of accreditation and e-skills certification systems says nothing about their quality, transparency, or fairness and thus the comparability of national accreditation and recognition processes within Europe. While it may be possible to cater for non-formal education within a traditional certification framework, the recognition of skills and competencies acquired in an *informal learning* setting must be processed through an assessment of both the learning process and the learning outcomes. It is difficult to identify applicable indicators to assess the quality of accreditation and certification. Some national initiatives point the way to achieving a more harmonised European approach. The

Norwegian, along with the Scottish<sup>5</sup>, Irish, French and Portuguese<sup>6</sup> policies are examples to be considered [6, p.66].

### ***1.1.6. Harmonise Existing Approaches***

Opinions and views of experts differ, and reveal that many initiatives work towards one goal but with different concepts. There is an obvious need to define collective goals and to harmonise existing approaches. Some experts are convinced that job-related qualifications which, thanks to e-skills certification can easily be compared, will lead to a higher transfer level for employees. In order to investigate how this can be best achieved, a survey was undertaken and is described below.

#### ***Survey Focus and Starting Point***

*The survey* aims to contribute to the discussion of possible ways towards, and solutions for, a harmonisation of the rather diversified situation of e-skills certification in the European ICT and user industry. The latter suffers most from a lack of e-skills. The survey aims to elaborate on, and suggest ways for, the implementation of a widely acceptable European approach to e-skills certification for ICT workers. ICT workers must be mobile and able to be easily and flexibly deployed in order that they may work throughout all of Europe. Concepts which aim to create certifications for qualifications gained on the job and also to enable comparisons between these qualifications should, therefore, be developed as a result of international co-operation.<sup>7</sup>

*The objective* is to propose a framework based on the achieved results and to derive concrete recommendations which may be implemented. The survey identifies and investigates the availability of voluntary approaches to setting European quality standards. Consequently, one of the core elements of the survey

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<sup>5</sup> Scottish Credit and Qualification Framework (SCQF).

<sup>6</sup> National System for Recognising, Validating and Certifying Competencies (RVCC).

<sup>7</sup> CEPIS press release: Panel Discussion at GI Annual Conference, Concepts for certification, October 2003, <http://www.cepis.org>, last visit 12.11.2004.

is to identify existing recognised and widely applied e-skills certification systems in the different countries. Information is gathered from high level experts and bodies widely recognised and active in the field of e-skills certification by means of a questionnaire. Their individual recommendations and preferences are analysed. One important part of the survey task includes the investigation of the nature, modes and structure of certification systems.

## ***1.2. Objectives***

Based on the motivation above, the operational objective for this study is the evaluation of issues of ICT certification at the International and European level by

- analysing attitudes of stakeholders towards current and future European level activities and
- highlighting potential solutions and recommendations to perceived problems.

The study's declared aim is to contribute to the European e-Skills and the CEN/ISSS working group on ICT skills as well as to support the activities of Cedefop. The report starts with analysing and structuring the notion "e-skills certification" by explaining the nature, modes and underlying basic concepts. Quality standards are expected to play a central role for transparency and comparability of e-skills certification systems. Therefore, the report deals with the issue of availability of quality standards. The survey aims to identify voluntary approaches offered by widely applied e-skills certifications. The degree and level of recognition of widely applied systems is investigated, overviewed and categorised based on the sample. The report develops recommendations and potential ways forward and highlights possible approaches to harmonise e-skills certification throughout Europe.

### ***1.3. Survey***

*The survey* assesses the data on the basis of a standardised questionnaire which was sent to selected stakeholders. The questionnaire<sup>8</sup> covers several important aspects of e-skills certification in Europe. For this study a questionnaire was established and agreed with CEDEFOP which received a reasonable response from 21 countries, thus showing a well balanced European coverage. However, it should be recognised as being limited to selected high-level expert responses.<sup>9</sup>

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<sup>8</sup> The questionnaire is attached to this report in the annex, page 119.

<sup>9</sup> The survey sample is described in more detail in the annex, page 150.



## 2. e-Skills Certification

*"Human, not financial, capital must be the starting point  
and ongoing foundation of a successful strategy."*

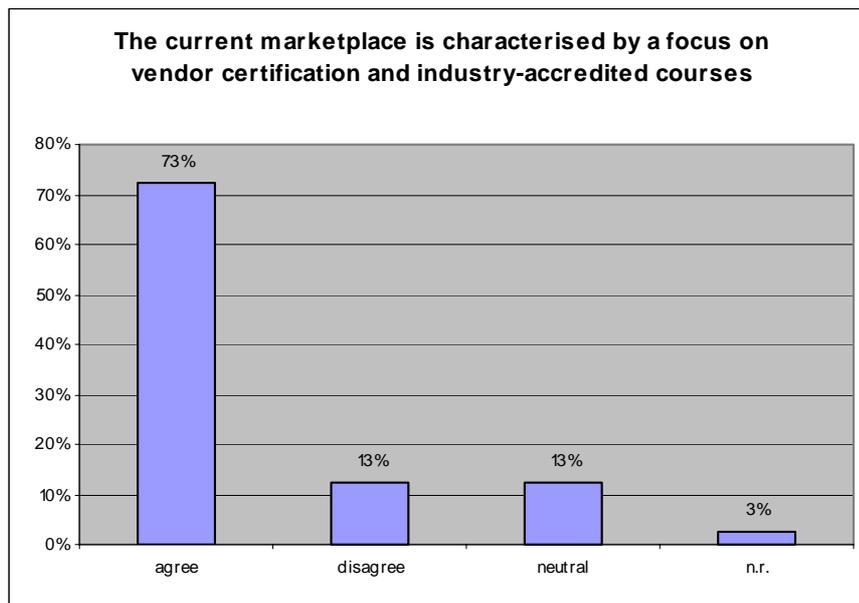
Barlett, C and Ghoshal, S.<sup>10</sup>

The difficulty individuals may have to demonstrate their knowledge, skills and competencies on the labour market complicates the possibility for movement into other jobs. This applies particularly for those qualifications acquired at work or in other non-formal/informal settings. This section focuses on e-skills certification. The section commences with structuring the notion of “e-skills certification” and describing the nature of certification by explaining its constituent parts. The gaps in the recognition of professional, academic and vocational qualifications of individuals from different countries and regions are a particular obstacle to people working in Europe [35, p9]. The issue of recognition of e-skills certification is rather too complex, and the perceptions by stakeholders are likely to be too diversified, to present implementable results within this report. However, this report intends to put emphasis on important aspects and subsystems influencing the degree of market recognition. The particular aim is to stimulate discussion between stakeholders by querying a sample of high level experts on how harmonisation in Europe might be achieved. In general, the success of systems offering credentials depends on the recognition by stakeholders, and in particular by employers, in different industry sectors. The nature, modes and some underlying basic concepts and definitions are described. A reference framework is characterised including the basic elements of e-skills certification depicting existing interdependencies and inter-relationships. Major roles and related

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<sup>10</sup> Cited according to [27].

activities within e-skills certification systems are specified. The best way to advance the field of e-skills certification is to understand its roots. ‘Industry ICT certifications’ play a major role in today’s e-skills certification landscape and are amongst the most recognised and most widely applied systems in Europe and beyond. This is backed up by the survey as shown in Figure 2. The majority, seventy-three per cent (73%) of the respondents feel that the current market-place is characterised by a focus on vendor certification and industry-accredited courses.



**Figure 2 Focus on vendor certification and industry-accredited courses**

### **2.1. Industry ICT Certification**

eSCC [30] published a report which expresses the role and view of e-skills certification from the perspective of industry. This opinion is summarised in the text below. Certifications play an important role in today’s ICT industry and represent emerging new paradigms and requirements concerning the demand for increased *flexibility* in the acquisition of skills by ICT workers.<sup>11</sup> Therefore, certifications give industry an appropriate means of providing an alternative way to “*right-to-title*” [30, p.17] for individuals, hitherto a privilege and reserved right

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<sup>11</sup> Flexibility is seen as one of the most important concepts for continuous education and professional development.

of the formal education system. Industry ICT certifications are voluntarily granted by industry stakeholders providing individuals only a “*right to title*”. Through industry ICT certifications companies are capable of integrating de facto “*practice control*” in their employment process. Examples are certifications offered by Microsoft, Cisco, Compaq, etc.<sup>12</sup> “*Within ICT industry, certifications are credentials that result from a voluntary evaluation process whereby an individual’s knowledge and/or skill in a particular subject area is verified against a set of predetermined skill standards by means of an objective assessment*” [30, p.17]. The notions “certification” and “certificate” are typically confused. Certificates often solely testify the pure physical attendance at a course or class programme. By contrast, industry certifications are perceived as a credential, a result of an objective assessment procedure run by third party, that an individual met the performance specifications delineated in job profiles recognised by industry stakeholders [30, p.18].

### ***2.1.1. Certification for ICT Security Professionals***

The dynamics of markets [3, p.22] prepare the ground for e-skills certification and e-skills as a moving target. An illustrative example provides the actual debate and increasing demand and quest for ICT security professionals [56]. *ICT security professional* is one of the hottest occupations in the ICT industry. Because industry lacks numbers of qualified security professionals, ICT vendors start to offer certification based on predetermined requirements which are in particular based on their solutions and technology. It is a fact that the challenge remains to build the “perfect” ICT security professional and commonly agreeing on what the profile of a real security professional looks like. “*Depending on the responsibilities and functions of a security position and the infrastructure of the organisation, someone in this role at one company can have a drastically different skill set than someone in a similar role at another company*” [56]. The situation lacks in the provision of guidance and pathways for lateral entries and individuals to plan their career and step into the labour market becoming an ICT security

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<sup>12</sup> See Appendix 2 – List of Vendor-specific Certificates, page 139.

professional. Therefore, there is a need to develop a common *set of standards* by stakeholders defining the role, but only little progress has been made in agreeing upon a set of skills or competencies to which all of these certifications lead.

| <b>Certification</b>  | <b>Description</b>   | <b>Content</b>  | <b>Certifying body</b>  |
|---|--|---|---|
| Cisco Certified Security Professional (CCSP)  | Validate advanced knowledge of securing networks   | Perimeter security, virtual private networks and intrusion protection, single/ integrated network security solution   | Cisco   |
| Security+   | Geared toward ICT professionals who want a one-exam certification covering a wide range of top-level security knowledge  | Topics every network administrator and engineer should know   | CompTIA   |
| Certified Information Systems Security Professional (CISSP)                                     | Focus on ten bodies of knowledge.<br>Work experience: 4 years of direct full-time security professional work experience  | Law, investigation and ethics to telecommunications, network and Internet security  | International Information Systems Security Certification Consortium |
| Microsoft Certified Systems Engineer (MCSE)<br>Microsoft Certified Systems Administrator (MCSA) | Offered security specialization for popular certifications.<br>Common path for many ICT security professionals, with 3,100 MCSEs obtaining the security specialization (July 2004) | Exams focused on specific security-related topics.<br>MCSE or MCSA, simply pass few additional exams to add the security specialization to their credential | Microsoft   |

**Table 1 Example: ICT security professionals [56]**

All of these certifications shown in Table 1 have experienced growth in the past year, and these are just a small selection of the security certifications on the market. However, one area of information security that is often neglected is

security awareness training for the ICT end user or non-ICT knowledge worker. One reason is the lack of standardised resources available for organisations for training their employees in security awareness. Another reason is likely barriers arising from the fear of the costs of such training programmes [56].

### ***2.1.2. Reasons and Motivation for Certification***

*Reasons and motivation* for employers to let their employees pass e-skills certifications, is the anticipated increase in productivity and supposed reduction of costs. In order to achieve these goals, industry vendors offer specific training in their solutions to transfer the required new e-skills (e.g. in the field of security) for advanced technologies [53]. The five main reasons and motivation for an individual in Europe to pursue e-skills certification are, in order of decreasing importance: 1) increase credibility [58], 2) assessment of knowledge, 3) preparation for a new position, 4) increase personal productivity and 5) fulfilment of job requirements.

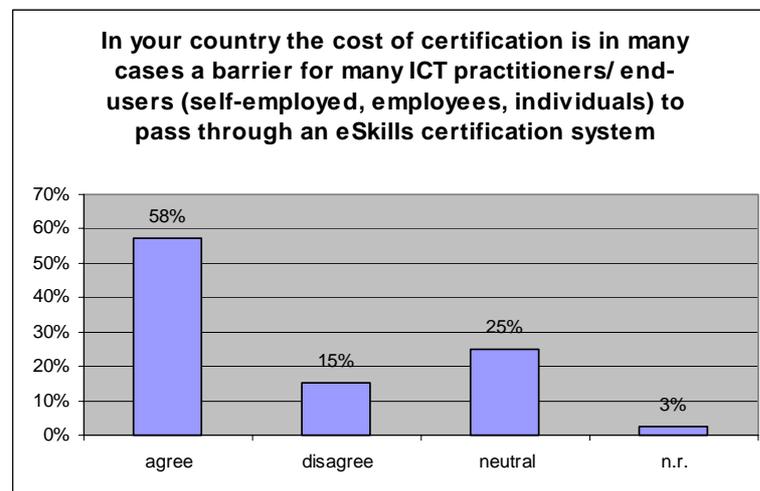
By comparison, in *North America* the reasons are slightly different. The most important reasons given by ICT workers to complete a certification programme are: 1) to be up-to-date with new technologies, 2) increased job prospects and 3) increased credibility [30, p.20]. Another reason is the request by customers to pursue certification programmes which, of course, implies the achievement of better job performance and enhanced quality [42]. In addition, certifications build an advantage for ICT contractors through updating of skills and preparing to compete for new business and retain existing business. Consumers of e-skills certification are categorised in two main groups [30, p.20f]: 1) functional consumers and 2) performance consumers.

The first category sums up individuals that are either new to the ICT field or new to the area of e-skills certification. The second category includes individuals which are already active as ICT workers in the aimed certification area [30, p.21].

### 2.1.3. Costs of Certification

Tracking costs for certification consists, from an employer's perspective, of accounting for two kinds of outlays. (Ed Tittel, Factoring the Costs of Certification [42])

- *Out-of-pocket costs* including expenditure on materials, books, practice tests, exams, classes and so on.
- *Time, overhead and opportunity costs* comprising the time costs factor in the hourly value of the time invested in studying, practicing and taking exams, attending classes or seminars, reading, surfing and doing all the many activities involved in obtaining or maintaining credentials.



**Figure 3 Cost of e-skills certification**

The respondents in the survey sample mentioned that the cost is, in many cases, a barrier for many ICT practitioners/end-users to pass through an e-skills certification system (as shown in Figure 3). With regard to the cost of certification as a barrier for employers to offer vocational training to employees the answers were more diversified. Forty-eight per cent (48%) of the respondents agreed, whereas forty per cent (40%) disagreed.

### 2.1.4. Models of e-Skills Certification

*e-Skills certification models* follow a widespread pyramidal structure distinguishing three expertise levels: entry (base), intermediate (mid), advanced

(high). Thereby, the number of certified professionals decreases with increasing expertise level [43], [30, p.22]. e-Skills certification models being investigated for this study provide individuals with multiple points of entry and are in general based on so-called certification ladders. A certification ladder consists of a sequence of individual certifications starting with relatively simple requirements and lightweight credentials. The model is steadily advancing to more complex requirements and more advanced credentials. Certification ladders offer good career guidance allowing individuals to plan their professional self-development. Obviously, such programmes tend to bind individuals to a specific programme. It appears that the intention is to make it easy for individuals to climb the ladder to reach the first levels. But the requirements to climb to higher rungs (levels) of the (job) ladder are more challenging [43].

In this way, individuals are able to develop their own career. The combination of credentials offers individual professional development and often holds the key to interesting, long-lived careers and lucrative consulting opportunities. The pyramidal model is applied by both vendor-specific and vendor-independent programmes. These programmes are not only multi-tiered, but also offer separate tracks, each with its own tiers and thus separate sets of credentials (e.g. Microsoft). Other companies, e.g. Novell and Cisco, keep the same names of credentials in separate tracks [43]. Vendor-specific and vendor-independent programmes differ by cost of entry, which is generally higher for the latter.

On the base-level vendor-neutral certifications<sup>13</sup> are the most common start for an ICT career. These certifications are increasingly offered by organisations like CompTIA motivated by expected cost savings preventing ICT suppliers from developing their own for the base-level. Vendor-specific certifications<sup>14</sup> aim at ICT practitioners belonging to the higher levels [30, p.23]<sup>15</sup> and strongly require the foundational knowledge and skills acquired by individuals at the base-level.

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<sup>13</sup> Vendor-neutral certifications cover foundational ICT knowledge and skill sets that are not specific to a set of ICT products [30, p.23].

<sup>14</sup> Vendor-specific certifications cover knowledge and skill sets closely tied to specific ICT products (e.g. Microsoft, Cisco, IBM, Novell, HP, etc.) [30, p.23].

<sup>15</sup> See page 49.

### 2.1.5. *Career Paths*

In the past, ICT workers were predominantly graduates from higher education and lateral entries from other branches and occupations [32, p.13]. In recent years, a multitude of job profiles and career paths have emerged due to new job requirements mainly driven by technology and application developments within the ICT field. The increasing number of available e-skills certifications and ICT suppliers boosts the wide recognition of these credentials. The e-skills certification model allows, in principle, two career paths. The typical way is to enter at base (or core) level and then climb up the certification ladder with increasing work experience, expertise, knowledge and skills. ICT workers and in particular ICT practitioners are in general allowed to enter the pyramid at the higher levels depending on their qualification (e.g. university degree in informatics) and general ICT background based on an already acquired level of experience, knowledge and skills. In this context, experience is of growing importance for the advanced level expert [30, p.23]. ICT workers with a university degree in informatics will enter the pyramidal model at the mid or high level depending on their previous work experience [32, p.9] and education.

In conclusion, career pathways are not generic and the landscape of e-skills certification offers various ways in which to develop individuals' professional careers. Certifications and related requirements, if based on validated skills standards [30, p.18] and frameworks, show potential to serve as career guidance. Skills standards once recognised by industry represent an important factor because of the difference to conventional/formal credentials.

## 2.2. *Structuring e-Skills Certification*

Having explained the perception of *e-skills certification* by industry, we now describe the basic nature and structure of e-skills certification. The accreditation system stands at the end of a (learning) process. In the following, acquisition of e-skills is analysed and evaluated. Figure 4<sup>16</sup> depicts the core modules and constituent parts of qualification and training systems. The arrows symbolise

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<sup>16</sup> Source: AIFB 2004, University of Karlsruhe, Germany.



requirements is crucial and should be regularly agreed between industry and educational bodies. Both 'know what' and 'know how' are important learning elements to become an ICT professional, [30, p.47] and blur the line between education and industry.<sup>18</sup> e-Skills certification provides stakeholders with a means to reward the fulfilment of specific job requirements by ICT workers for occupational roles.

Today, a typical career path of an ICT worker starts with formal education. After having received credentials from formal education an individual normally starts his/her professional career with training on the job. However, a direct step into the job and occupational role is conceivable by acquiring job-specific knowledge and skills primarily by practice. The latter scenario places emphasis on the importance of non-formal and informal learning. The basis on which to provide specific training for individuals is the definition of requirements associated with occupational roles to derive and develop relevant training programmes. In this context, diagnostic testing provides a test environment which is open and foresees in general no supervision and strict regulations. Diagnostic tests aim to offer a voluntary evaluation of a candidate to assess his/her current status of knowledge and skills. Diagnostic and final testing both rely on the definition of job and qualification requirements as a prerequisite. The basic understanding of training covers the acquisition of relevant knowledge, skills, and competencies by an individual needed for a specific job. The final testing is optional and voluntary for individuals to formally verify, and publicly recognise, the fulfilment of required qualification. Certifications are credentials which result from this voluntary evaluation process. The issued certifications are either lifelong or have to be renewed when expired. The module on top is work experience continuously gathered by the individual during the working process, informal learning and continuous professional development.

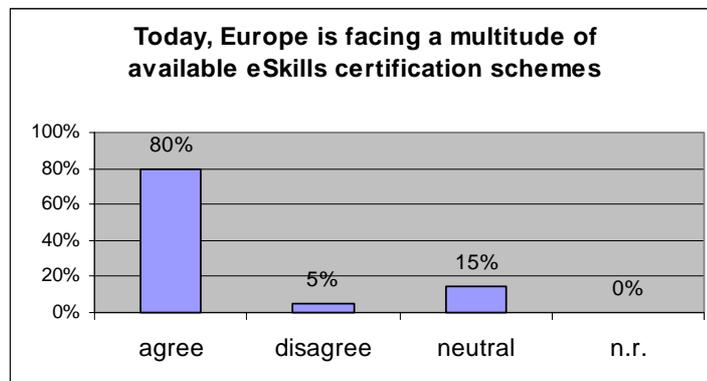
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<sup>18</sup> The eSkills Certification Consortium (eSSC) [30] proposes possible ways forward towards recognised e-skills certification and multistakeholder-partnerships.

### 2.3. Certification

Industry stakeholders are particularly anxious to differentiate their certification programmes from so called “proprietary” organisations which points to the rather chaotic situation of e-skills certification caused by a multitude of qualification and training programmes [30, p. 18]. This perception is supported by the respondents (see Figure 5) and underlines the current difficulty individuals may encounter when asked to choose between the existing qualification and training programmes.

As displayed in Figure 4, certification systems are a constituent part of a larger system (qualification and training system). The aim of this section is to present a picture of e-skills certification systems. e-Skills certification at the foundation level will continue to be a door-opener to positions – and the “must have” set of credentials that validates the individual’s mastery of a set of vendor-neutral industry standards and vendor-specific operational details – and a reliable predictor of employees’ success. Certifications are seen to increasingly become validation milestones along a road of continuous improvement [54].



**Figure 5** Multitude of available e-skills certification schemes

*Certification* is the end point of a training process [54] and is in turn part of a system providing credentials to individuals. Certification in the strict sense is the acknowledgement of conformity with a norm or standard [44]. Certification results from a voluntary evaluation process whereby an individual’s knowledge and/or skill in a particular area of interest are validated against a set of predetermined skills requirements e.g. skills standards by means of an objective

assessment [30, p.17], [58]<sup>19</sup>. Accordingly, certifications are part of a larger system issuing credentials for achieved learning objectives and outcomes. Today, an ICT worker has to fulfil constantly changing and increasing qualification requirements. Employers prefer to see multiple certifications, but also demand complementary extensive experience; academic credentials; related business, communication and project management skills; outstanding references; and a track record of success [54].

Certifications are typically, though incorrectly, confused with certificates. The latter relates to the documentation of successful completion of a learning programme or class, but lacks in reference to skills requirements or standards and wide recognition of industry stakeholders [30, p.18]. This implies a market value associated with certification programmes as a consequence of an existing *demand* for specific certifications and associated performance expectations of an individual by employers.

In general, e-skills certifications are granted by professional associations, firms, trade and/or industry associations, or proprietary organisations. At the end of the certification process, individuals obtain formal proof of successful attainment of required knowledge and skills for a specific role or job [30, p17].

A brief history of the ICT certification landscape is made by eSCC [30, p.19ff]. The ICT certification landscape blossomed in the 1990's due to the tremendous demand for skilled ICT workers. However, it is necessary to distinguish between situations where certification programmes for individuals are justified and situations where other forms of qualification are more appropriate [45]. From a learner's perspective, the rationale is consequently to select on the basis of cost and market recognition (value) the 'right' certification for his/her professional development. It is important to note that in general the passing of assessment(s) or running through a certification process should not be seen as a necessity for an individuals' career development.

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<sup>19</sup> Certification is career recognition through the evaluation and approval of individuals engaged in a specific occupation or profession. Professional certification has expanded significantly over the past decades [58].

The certification process itself is based on a supporting mechanism provided by certifications and procedures. Hence, they have to be the subject of analysis and are to be closely looked at to validate and determine the degree of market recognition [30, p.18]. Supporting mechanisms are primarily: defined skill standards, the process for accrediting curricula and learning material, validation of corresponding assessment tools, objectivity of administration protocols, reliability of protocols for ensuring security of data, and mechanisms for tracking compliance, candidate verification and recertification.

Available *quality standards* such as ISO/IEC 17024 [4] define general requirements for bodies operating certification of individuals. Figure 6 illustrates the subject covered by the normative document of the standard. Principally, these are certification system, programme and process.

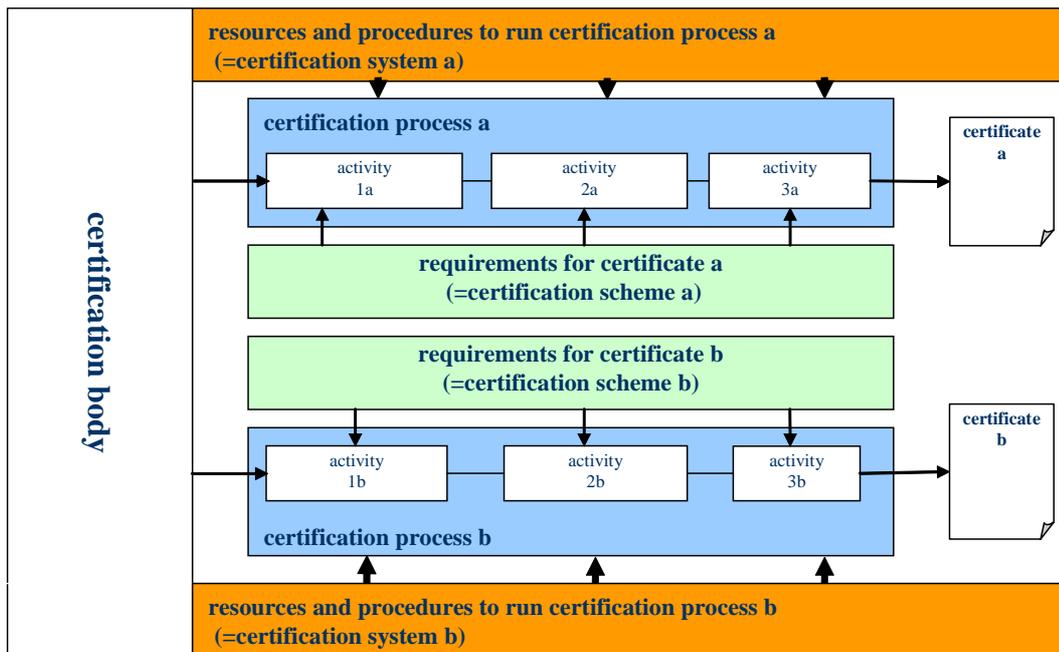


Figure 6 The system of e-skills certification<sup>20</sup>

### 2.3.1. Certification System

A *certification system* summarises the set of procedures and resources for carrying out the certification process as per a certification programme, leading to the issue

<sup>20</sup> Figure is partly based on [4, ISO].

of a certificate of competence by the certifying body including maintenance as one of the envisaged management activities [4] (see Figure 6). The certification system normally follows specific policies supporting quality and market recognition. These policies include the operation of specific procedures by means of required resources. In contrast to other types of conformity assessment bodies, such as management system certification/registration bodies, one of the characteristic functions of the personnel certification body is to conduct an examination which uses objective criteria for competence and scoring. It is recognised that such an examination, if well planned and structured by the certification body, can substantially serve to ensure impartiality of operations and reduce the risk of a conflict of interest [4]. In addition, the organisation shall operate a management system which is documented and covers all the requirements of an International Standard e.g. ISO/IEC 17024 [4], and ensures the effective application of these requirements.

### ***2.3.2. Certification Programme***

*A certification programme* specifies certification requirements related to selected categories of persons to which the same particular procedures, standards and rules apply. Many certification programmes are initiated in the form of job profiles which provide a skill set required, for example, for a specific ICT practitioner occupation in ICT industry. It consists of a certificate as a credential, a certification body, requirements of skills defined in profiles, and accompanying policies e.g. security, confidentiality, impartiality and fairness. The certification process is part of a certification programme and includes such activities as development, maintenance, decision and use of certificates, etc.

Certification of persons is one means of providing evidence that the certified person meets the requirements of the certification scheme. Confidence in the respective certification programmes is achieved by means of an internationally accepted process of assessment, subsequent surveillance and periodic re-assessment of the competence of certified persons. The development of new certification programmes for persons, in response to the ever increasing velocity of technological innovation and growing specialisation of personnel, may

compensate for variations in education and training and thus facilitate the global job market. If commonly accepted and agreed occupational frameworks are used to develop certification programmes it is a precondition that comparability and transferability are achieved.

The certification body shall appoint a scheme committee [4, ISO], which shall be responsible for the development and maintenance of the certification programme for each type of certification being considered. The programme committee shall fairly and equitably represent the interests of all parties significantly concerned with the certification programme, without any particular interest predominating. Where a certification programme is developed by organisations other than the certification body, the respective developer of the programme shall adhere to the same principles.

### ***2.3.3. Certification Process***

*The certification process* comprises all activities by which a certification body establishes that a person fulfils specified competence requirements, including application, examination, evaluation, decision on certification, appeal, complaint, surveillance and recertification, use of certificates and logos/marks. The certification body shall provide, on request, a detailed and up to date description of the certification process, appropriate to each certification programme (including fees), and the documents containing the requirements for certification, the applicants' rights, and the duties of a certified person which includes a code of conduct. Core activities to be handled by a certification body are:

#### ***2.3.3.1. Application***

The certification body shall require the completion of an application, signed by the applicant seeking certification, which includes the scope of the desired certification, a statement that the person agrees to comply with requirements of a desired certification. The candidate has to agree that he/she is willing to supply any information needed for the evaluation, details of relevant qualifications, confirmed and supported by evidence. It is foreseen that the application activity

will record general information on the applicant, for example name, address and other information required to identify the person.

#### **2.3.3.2. Evaluation**

*Evaluation* is realised in the form of an assessment that a person fulfils the requirements of the certification programme, leading to a decision on certification.

#### **2.3.3.3. Examination**

*Examination* is understood as a mechanism that is part of the evaluation, which measures a candidate's competence by one or more means such as written, oral, practical and observational.

#### **2.3.3.4. Development**

The certification body shall define the methods and mechanisms to be used to evaluate the competence of candidates, and shall establish appropriate policies and procedures for the initial development and continued maintenance of these methods and mechanisms.

#### **2.3.3.5. Use of Certificates**

A *certification body* that provides a certification mark or logo shall document the conditions for use and shall appropriately manage the rights for usage and representation. This activity foresees that the certified person signs an agreement regulating how to use the issued credential in accordance and conformity to these conditions.

#### **2.3.3.6. Surveillance and Recertification**

The certification body shall define a pro-active *surveillance process* to monitor candidate's compliance with relevant provisions of the certification programme. Moreover, the certification body shall define recertification requirements according to the competence standard and other relevant documents, to ensure continuity in order that the certified person continues to comply with the current certification requirements.

### **2.3.3.7. Decision of Certification**

*The decision of certification* of a candidate shall be made solely by the certification body on the basis of the information gathered during the certification process. Those who make the certification decision shall not have participated in the examination or training of the candidate. The certification body shall provide a credential (e.g. certificate) to all certified persons. The certification body shall maintain sole ownership of this credential. The credential may take the form of a letter, card or other medium, signed or authorised by a responsible officer of the certification body. If a certificate is issued as a credential it shall, for example, contain, as a minimum, the following information:

- a) Name of the certified person and a unique certification number;
- b) Name of the certification body;
- c) Reference to the competence standard or other relevant documents, including issues, on which the certification is based;
- d) Scope of the certification, including validity conditions and limitations;
- e) Effective date of certification and date of expiry.

## **2.4. Definition**

As already apparent, certifications are based on definitions of skill requirements based on skills standards and frameworks [30, p.18]. These definitions deliver performance specifications that identify the knowledge and skills and individual needs to succeed in the workplace.<sup>21</sup> In this way, it defines what a person must know and be capable of in order to successfully perform roles related to a specific job. In this context, the challenge is to assess the relevant qualifications required in a specific work process and in order to derive from this the qualification required by ICT workers [10, p.36] broken down into knowledge, skills, and competencies. This procedure allows job profiles to be transferred into concrete and well-defined learning objectives. The availability and knowledge of learning objectives are prerequisites for informal learning (self-directed learning processes) and thus lifelong learning. Definitions of requirements have to be synchronised

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<sup>21</sup> Spill, R. (2002) cited according to [30, p.18].

with certification programmes at regular intervals. As already mentioned, certification programmes provide specific certification requirements related to specific categories of persons to which the same particular standards and rules, and the same procedures apply [45]. Certification programmes should not be confused with, and are not necessarily the same as, definitions e.g. job profiles. Definitions are provided by organisations independent from certifications. The defined job profiles by the Career Space Consortium<sup>22</sup> serve as an example.

#### **2.4.1. Qualification**

*Qualification* is the demonstration of personal attributes, education, training and/or work experience [4]. Qualification is shown in the form of credentials (e.g. certificates or diplomas) or other evidence linked to the delivery and assessment of training received.<sup>23</sup> Qualification is the outcome of specific training, education, work experience and shows a significant interdependency with the personal attributes of an individual. Qualification summarises knowledge, skills, and capabilities which are required by specific activities of a job or daily life. From an employer's point of view, the notion is associated with effectiveness gained by an individual in the production process. From an individual's point of view, qualification is a precondition for successful occupation and job fulfilment, because the status of development influences his/her market opportunities and thus his/her labour market value. The development of key qualifications is directly connected to the compliance of specific occupational and academic requirements [33, p.448].

#### **2.4.2. Knowledge, Skills, Competence**

In literature various definitions of *knowledge, skills, and competence* can be found. For the purpose of this report, some basic definitions are cited without

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<sup>22</sup> Information about Career Space is available at <http://www.career-space.com>, last visit 12.11.2004.

<sup>23</sup> Cedefop: Draft Final Report: Towards a Comprehensive European level E-Skills Framework, page 101, restricted Report for CEN/ISSS ICT skills workshop, May 2004.

introducing new definitions or to recapitulate and overview the variety of available definitions. Interested readers are recommended to refer to referenced material for discussing the basic terms.

#### **2.4.2.1. Knowledge**

*Knowledge* and information are seen as new economical factors of production in the Knowledge Society [10, p.23]. The notions “knowledge worker” and “knowledge company” are, in this context, reflecting the importance of knowledge in today’s value creation processes in industry. In particular this applies in knowledge intensive environments such as ICT or those applying ICT intensively. In future, it is predicted that shortages in these resources will jeopardise continuous economic development and progress. Knowledge is acquired through learning processes and is about facts and social interrelations [33, p.316]. Knowledge summarises the capabilities and skills applied by individuals to provide solutions for specific problems [34, p.44]. A variety of definitions is provided by knowledge management literature.<sup>24</sup> Two major categories for knowledge are: explicit and implicit. Explicit knowledge can be accessed and transferred by other individuals; implicit knowledge is bound to the personal capacities and experience of a certain individual. Additionally, knowledge can be categorised into “know-what” and “know-how” [30, p.47].

#### **2.4.2.2. Skills**

*Skills* are defined as capabilities, definable by content, to be acquired and activated through related professional training. In this context, capabilities are the physical or psychological attributes of an individual to be applied in activity-related approaches [33, p.206].

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<sup>24</sup> Data and information are transformed into knowledge if the individual is able to reason and apply it within a specific professional context. Data is transferred to information by linkage to a specific context; information is transferred to knowledge based on experience and individual’s intellectual and mental capacity.

### 2.4.2.3. Competence

“*Competence*” is a comprehensive expression and it is difficult to build systematic categories [31, p.74f.]. Cedefop defines competence as the “*ability to apply knowledge, know-how and skills in an habitual or changing situation.*”<sup>25</sup> The term describes the ability to put knowledge and skills into practice. Competence relates to the availability of possible actions or activities of an ICT worker and goes beyond the defined content of knowledge and skills. Competence comprises the ability of an individual to acquire autonomously new knowledge and skills on demand. This implies the adoption of the lifelong learning paradigm and the implementation of an adequate organisational culture [29, p.20] to continuously acquire knowledge, skills and new capabilities. Important subcategories to be delineated are professional competence<sup>26</sup>, methods competence<sup>27</sup> or expertise, social competence<sup>28</sup> and reflection competence<sup>29</sup>. Competence in a field depends on an individual’s capabilities to both name and explore what could be described as ‘tacit knowledge’, and to ‘unthinkingly’ make use of it in appropriate circumstances [50]. Competence is the set of capabilities that people in a particular occupation need to have, in order to reliably and consistently perform that role to an adequate level of performance (the term is therefore close to, and often used in, this context interchangeably with skills) [26]. Another definition [4] uses the term competence as the ability of a person to be certified to apply knowledge and/or skills and, where relevant, demonstrate personal attributes, as defined in the certification scheme. *Competence* consists of personal attributes, individual knowledge and acquired skills. The notion secures flexibility and provides alternatives and therefore constitutes the capabilities of an individual to act and decide independently in occupation and daily life [33, p.448].

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<sup>25</sup> Source: Cedefop 2002, in Terminology of vocational training policy: a multilingual glossary for an enlarged Europe, p. 47.

<sup>26</sup> Previous knowledge of working content and related tools and methods [31, p.75].

<sup>27</sup> Formal, logical and informal aspects of methods to be applied in the working context and related handling of knowledge and skills [31,p.75].

<sup>28</sup> Social interaction with colleagues and human beings in general comprising e.g. sensibility, abilities to communicate, co-operate, implement, conflict resolution, etc. [31, p75].

<sup>29</sup> Capability to link to immediate coherences and derive new knowledge and skills [31, p.75].

### 2.4.3. *e-Skills*

“*e-Skills*” are the nucleus, the core concept of our model, and are therefore discussed more broadly. It is difficult to provide a comprehensive and widely accepted definition of e-skills. The definitions for the notion “e-skills” vary significantly.<sup>30</sup> However, for this report the following definition is applied mainly based on the *European e-Skills Forum*. “*The term “e-skills” encompasses a wide range of capabilities (knowledge, skills and competences) and issues with an e-skills dimension span over a number of economic and social dimensions*” [40]. Stucky et al. [26] developed an IT Competence Maturity Model and categorised e-skills according to five degrees: (1) *IT awareness* (basic knowledge), (2) *IT literacy* (knowledge to operate a PC), (3) *expert user* (special knowledge/expertise with application software, helping other users), (4) *professional entry level* (professional knowledge) and (5) *professional level IT skills* (advanced professional knowledge). While the categorisation is satisfactory for the model, it does not provide the required granularity of classification for this study task. Thus, the classification is advanced by distinguishing three main categories as proposed by Stucky et al. [26], European e-Skills Forum [40].

### 2.4.4. *ICT Practitioner, End-User and e-Business Skills*

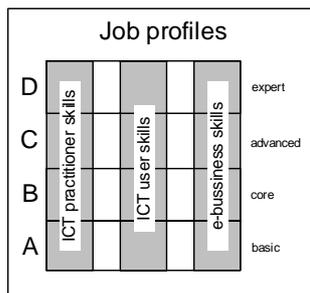
The term *e-skills* includes ICT Practitioner Skills, ICT End-User Skills and e-Leadership or e-Business Skills [40]. In general, the term ‘skills’ is used as the set of requirements needed by employers from those who are capable of satisfactorily fulfilling an occupational role [26].

*ICT practitioner skills* comprise the capabilities required for specifying, designing, developing, installing, operating, supporting, maintaining, managing, evaluating and researching ICT systems, for the benefit of others. ICT end-user skills include the capabilities required for an effective use by the individual user of ICT systems and devices, for whatever purpose. ICT end-users make use of the

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<sup>30</sup> e-Skills are distinguished in different ways, e.g. ICT professional skills, applied ICT skills and digital literacy or basic ICT skills [11, p. 15f.]. For other categorisations and definitions see EITO [16], [17] and [12, 13, 14, 15, 18].

systems as tools in support of their own work, which is in many cases not ICT. End-user skills cover basic digital- (or ICT-) literacy, the utilisation of common (“generic”) software tools in an office environment, and the use of specialised tools supporting major business functions within a large number of “user sectors”. The third category to be distinguished is *e-business skills*. This category of skills summarises the capabilities needed to exploit the strategic opportunities provided by ICT (in particular, the Internet) for specific industry or societal sectors. e-Business skills are strategic and innovation-management, not technology-management, skills - which are part of ICT Practitioner skills. e-Business skills contain elements of both ICT practitioner and end-user skills, but in addition they contain a significant element of generic (non-sector specific) non-ICT skills.<sup>31</sup> Thus the distinction between the categories introduced is not strict. There is an overlapping between the categories as illustrated in Figure 7.



- A: Basic level (assistant, end-user),
- B: Core level (technician, end-user),
- C: Advanced level (specialist, end-user),
- D: Expert level (professional, end-user).

**Figure 7 e-skills by categories**

Furthermore, within these categories, e-skills are categorised by four different levels (the related qualification level is indicated for both ICT practitioner and (end-) user level).<sup>32</sup> In literature, the definition of skills categories is not consistent and there is a variety of existing definitions. Consequently, this report intends to compromise in order to find the right granularity on the basis of material and literature available [30, p21ff], [40, p4ff], [37, p51ff], [38, p.36f], [39, p67f]. The usage of the levels A, B, C, D is not binding, but a straightforward approach, applying four vertical categories, to investigate e-skills certification indicated on returned questionnaires. In contrast, the SFIA model uses seven different levels of

<sup>31</sup> A comprehensive overview of the categories of e-Skills is provided by [40].

<sup>32</sup> The term ICT end-user-skills emphasises that the term refers to user skills which are not overlapping with practitioner skills.

skills<sup>33</sup> which were found too explicit for the survey task. The respondents were asked to characterise widely applied e-skills certification systems in their countries according to these categories without differentiating between the horizontal dimensions (see Figure 7).

## **2.5. Learning Process**

*Learning* content has to be continuously adapted to changing requirements by employers and individuals [10, p.33]. Individuals are increasingly confronted with an ever growing demand from industry and society for continuous self-directed learning [29] and informal learning. As a result of this the number of training programmes is steadily increasing. And as a consequence access to and provision of learning content is improving. In this regard, the concept of certification is seen to be of growing importance as a means of assessing an individual's informal learning outcome and by this means producing evidence of individual's achievements in lifelong learning.

Individuals acquire relevant knowledge and skills by undertaking learning and training activities. Besides training activities, testing in the sense of assessment of achieved individual competencies is an important aspect. Testing and certification are strictly differentiated. Testing stands for the assessment of a person who meets the defined requirements imposed by a specific qualification. The requirements are predefined by job profiles.

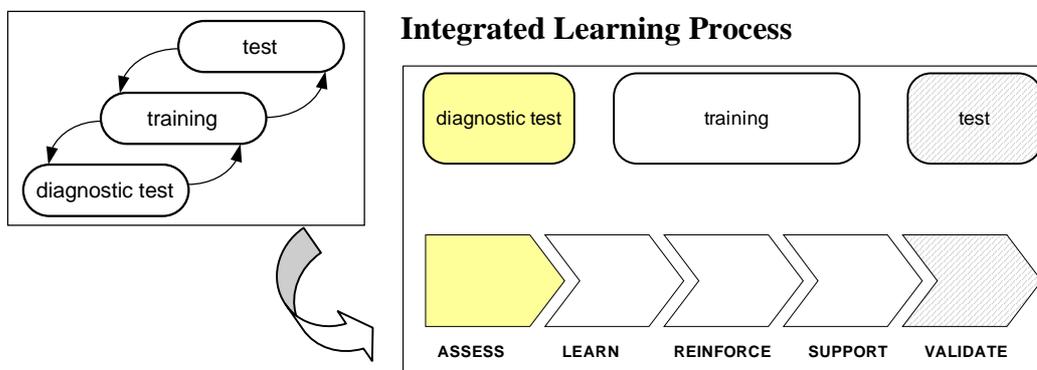
Testing can be part of conformity assessment or evaluations (examination) within a certification system, but does not compulsorily refer to an existing norm or standards; whereas certification demands to be impartial and consequently to be independent of training providers and test centres. Therefore it has to be decoupled from the premise to attend training courses [44]. Training programmes

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<sup>33</sup> The SFIA model applies the levels (1) follow, (2) assist, (3) apply, (4) enable, (5) ensure, advise, (6) initiate, influence, (7) set strategy, inspire, mobilise. Those categories imply the third dimension expertise and e-Business Skills not explicitly. SFIA puts skills into their business context by an additional dimension of five categories (strategy & planning, management & administration, sales & marketing, development & implementation and service delivery [28].

should build e-skills. Certification programmes should guarantee skill levels; and besides this, the learning process does not require to be completed by certification. The evaluation and hence examination, by a certification system is optional and voluntary for individuals. This perception is displayed in Figure 4.<sup>34</sup>

Diagnostic testing assesses the needs for training of an individual. This form of test determines the degree of knowledge and skills of a candidate. In addition, training providers offer counselling interviews to recommend training courses or identify and agree upon learning objectives. Therefore, in the integrated learning process this activity refers to process step ‘assess’ (see Figure 8).



**Figure 8 Learning process by modules and process steps<sup>35</sup>**

The process steps ‘learn’, ‘reinforce’, ‘support’ build the module ‘training’. Knowledge and skills are acquired by learning methods supported by learning content and media. Individuals secure their knowledge and skills by means of learning material and repetition of learning content to meet the defined learning objectives. The training provider offers support to students in the form of a help desk or moderated communities of practice to answer questions concerning the learning content.

The last activity in the sequence shown is validation if the learning objectives have been met by the student based on the learning outcome (‘validate’). The learning outcome and candidate’s competence is measured by one or more examination. Examinations are web-based, oral, practical and observational. Testing is offered by test centres which are possibly part of a training centre. The

<sup>34</sup> See page 37.

<sup>35</sup> Figure is partly based on [48].

effectiveness of the learning process is influenced by the following dimensions [50]: training and motivation, quality and relevance of materials and reinforcement of literacy.

### **2.5.1. Training**

Today, individuals and in particular ICT workers require continuous learning and upskilling due to shortening technological lifecycles and resulting decay time of knowledge and e-skills. The paradigm of lifelong learning requires a flexible qualification and training system. The learner stands in the middle of this system acquiring knowledge, skills, and competences. The traditional ways of acquiring knowledge and skills are still predominant, but new learning concepts, e.g. self-directed learning and informal learning, have become more and more popular. Personal preferences and proclivities impact and influence each individual's learning experience. Therefore, they should be well considered by students and teachers during the planning phase [49]. Hence, the success and motivation of training depends on the right selection of learning methods and styles, study materials, etc. according to the learner's personal preferences.

#### **2.5.1.1. Learning Programmes**

A variety of learning models and derived programmes is available for individuals who are willing to pass e-skills certification [49]. The guiding principle is that different people learn best in different ways. However, learning programmes are often directly aligned with various e-skills certifications. Training material and courseware is created by education and training providers which are often completely independent of certification providers or, in some cases accredited (e.g. EUCIP<sup>36</sup>) or developed by e-skills certifications providers (e.g. Microsoft) and used by accredited and/or authorised training providers [30, p.23]. Self-directed learning has gained significantly in popularity in the last decade [50], [29], [10, p.37]. It can be seen as people teaching themselves through conversation, through constructing some sort of learning plan, or by following

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<sup>36</sup> European Certification of Informatics Professionals: <http://www.eucip.com>.

programmes of learning constructed by others (e.g. courseware, e-learning, etc.) [50].

### ***2.5.1.2. Training Blend***

eSCC [30, p.25] argues that the type of training is blended according to the type of e-skills certification (defined by level of expertise). The learning content for base and high-level certificates is predominantly delivered through formal learning environments (instructor-led classes). Content required for certification, particularly on the mid-level, is delivered through informal learning (e-learning, computer- or internet-based training). Consequently, e-skills certification systems can be distinguished by source, delivery method for available courseware and the individual's access to learning content. Blended training allows choosing the right learning method and media to support different steps of the learning process. Training programmes should therefore be a combination of traditional and media-based learning in orientation towards defined learning objectives [10, p.37].

### ***2.5.1.3. Learning Methods and Styles***

Literature offers a multitude of contributions in the form of learning models, styles, etc. Thus this report intends not to repeat the available material. As e-skills certification aims to assess a person's fulfilment of predefined requirements [45], learning methods and styles have significant influence if these requirements are to be met. A good introduction and overview of fundamental learning methods is provided [50] to which the report in the following mainly refers (see Table 2).

*Formal learning* stands for "traditional" learning environments, the hierarchically structured chronological learning system (education, academic studies, a variety of specialised programmes and institutions for full-time technical and professional training) [50]. Learning takes place in the form of physical, face-to-face, teacher-centred classroom training (instructor-led training).

*Non-formal learning* is learner-centred and provides learners with more flexibility. It includes any organised educational activity outside the established formal system. The education provided is in the interests of the learners, and the curriculum planning is preferably bottom-up undertaken by the learners themselves. But other examples of non-formal programmes are common. Almost

all employer-led and state-provided training falls into this category. Informal learning (or education) is the truly lifelong process whereby every individual acquires attitudes, values, skills and knowledge, from daily experience and influences, by training environment and training resources (public courseware, training material, library, books, mass media, etc.) in the individual's environment. Non-formal and informal learning are more difficult to distinguish.

|                                 | <b>formal</b>  | <b>non-formal</b>                                | <b>informal</b>  |
|---------------------------------|--|--|--|
| <b>purposes</b>                 | long-term & general<br>credential-based                          | short-term & specific,<br>non-credential based   | situated learning, specific,<br>activity- and experience-<br>based |
| <b>timing</b>                   | long-cycle/ preparatory/<br>full-time                            | individualised/ output-<br>centred               | individualised   |
| <b>content</b>                  | standardised/ input-<br>centred                                  | individualised/ output<br>centred                | individualised,<br>contextualised                                  |
|                                 | Academic   | practical  | practical, tacit knowledge   |
|                                 | entry requirements<br>determine clientele                        | clientele determine entry<br>requirements        | individual interests and<br>needs                                  |
| <b>delivery<br/>system</b>      | institution-based, isolated<br>from environment                  | environment-based,<br>community-related          | community-related, work<br>context, collaborative,<br>collegial    |
|                                 | rigidly structured,<br>teacher-centred and<br>resource intensive | flexible, learner centred<br>and resource saving | flexible, informal ways,<br>non-course based                       |
| <b>control</b>                  | external/ hierarchical   | self-governing/<br>democratic                    | self-directed  |
| <b>curriculum<br/>formation</b> | top-down   | blended: top-down or<br>bottom-up                | bottom-up  |
|                                 | set curriculum   | negotiated curriculum                            | non-curriculum,<br>conversation based,<br>interest and needs       |

**Table 2 Ideal type models of normal and non-formal education<sup>37</sup>**

*Formal education* is linked with schools and training institutions; non-formal with community groups and other organisations; and informal covers what is left, e.g.

<sup>37</sup> This table is partly based on [50].

interactions with friends, family and work colleagues or communities of practice. *Informal learning* is defined as “learning which takes place in the work context, relates to an individual’s performance in their job and/ or their employability, and which is not formally organised into a programme or curriculum by the employer. It may be recognised by the different parties involved, and may or may not be specifically encouraged” [50]. Other definitions emphasise learning that takes place outside a dedicated learning environment, non course-based learning activities, (which might include discussion, talks or presentations, information, advice and guidance) provided or facilitated in response to expressed interests and needs. In addition, planned and structured learning, based on identified interests and needs, which is delivered in flexible and informal ways and in informal community settings.

Another path into the notion of informal learning is to view it simply as implicit learning [50] aimed at the acquisition of tacit knowledge (‘that which we know but can not tell’) as a learning result. *Informal learning* is linked to situational learning. Learning in this sense is understood as being internal, or “within the soul” of individuals [50]. Educators that are largely working around conversation can be seen as informal; those working through set curricula are formal.

#### ***2.5.1.4. Learning and Preparation Material***

Many different materials are available to prepare for e-skills certification. In spite of the past downturn and recent consolidation of the ICT sector, the certification market remains a profitable business. A good overview is provided of the most essential and most frequently chosen elements in a typical collection of certification preparation materials [51].

The most convenient approach for learners is to obtain a so-called all-in-one training package. These packages include access to online or computer-based training, audiotapes, question/answer collections and various kinds of books and exam guides.<sup>38</sup> The prices for these training packages vary. More expensive packages sometimes come with money-back guarantees e.g. for certification exams or the cost of the materials themselves. Additionally, instructor-led

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<sup>38</sup> Focused books that stick closely to examination topics and sample questions.

classroom training is offered. Individuals have many options, ranging from costly commercial training, or boot camps, to classes at local community colleges or other education programmes. Furthermore, a variety of collaborative and collegial learning environments exists e.g. user groups, study cells, online-communities etc. These communities are formed by individuals who are studying for the same exams and are strongly recommended by certified ICT workers. Virtual certification communities are strongly recommended for learners to get answers to tough questions and benefit from interaction with colleagues [51].

*Online training* combines the features and benefits of the classroom with self-paced reading assignments, labs and practice tests. In general, online training is cheaper than classroom training, but does not provide as many benefits. Options available for learners range from expensive training outlets or educational conferences to low-cost (or free) video-based training providers.

*Practice tests* (or diagnostic tests) offer the best form of readiness assessment available. Apart from the purpose of identifying training needs and defining learning objectives, passing practice tests should mean passing the evaluation process of the e-skills certification system.

Publication bundles are popular for multi-exam certifications such as offered by Microsoft, Cisco, etc. Most commonly, these bundles cover core or common topics. Study guide books are a key element in a preparation package. These books are designed to deliver background information and to cover general concepts and technologies. Popular programmes offer a variety of different study guides. Individuals have to choose from these programmes and create their own learning set [51].

### **2.5.2. Test**

Certifications provide documentation, as aforementioned, in a formal way, that an individual has met predefined performance specifications. Having successfully passed the required assessment(s), the individual receives a credential. Assessment or testing is an important part of the e-skills certification process. Testing is a means of providing information about an individual's standing with respect to a specific set of knowledge, skills, and competence as defined by a

specific job profile or occupational role [30, p.18]. For this reason, testing is a critical task that influences strongly the degree of recognition by relevant stakeholders. According to eSCC “assessments must be reliable, valid, objective, unbiased, and criterion-referenced” [30, p.18].

One added benefit of a good test is the straightforward nature of training and learning the content which the test covers. If the test measures knowledge, then accompanying books and manuals should be helpful in preparing for the test. If the test measures specific job skills, then on-the-job experience, working with simulations and gathering of other types of experience will be the most effective way to prepare [47]. Psychometrics is the science that underlies testing. Question quantity and question quality are two very important aspects of testing that are required for testing to work. If an e-skills certification test is bad, it is most likely because of a problem in one or both of these aspects.

Diagnostic tests are important for individuals prior to the final exam and for the preparation for a specific e-skills certification scheme. Recognition of the issued credential depends on the anticipated quality of the final examination tests by the community [52]. e-Skills certification providers make great efforts to educate programme participants about the importance of security issues. The aim is to prevent test cheating and exam piracy. Therefore, certification providers create stronger policies for non-disclosure of confidential test information, testing retakes and certification revocation. An example of an offering of diagnostic testing is Microsoft’s skill assessment program.<sup>39</sup>

Certification providers normally tend to increase the certification programme’s value by making sure that the right individuals get certified and that the test content is not compromised [52]. Hence, certification bodies typically conduct data analysis of exam results and develop strategies for minimising programme risks through better test security practices. Albeit, communities of learners are an important means for individuals to prepare for certification. Providers monitor the activities of Internet communities e.g. by combing the Internet to identify test brain-dump sites [52]. Good test content means questions that reasonably measure the appropriate knowledge, skills, or competence.

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<sup>39</sup> <http://www.microsoft.com/learning/assessment/default.asp>, last visit 24.11.2004.

| <b>test<br/>criterion</b>    | <b>web-based</b>   | <b>oral</b>   | <b>written</b>  | <b>document<br/>analysis</b>                         | <b>observation</b>   |
|------------------------------|--|---|---|--|--|
| <b>objective<br/>purpose</b> | assess skills,<br>knowledge                              | interview,<br>interaction,<br>personal attributes   | skills and<br>knowledge   | project,<br>process-<br>orientation,<br>situative    | competence,<br>experience,<br>tacit<br>knowledge,<br>learner centred |
| <b>content</b>               | 50-70<br>questions,<br>multiple-<br>choice, test<br>base | questions learning<br>material, set<br>curriculum,<br>knowledge                                   | open and closed<br>questions, case<br>studies,<br>multiple-choice | outcome<br>project,<br>working<br>process,<br>skills | competence,<br>behaviour,<br>skills                                  |
| <b>delivery<br/>system</b>   | Internet,<br>standardised,<br>test centres               | audit, educator   | paper   | paper,<br>review                                     | audit,<br>experiment   |
| <b>control</b>               | central  | central   | central   | decentral  | decentral, self-<br>directed   |
| <b>response</b>              | synchronous  | synchronous   | asynchronous  | asynchrono<br>us                                     | asynchronous   |
| <b>system</b>                | formal and<br>non-formal                                 | formal, non-formal  | formal learning   | formal, non-<br>formal                               | non-formal<br>informal   |
| <b>example</b>               | vendor-<br>certificates,<br>EUCIP                        | higher education,<br>university,<br>vocational training,<br>certification as e.g.<br>German AITTS | higher<br>education,<br>university,<br>vocational<br>training     | certification<br>e.g. AITTS                          | vocational<br>training   |

**Table 3 Overview of test methods<sup>40</sup>**

However the questions are, if multiple-choice or some other type, the primary test to capture what the candidate knows or is able to do in conformity with the chosen e-skills certification scheme. Unfortunately, many examinations fail to measure the abilities they claim to test [47].

In e-skills certification, which is heavily dependent on job skills, the tests tend to use questions that measure memorised information, asking for facts and definitions rather than a demonstration of skills. Thus, some tests appear to be

<sup>40</sup> Table is partly based on [29, p.244], [47].

irrelevant and overpriced. Even when the test questions are good, there still needs to be a sufficient quantity to get a reliable score. Just asking a person one question, even if it's an excellent question, is inadequate. A test needs, roughly, between 50 and 70 questions to produce a good score [47]. With too many questions, money and time are wasted [47]. In practice, tests are centrally operated by the certification provider or an accredited test provider. They are based on a test base with a collection of possible questions and topics to be queried. Alternatively, tests consist of a review of documents produced by the candidate and/or oral examination (interview) on basis of this documentation [29, p.244]. Before a candidate is able to run through the examination, it has to be checked that the candidate meets the requirements for admission to the certification scheme. The test typically is combining testing methods shown in Table 3. A good overview of evaluation methods in self-directed learning environments is given by [29, p.231-257].

## **2.6. Education and work experience**

*Education and work experience* are the two framing antipols in the model introduced to structure e-skills certification (shown in Figure 4).<sup>41</sup> Becoming an ICT worker, as well as continuous professional development, requires both learning know-how and know-what [30, p.47].<sup>42</sup> Required education and work experience are defined and documented in specific job profiles or occupational roles. This activity refers to the module 'definition' of the aforementioned model. Furthermore, education and work experience are the foundation to develop training courses and content.

### **2.6.1. Education**

*Education* is responsible and lays the foundation for the initial transfer of core knowledge and basic understanding (know-how) of ICT workers. Typically, this is the first step of an ICT worker on the career path. Education teaches concepts,

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<sup>41</sup> See page 37.

<sup>42</sup> See section 2.4.2.1, page 47.

theories, problem solving capabilities and constitutes the pre-requisite to be trained on specific job requirements. Credentials in the form of degrees obtained by students are in general widely recognised and typically valid for lifetime. Following a traditional linear education and training model ICT workers obtain their first qualification with relevance for employment solely from education. After entering into the ICT profession, the gained core knowledge and skills are continuously expanded [30, p.48]. By fulfilment of occupational roles, individuals gain work experience and needed competencies and preferably gain and expand specialised knowledge and skills.

### **2.6.2. *Work Experience***

*Work experience* is continuously gathered by individuals fulfilling their occupational role, and gained in the daily working process, but as well by informal learning and continuous professional development. Without doubt, evidence of relevant working experience is important for the individuals' current and future employability [30, p.48ff.]. If a candidate has a required qualification for a specific job, it does not necessarily imply that he possesses the required competencies to fulfil his professional role. Therefore, recent, relevant, extensive experience of an ICT worker is the top hiring criteria of employers, followed by applicable formal education as a means of growing and expanding his/her knowledge and skills.

### **2.7. *Quality Standards***

*Quality standards* are provided by independent standardisation bodies and sector associations documented in the form of normative documents. De facto standards are offered by public and/or private industry initiatives and are achieved through a broad acceptance by the stakeholders in a specific sector/field. Quality standards are to be distinguished concerning the subjects covered e.g. process, method and content. For organisations offering certification of persons two internationally recognised standards are:

- *EAC EN 45013*: European Standard for Bodies Operating Certification of Personnel and
- *ISO/IEC 17024*: ISO norm “Conformity assessment – General requirements for bodies operating certification for persons”.

What follows is based on ISO/IEC 17024. The standard is international and has been drawn up with the objective of achieving and promoting a globally accepted benchmark for organisations operating certification of persons [4].

In an ideal case, applied quality standard(s) should be the basis for the recognition of the certification bodies and their certification schemes, in order to promote acceptance at national and international level. One straightforward approach to harmonise e-skills certifications is to assess underlying systems for developing and maintaining certification schemes for persons. This will likely establish the environment for mutual recognition and the global exchange of personnel. Quality management in further education and vocational training focuses, in particular, on quality concerning organisation, learning infrastructure, training and teaching, and last but not least the process of learning itself. Primarily, the certification body has to develop its own quality policy, implemented by means of quality models or concepts. In addition, certification bodies should derive a related mission statement to be followed by all persons involved [57].

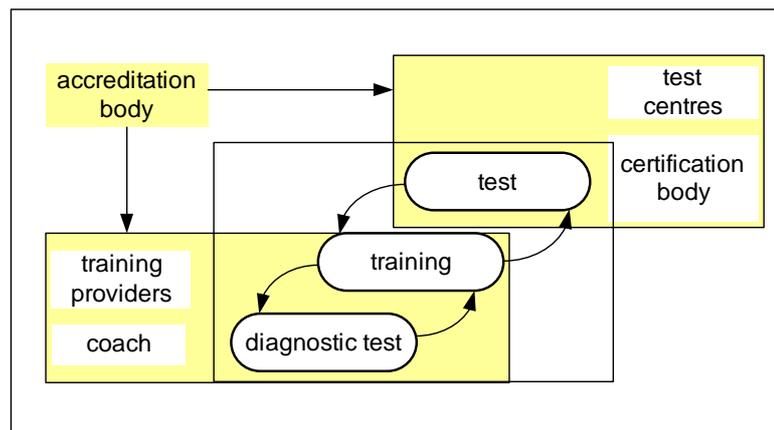
### ***2.7.1. Organisation of Certification Bodies***

According to ISO/IEC normative document, the *certification body* shall have a documented structure which safeguards impartiality, including provisions to assure the impartiality of the operations of the certification body. This structure shall enable the participation of all parties significantly concerned in the development of policies and principles regarding the content and functioning of the certification system, without any particular interest predominating. The imposed requirements are to be considered as general requirements for bodies operating certification schemes for persons and therefore may have to be supplemented in response to additional demonstrated market needs by supply or demand side or specific regulations and government requirements [4]. In the case that certification bodies decide to subcontract work related to certification (e.g.

examination, testing) to an external body or person, a properly documented agreement is recommended covering the arrangement, including confidentiality and prevention of a conflict of interest. Decision on certification shall not be subcontracted under any circumstances. In general, the assessment of conformity of an object of interest with specific obligatory or voluntary standards is subject to another respective activity called accreditation.

### 2.7.2. Accreditation

*The purpose of accreditation* is to assess if a certification system is in conformity to a predefined set of requirements or standards e.g. ISO/IEC 17024. Inspection bodies are in charge of accreditation. Figure 9 maps the aforementioned learning system to existing roles and organisations involved. Thereby, the delineation is not presumed to be strict, as for example the training provider and test centre in practice might belong to the same organisation. However, to put accreditation bodies in place is an important prerequisite for mutual recognition of e-skills certification by stakeholders in the sector or industry branch. The accreditation task can be assigned to certification providers or to independent third parties. Certification bodies are primarily in charge of approving whether specific training courses fulfil requirements imposed by the certification scheme.



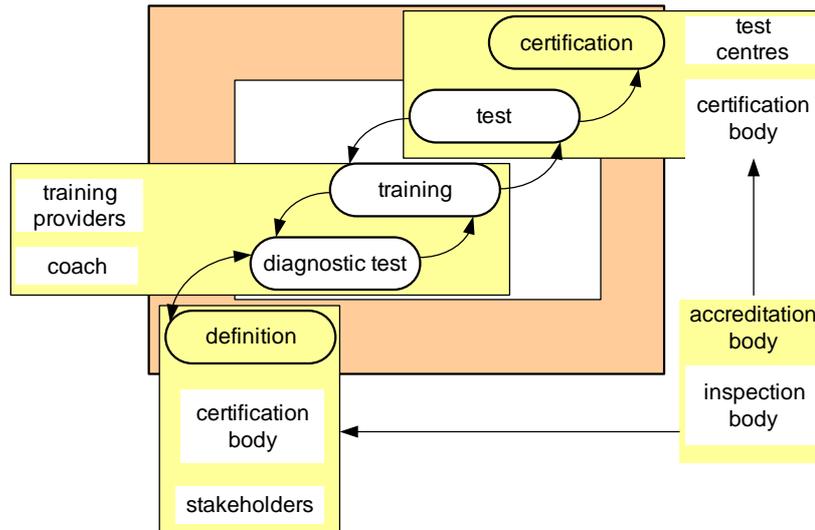
**Figure 9 Subject of accreditation activities by e-skills certification bodies**

Certification bodies typically require training providers to ensure that candidates who successfully complete their courses to prepare for examination will have met learning objectives relevant to the knowledge and skills prescribed in the

certification scheme. Besides, it is in the interest of accreditation bodies to ensure that a systematic process is utilised to determine the knowledge, skills, and competencies of persons running through a certification programme [55, p.13]. The accreditation process can accordingly address training providers, coaches, test centres and, of course, certification providers and bodies themselves. Accreditation can be enlarged to aim at the general recognition of certification systems. Thereby, the availability of a widely accepted norm or standard is one important prerequisite. In conclusion, within an e-skills certification system, the assessment of conformity with specific standards or quality criteria is the subject of accreditation. Further, the object of inspection is primarily the training and evaluation system including diagnostic and final testing. Accreditation also covers assessing conformity with policies e.g. security requirements, code of conduct for candidates, etc.

### **2.7.3. Conclusion**

Accreditation includes the inspection of the organisation of the e-skills certification body concerning their fulfilment of predefined requirements and conformity with quality directives or mission statements [57]. Therefore, appropriate quality management procedures within e-skills certifications address three main activity areas (see Figure 10) which go beyond the organisational structures and boundaries of the certification body: 1) examination and testing, 2) training provision, and 3) definition of requirements. Primarily, the certification system is the subject of inspection. Thus, inspection bodies assess the conformity of the modules, certification and test. The certification process relies on the proper definition of specific job or occupational requirements that the candidate has to fulfil.



**Figure 10** Achieving mutual recognition of e-skills certification systems

These are the areas to be primarily assessed by accreditation. The quality of learning material, learning and testing infrastructure, etc., subject matter of training and diagnostic testing, are to be considered by adequate quality measures and related policy. This is of growing importance within learner-centred programmes and informal learning environments [57].

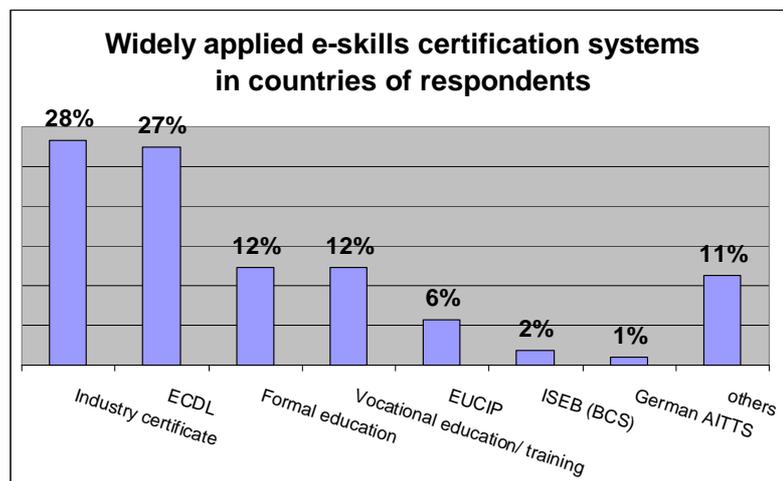


### 3. Widely Applied e-Skills Certification Systems

*“The essence of intelligence is skill in extracting meaning from everyday experience.”*

*Unknown*

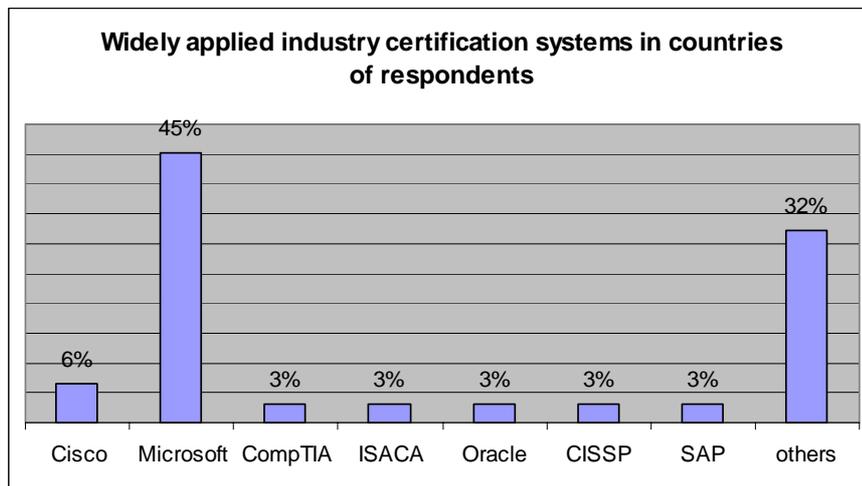
In this section a categorisation of e-skills certification systems as widely applied in Europe is presented. Different categories are used to compare widely applied certification systems. The aim is to overview and draw a sufficiently clear picture of what is already in place in the European market. In this way, the report intends to identify, present and propose voluntary approaches for standardisation. The experts involved in the survey were requested to categorise established systems that are already widely applied in their countries.



**Figure 11 Widely applied e-skills certification systems in respondents' countries**

Consequently, the first task to be undertaken is analysing the current situation by countries and characterise systems that are already in place in respondents'

countries. The respondents named 106 e-skills certification systems in total, which are widely applied in their countries. The systems were aggregated and Figure 11 shows the systems ordered by frequencies. The results support the perception that *industry certifications* (28%) play an important role and are widely applied in the respondents' countries. *ECDL* (27%) is also widely applied followed by the accredited systems of *formal education* (12%). *EUCIP* is a comparatively new initiative aiming at ICT practitioners (6%). *Others* (11%) summarise named systems not specified or primarily locally known. Figure 12 illustrates a specific look into the industry certification systems already in place in the respondents' countries. The survey sample underpins the existing diversity of available industry e-skills certification systems on the market.



**Figure 12 Widely applied industry certification systems in countries of respondents**

In the following, e-skills certification systems are categorised by several dimensions. Significant statistical results are presented for each dimension. The survey task aims at identifying and proposing voluntary standards for e-skills certification. Therefore systems named by the experts with high frequencies are studied in more depth to better understand and extract the nature of available voluntary standards.

### 3.1. Market Recognition

First of all, e-skills certification systems can be distinguished by their level of *market recognition*. The market recognition heavily influences the ability of an individual to apply for work in a particular area of interest. The level of market recognition also significantly determines the market price for particular skills from the demand side.

The level of market recognition is primarily determined by recruiting preferences of employers and the resulting market demand and market price for a particular certification. In principle, with increasing market prices, the supply of labour will increase, because it becomes more attractive to obtain work in an area of rising labour prices. The level of market recognition of the system is a perceived indicator for individuals/learners for the quality of acquired knowledge, skills, and competencies; and for employers an adequate indicator for the degree of fulfilment of specific predefined requirements determined by an occupational role.

| Name System                    | #  |
|--------------------------------|----|
| ECDL                           | 21 |
| Microsoft                      | 13 |
| others                         | 10 |
| Vocational education/ training | 10 |
| Formal education               | 10 |
| Industry/ vendor certificate   | 7  |
| EUCIP                          | 3  |
| ISEB (BCS)                     | 1  |
| CISSP                          | 1  |
| Oracle                         | 1  |
| ISACA                          | 1  |
| CompTIA                        | 1  |
| Cisco                          | 1  |
| German AITTS                   | 0  |

**Table 4 Widely applied systems with significant degree of market recognition**

The analysis of the survey sample shows that the widely applied systems possess, in general, significant market recognition. Therefore there is already something for current activities to build on (see Table 4). This supports our impression that market recognition is the central key to access the national markets. In the following, the report focuses on systems with the highest frequencies.

These systems are ECDL<sup>43</sup>, Microsoft<sup>44</sup>, vocational education/training system, formal education, industry/vendor certificates<sup>45</sup> (other than Microsoft) and

<sup>43</sup> European Computer Driving Licence: <http://www.ecdl.com>.

<sup>44</sup> Microsoft Learning Home Page: <http://www.microsoft.com/learning/>.

<sup>45</sup> To simplify the analysis this category in the following shall represent all vendor certificates excluding Microsoft. A comprehensive list of ICT vendor certificates is provided in the Annex, page 139.

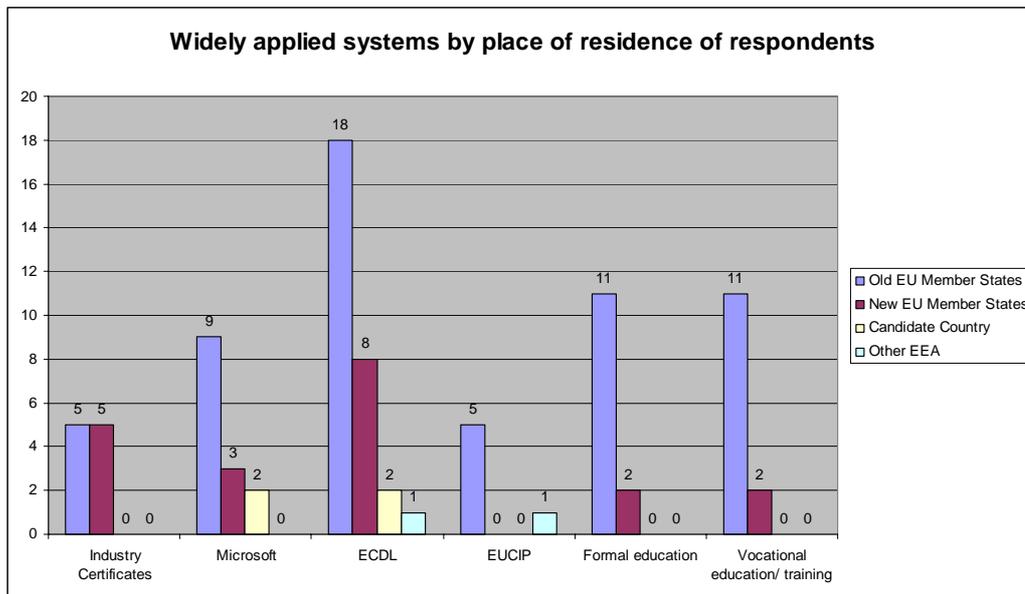
EUCIP<sup>46</sup>. In this way, the subject of analysis is reduced to the systems which show potential to serve as voluntary approaches for standards.

| System                  | strong | good |
|-------------------------|--------|------|
| 1 ECDL                  | 10     | 11   |
| 3 Formal education      | 8      | 2    |
| 4 Vocational education/ | 4      | 6    |
| 5 Microsoft             | 2      | 11   |
| 6 Industry Certificates | 0      | 7    |
| 7 EUCIP                 | 0      | 3    |

If the degree of recognition is subdivided into strong and good, then formal education and vocational education/training gain ground.

**Table 5 Widely applied systems by degree of recognition**

ECDL shows a good balance between strong and good recognition. In contrast, pure industry certificates significantly turn out comparatively weak. Furthermore, the degree of market recognition is strongly influenced by specific characteristics of the national labour market. The frequencies of those named widely applied and recognised systems are shown in Figure 13 categorised by place of residence of respondents. The survey sample includes respondents from 21 countries. Thirteen (13) respondents are located in the “Old” EU Member States, six (6) in New Member States as well as two respondents belonging to a Candidate Country (1) and Other EEA Countries (1).<sup>47</sup>



**Figure 13 Widely applied systems by place of residence**

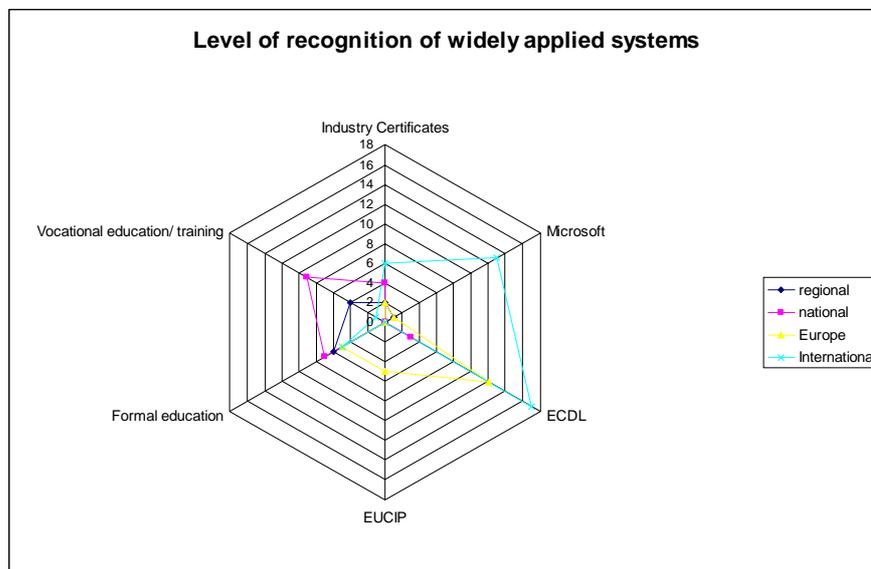
<sup>46</sup> European Certification of Informatics Professionals: <http://www.eucip.com>.

<sup>47</sup> See Appendix, page 150 for more information concerning analysis of the survey sample.

The respondents were asked to indicate how far the achievement of vocational qualification is a precondition for employment in their countries. The degree of market recognition relies on the attitude of employers and the precondition of certificates or diplomas for ICT workers for employment in a relevant job. The achievement of vocational qualification is in the majority of the respondents' countries a precondition for employment, twenty-two (22) respondents agreed, eleven (11) respondents disagreed, and five (5) respondents indicated a neutral position. According to the study of eSCC [30, p.47ff.] employers' top hiring criteria are relevant formal education, vendor-specific and vendor-neutral certifications, in addition to experience which is rated to be of the utmost importance.

### 3.2. *Level of Recognition*

*The market recognition of e-skills certification systems relies significantly on the reputation of, and confidence by employers in, the respective certification body.*



**Figure 14** Level of recognition of widely applied systems

e-Skills certification systems as aforementioned are constituted based on the definition of requirements against which a candidate is validated. Another important aspect influencing the general market recognition is the anticipated

uptake of existing job or performance requirements and their presence in the respective e-skills certification scheme.

The market recognition delineates the levels *regional*, *national*, *European* and *International*. The analysis of the survey sample showed that the perception of the respondents is that proprietary or vendor-specific certification systems often possess a high recognition on all levels as e.g. certificates offered by companies such as Microsoft, Sun, Cisco, etc.<sup>48</sup>

| System                         | regional | national | Europe | International |
|--------------------------------|----------|----------|--------|---------------|
| ECDL                           | 0        | 3        | 12     | 17            |
| EUCIP                          | 0        | 0        | 5      | 0             |
| Formal education               | 6        | 7        | 5      | 5             |
| Industry Certificates          | 2        | 4        | 2      | 6             |
| Microsoft                      | 1        | 0        | 1      | 13            |
| Vocational education/ training | 4        | 9        | 0      | 1             |

**Table 6 Level of recognition of widely applied systems**

The analysis of returned questionnaires is shown in Figure 14 displaying the systems with highest rating for degree of market recognition of the widely applied systems in respondents’ countries. Microsoft’s certification offerings are clearly perceived to be internationally recognised. The ECDL possesses significant recognition at European and International Level. EUCIP and formal education programmes also show significant recognition at European level. The level of recognition of formal education and vocational education/training programmes turns out to be primarily regional and national.

### 3.3. *Level of Skills*

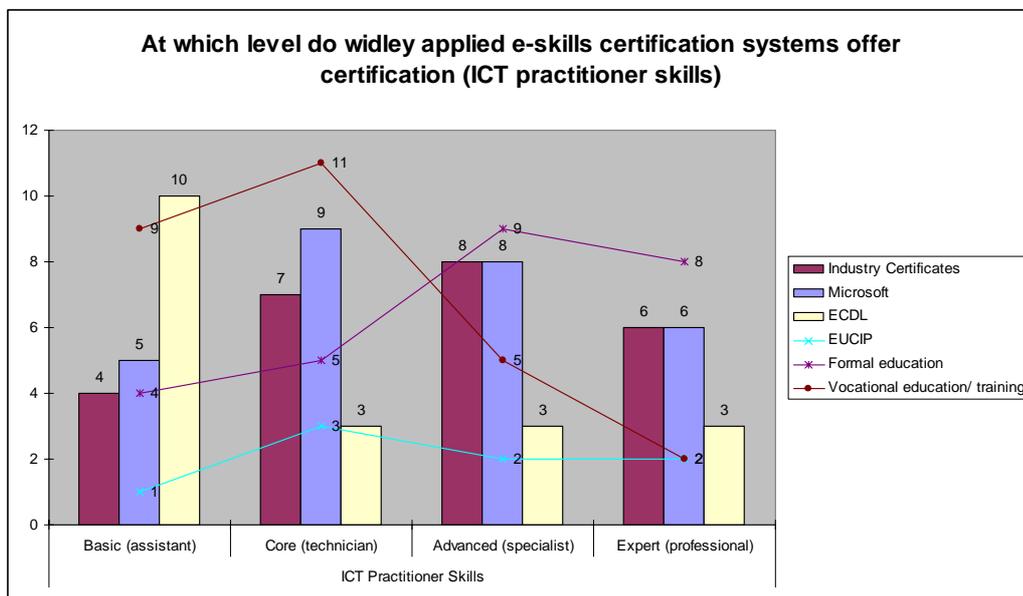
*The level of skills* (qualification) at which a certification system offers certification is the next category to distinguish systems. With reference to the definitions and concepts introduced in the section before ICT practitioner skills and ICT end-user skills are the two main levels at which a system may offer certification services. Because no generally agreed definition of e-skills is available until now, the

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<sup>48</sup> See also Appendix 2, List of vendor-specific certificates.

categorisation of e-skills applied in this survey relies on the definitions provided in chapter 2 above.<sup>49</sup>

The result of the analysis of this category is shown in Figure 15 and Figure 16. ICT end-user skills are primarily supported by programmes such as ECDL and the vocational education/training system. Microsoft and formal education also offer qualifications at these skill levels. ICT practitioner skills on the basic level (assistant) are perceived to be significantly addressed by the ECDL. Whereas, Microsoft and other industry certifications primarily address ICT practitioner skills on the higher levels (core, advanced and expert).



**Figure 15** Categorisation of systems by level of e-skills covered (ICT practitioner skills)

When looking into ICT end-user skills, the ECDL is the leading and most widely applied programme primarily on basic and core, but also on advanced and expert level. Further programmes to be mentioned are Microsoft and industry certifications for the core and advanced level.

Therefore, the analysis of the sample for ICT practitioner skills shows that the advanced and expert level is predominantly covered by formal education systems and industry certifications. At the basic and core level vocational education/training systems and industry certifications play an important role. The ECDL also shows a strong contribution for the basic level (assistant). At the ICT

<sup>49</sup> See section 2.4.3, “e-Skills”, page 49.

end-user level the ECDL turns out to be the leading initiative followed by vocational and formal education systems.

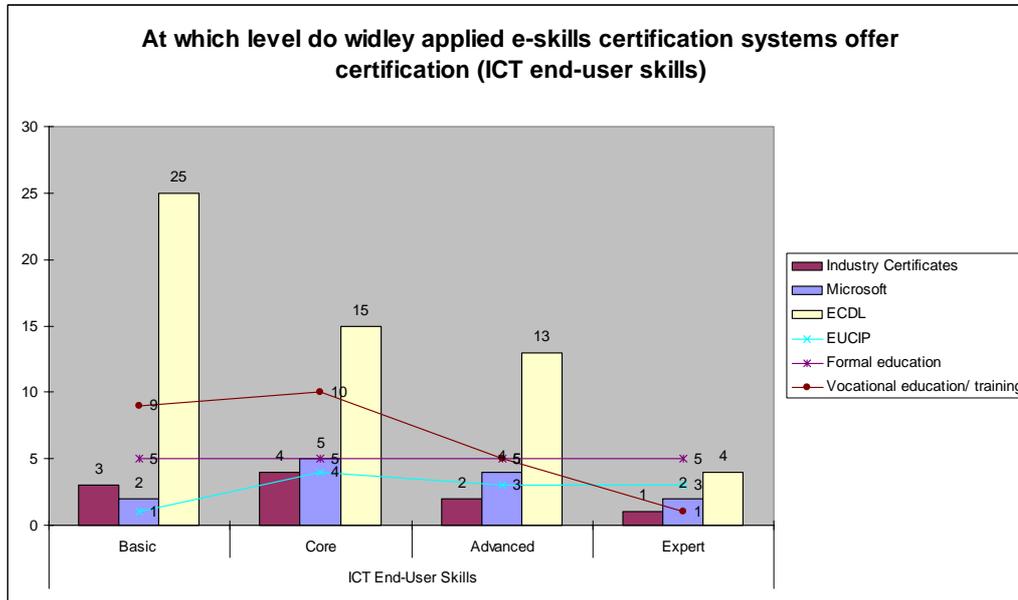


Figure 16 Categorisation of systems by level of e-skills covered (ICT end-user skills)

### 3.4. Geographical Coverage

Certification systems differ in their *geographical coverage*. International IT vendors, e.g. Microsoft, cover the market on European and International level. A strong interdependency exists between the dimensions of geographical coverage and market recognition. Existing barriers such as differences in culture (e.g. language, attitudes) and the labour market structure may seriously hamper the demand for a specific certification system. The analysis shows that the ECDL, Microsoft and industry certifications are players on European and International level. Formal and vocational education systems predominantly cover the national level. The ECDL and industry certificates also turn out to have a significant geographic coverage at the national level.

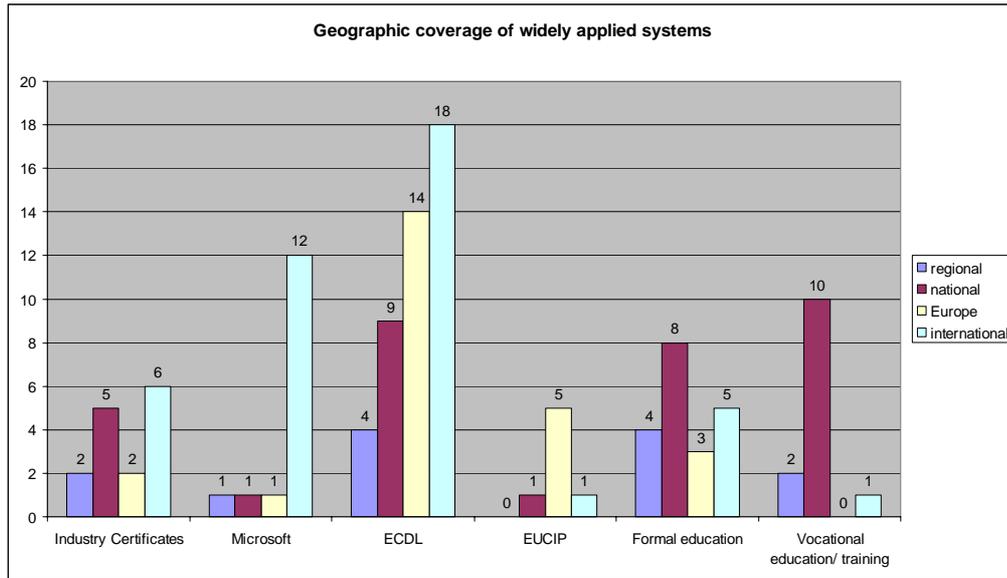


Figure 17 Geographical coverage

### 3.5. Certification Body

*Certification systems* can be categorised by the type of certification body/ institution issuing credentials e.g. certificates or diplomas. The majority of the accreditation systems of the widely applied e-skills certification programmes named in the sample, issue certificates (see Figure 18). Certification bodies are *enterprises* (32), *governmental institutions* (23), *employer's association* (20), *officially recognised schools* (14), *social partner committee* (8) and *others* (6). Diplomas are issued by governmental institutions (12) employers' associations (8) and officially recognised schools (7).

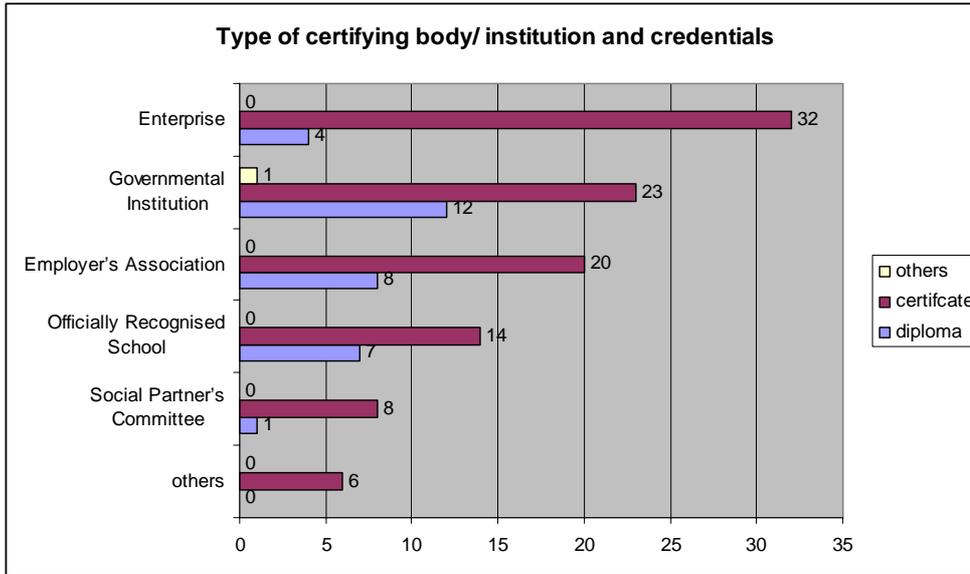


Figure 18 Type of certification body/ institution by credentials

### 3.6. Degree of Standardisation

The degree of standardisation can be a de facto standard (or industry or proprietary standard) or a formal standard issued by a governmental body (ministry) or standardisation body (e.g. ISO/IEC or EAC).<sup>50</sup> De facto standards or proprietary standards rely on a high degree of market recognition from the demand and/or supply side. Figure 19 displays the available degree of standardisation of the systems named by the respondents.

The ECDL shows a remarkable perception by the respondents to be a voluntary approach for standardisation (18) and industry standard (11). Industry certifications (7) and Microsoft (8) are characterised as industry standards. Formal standards are rather rare from the perspective of the respondents. Primarily formal standards are associated by the respondents with formal and vocational training systems, but also with the ECDL. Besides, a significant number of respondents are not sure how to characterise the existing degree of standardisation. This occurred for the ECDL (7), formal (6) and vocational education (5) system.

<sup>50</sup> See section 2.7, page 61.

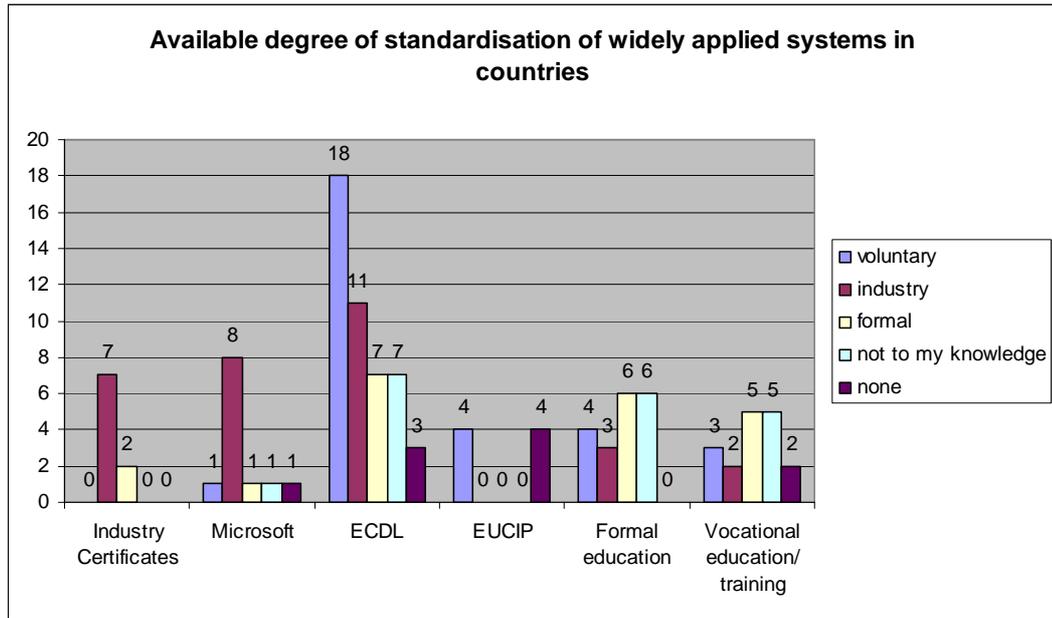


Figure 19 Available degree of standardisation in respondents' countries

### 3.7. Outcome

The outcome of a certification process can be accreditation in the form of a certificate or a diploma. The decision on certification is made by the certification body at the end of the evaluation process. The certificates or diplomas can be categorised by the organisational status of the certification body and primarily by the dependency of the certification to a specific product or vendor into vendor-neutral, vendor-specific, public or private/industry. In the sample the majority of issued credentials of widely applied e-skills certification systems are named as *certificate* (73). *Diplomas* are used as credentials by 24 systems. Certificates are characterised in the sample primarily as *vendor-neutral* (30). Further categories mentioned are *private/industry* (20), *vendor-specific* (15), *public* (8) and *others* (6). The category '*other*' is used by respondents with comment 'vendor-independent'. Another important aspect is the relationship between market recognition and credential. For the majority of widely applied systems issuing certificates, the respondents feel the degree of market recognition to be good (33) or even to be strong (22). In systems issuing diplomas the market recognition was rated to be good (14) or even strong (5). For a significant number of certificates (12) and diplomas (5) the market recognition was rated neutral.

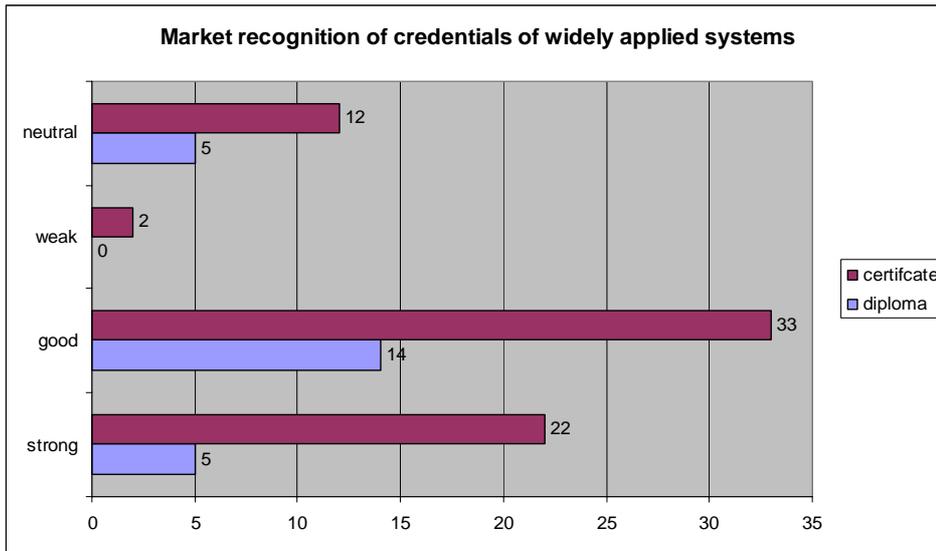


Figure 20 Characteristics of certification outcome

### 3.8. Target Group

e-Skills certification systems can be categorised by the target group addressed. The market realities involve significant inflows into ICT worker occupations both with those from non-IT degrees and from more mature people in other occupations [3, p. 22]. The different target groups addressed by widely applied e-skills certification systems in the sample are ICT workers (*ICT practitioners* (55) and *ICT end-users* (50)) and *students* (53) as illustrated in Figure 22.

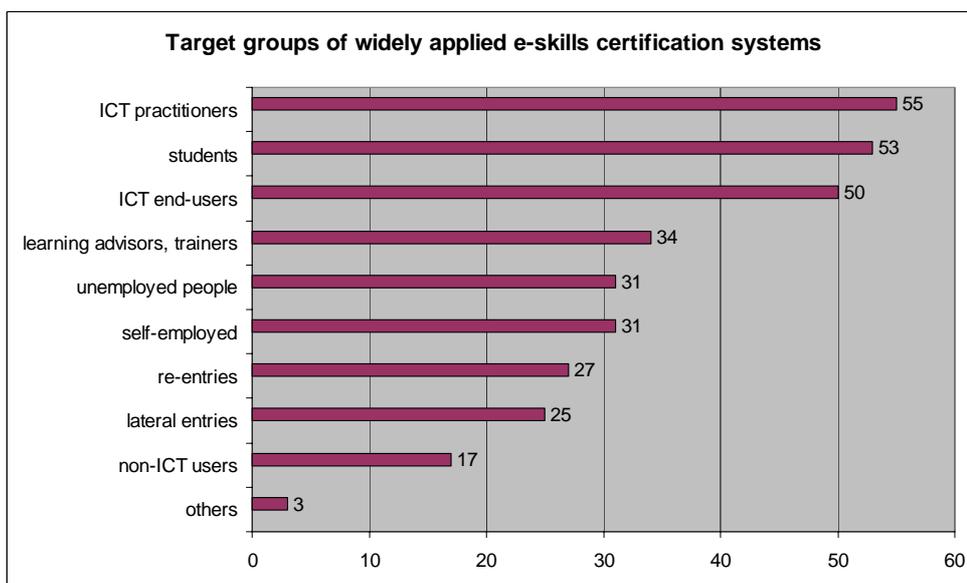
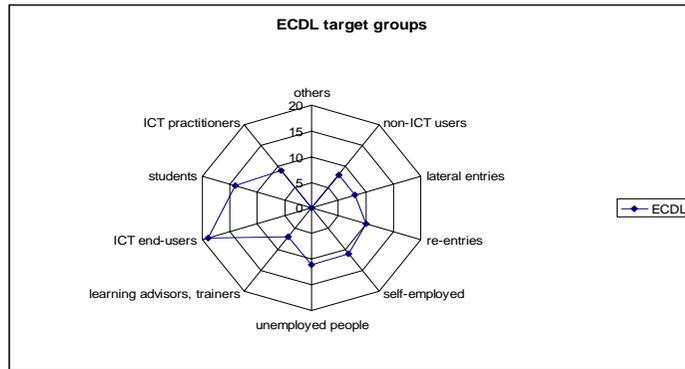


Figure 21 Target groups of widely applied systems

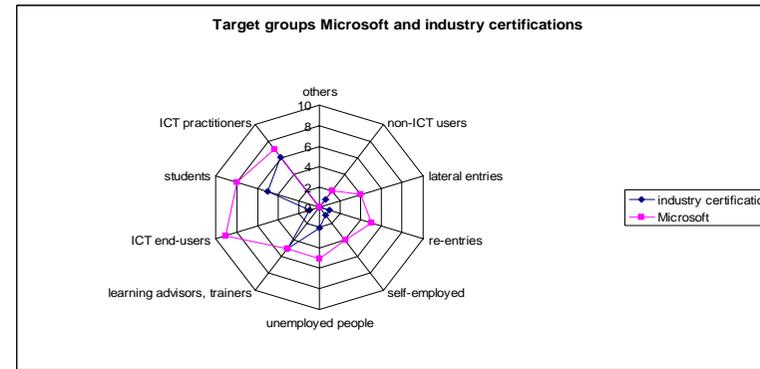
Another reasonable categorisation is to establish the differentiation of the certification system between *self-employed* (31), *unemployed* (31) and *learning advisors/trainers* (34). *Lateral entries* are addressed by 25 and *re-entries* by 27 of named widely applied systems in the sample. Lateral entries represent the inflow into specific job areas by other occupations and re-entries emphasise the acquisition of new or re-training or re-skilling of workers with obsolescent skills for specific job profiles. For *non-ICT users* 17 systems are seen to offer relevant qualifications.

A subject of interest to look into is the analysis of target groups for the six systems with highest frequencies in the sample. In Figure 22 the result of this analysis is shown for the ECDL, Microsoft/industry certifications, EUCIP, formal/vocational education.

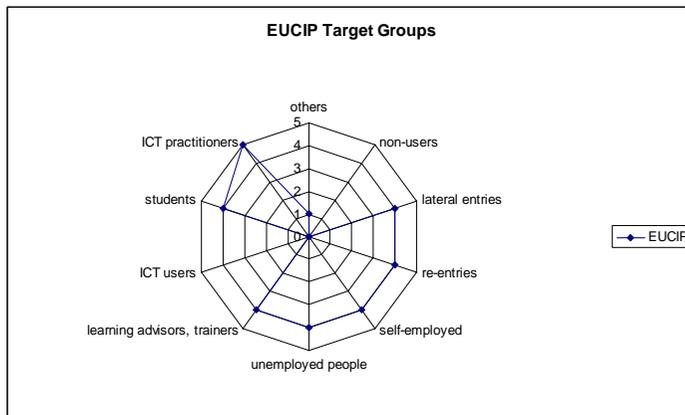
**ECDL**



**Microsoft/ industry certifications**



**EUCIP**



**Formal/ vocational education**

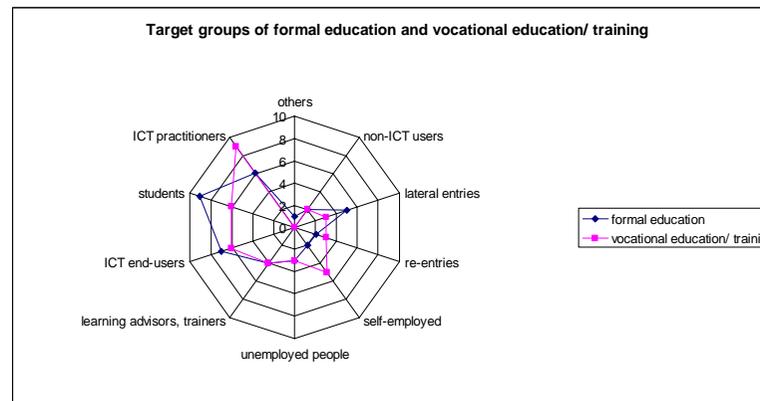


Figure 22 Target groups of most frequently named systems

### 3.9. Success Factors

The success of ICT industry certification systems depends mainly on the wide recognition by industry stakeholders [30, p.18].<sup>51</sup> From this point of view, the success of e-skills certification systems constitutes the general recognition by employers and stakeholders in a specific branch or industry sector. This perception is strongly supported and was agreed by 95 per cent (95%) of the respondents in the sample (see Figure 23).

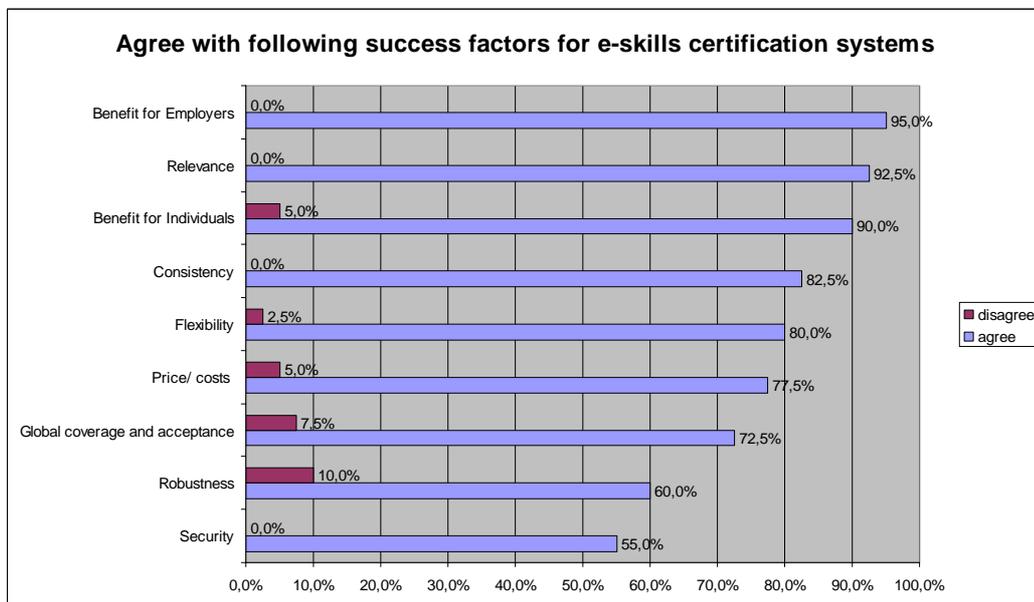


Figure 23 Success factors for e-skills certification systems<sup>52</sup>

However, there is another perspective to be considered. For an individual's certifications and related training and qualifications are more likely to present an opportunity for his/her personal or professional development. From this perspective, e-skills certification systems play an important role for accreditation and recognition of his/her self-directed learning outcomes. Relevance is perceived to be an important success factor and is supported by 92.5 per cent of the respondents (see Figure 23). Lifelong learning demands new ways of learning and

<sup>51</sup> See section 2.1, page 30.

<sup>52</sup> The respondents were asked how far they agree with the following success factors.

acquisition of knowledge, skills and competencies. Thus, proprietary certification systems give an individual the opportunity to show evidence of, and benefit from, continuous gain and expansion of his/her knowledge and skills. This is seen as an important prerequisite for his/her personal or professional development. This is backed up by the survey results showing ninety per cent (90%) per cent of the respondents agreeing with individual's benefit as reason for success (see Figure 23). However, it is worth mentioning that five per cent (5%) of the respondents disagreed. The reason is probably that not all respondents perceive both perspectives of e-skills certification to be important, and primarily feel increase in employability as motivation for individuals to pass a programme.

Other reasons for success of e-skills certification systems are *consistency*<sup>53</sup> (82,5 %), *flexibility* (80 %), *cost and price* (77,5%) for participation, *degree of global coverage and acceptance*<sup>54</sup> (72,5%), *robustness*<sup>55</sup> (60%), and last but not least *security* (55%). The rating by respondents for security as being less important is astonishing because leading e-skills certification systems are trying to ensure a high degree of security for their programmes (e.g. Microsoft).<sup>56</sup> Security expresses the degree of reliability and validity of a certification (e.g. integrity of the programme and the assurance that a person certified by a specific certification system did not copy or pass the test or exam by unfair means e.g. by legally discouraging piracy of exam items).

Furthermore, the respondents were asked if they agreed with independence from specific products or ICT vendors as a reason for the success of e-skills certification systems. The results of the analysis are displayed in Figure 24.

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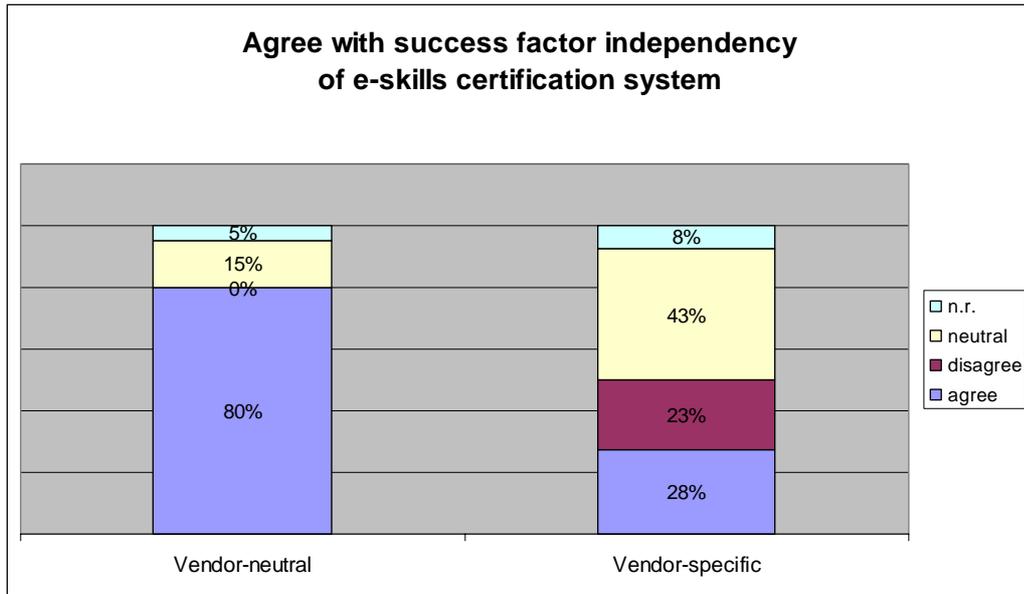
<sup>53</sup> Consistency expresses to what degree the transferred knowledge, skills and training contents match the underlying job requirements implied with a certification.

<sup>54</sup> The degree of global coverage and acceptance is an indicator for the durability and sustainability of the investment made.

<sup>55</sup> Robustness expresses the time horizon and the degree of validity of the issued credentials of certifications with regard to skill obsolescence.

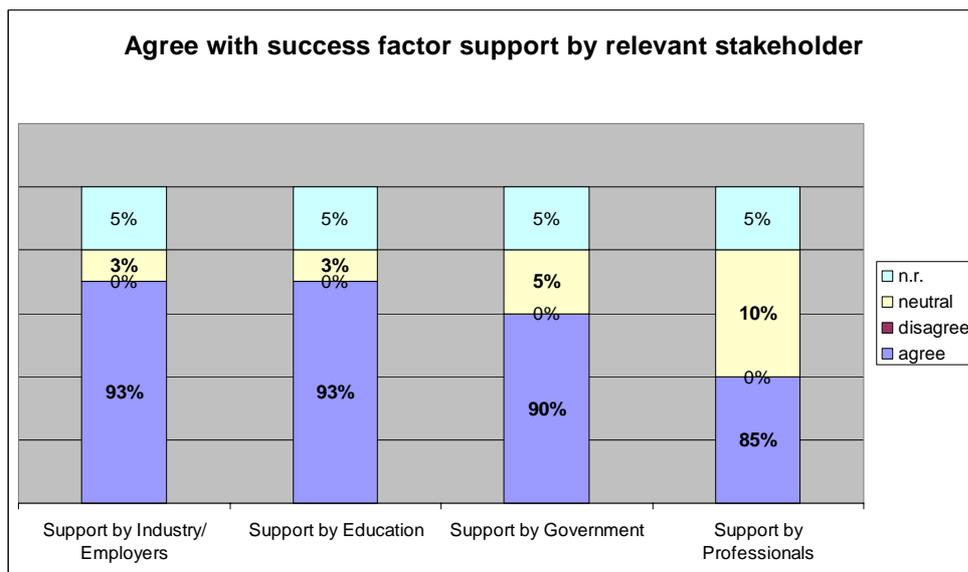
<sup>56</sup> For example does Microsoft report about content privacy of exams and tests.

<http://www.microsoft.com/learning/mcpexams/faq/security.asp>, last visit 13 August 2004.



**Figure 24** Independency as success factor

The majority of respondents answered that vendor-neutral systems are more successful (80%), fifteen per cent (15%) disagreed and five per cent (5%) were neutral. The opinion regarding vendor-specific systems is rather diversified. 43 per cent of respondents take a neutral position and neither agreed nor disagreed. Less than one third (28%) of respondents agreed and twenty-three per cent (23%) disagreed with vendor-specific orientation for reason of success.



**Figure 25** Support by relevant stakeholder

The degree of market recognition is presumably influenced by the active and official support of stakeholders. Figure 25 shows how the respondents agreed with support by relevant stakeholders as being a reason for success. Support by *industry/employers* (93%), *education* (93%) and *government* (90%) are perceived to enhance the impact and success of e-skills certification systems. Support by *professionals* was seen by eight-five per cent (85%) of respondents to be of relevance.

## 4. Future of e-Skills Certification

*“The world does not pay for what a person knows.  
But it pays for what a person does with what he knows.”*

Laurence Lee

In this section the future role of e-skills certification systems as accreditation systems and formal recognition of individuals' training and learning outcomes is described. Achieved results of the statistical analysis of the sample are presented with regard to the future of e-skills certification. Most importantly, significant results are described which are likely to contribute to the current discussion of stakeholders on how transparency and comparability is likely to be achieved for qualifications of ICT workers throughout Europe and beyond.

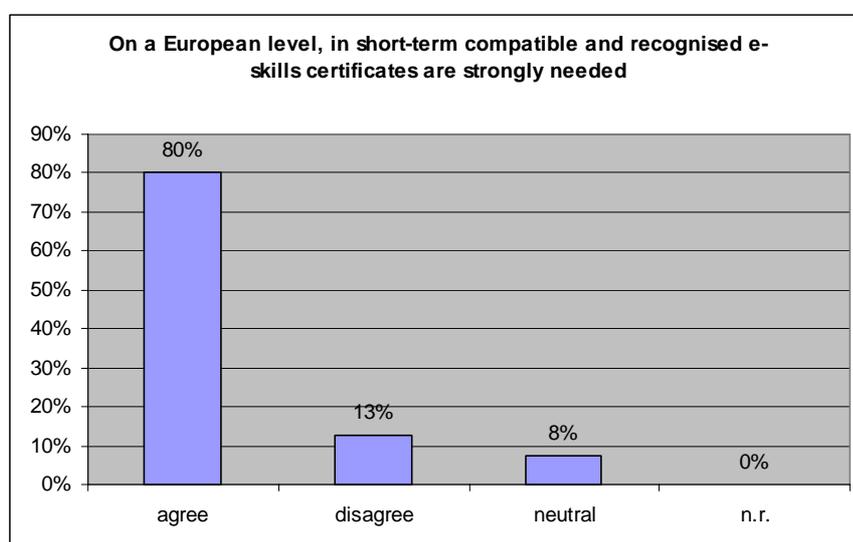
### 4.1. Current Situation

The first issue to be looked into is the perception of the *current situation* of e-skills certification in Europe by respondents. Most interesting is the rather clear statement supported by eighty per cent (80%) of respondents, that on a European level in the short term compatible and recognised e-skills certificates are strongly needed. In addition eighty per cent (80%) of returned questionnaires agreed that Europe is facing a multitude of available e-skills certification schemes.<sup>57</sup> The situation differs in the respondents' countries. The importance (level of acceptance and usage) of e-skills certification differs significantly amongst member states and other countries. This statement is supported by seventy per cent (70%) of the respondents, three per cent (3%) disagreed, twenty-three per

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<sup>57</sup> See Figure 5, page 39.

cent (23%) have a neutral position, five per cent (5%) selected 'not relevant'. National regulations and legislation are to be considered in the discussion. More than half of the respondents (53%) agreed that in their country vocational qualification and related training is generally specified and regulated through legislation involving licensing and certification. Disagreement is shown by twenty-five per cent (25%) and eighteen per cent (18%) of respondents take a neutral position. Further, the analysis of the sample shows, that forty-eight per cent (48%) of the respondents disagree that the comparability and transparency of e-skills certification schemes on a European and International level is given too much priority in the current debate.



**Figure 26 Compatible and recognised e-skills certifications are strongly needed**

Less than one third of respondents (28%) agree. The majority of respondents (73%) state that Europe needs fewer, but more relevant, e-skills certification schemes. Only five per cent (5%) of respondents show their disagreement with this statement, twenty-three per cent (23%) have a neutral position.

Although good progress is made by current initiatives [40], from the perspective of sixty-five per cent (65%) of the respondents the current initiatives and current debate are still far away from a European reference framework of promoting eSkills training, recognition and transparency. Only five per cent (5%) disagreed with this statement but twenty-eight per cent (28%) answered 'neutral'. This obviously shows the need to have a broader and more intensive dissemination of

achievements and progress made by the current initiatives and debate. Besides, the respondents showed a rather diversified perception concerning the cost of certification in their countries in many cases as being a barrier for many ICT employers to offer certified vocational training for employed ICT practitioners/users. In the sample, forty-eight per cent (48%) agreed, forty per cent (40%) disagreed and thirteen per cent (13%) indicated a neutral position.

#### 4.2. Type of e-Skills Certification Systems

Due to the perception by the respondents of a multitude of existing e-skills certification systems and the agreement that fewer systems are needed, the question remains which type of e-skills certification systems play an important role to achieve transparency and comparability of e-skills certification systems in Europe. Based on the answers received, *vendor-independent sponsorship* turns out to be of high importance (see Figure 27). However, as already mentioned, the survey sample supports the perception that the current marketplace is characterised by a focus on vendor-specific certification and industry-accredited courses.<sup>58</sup>

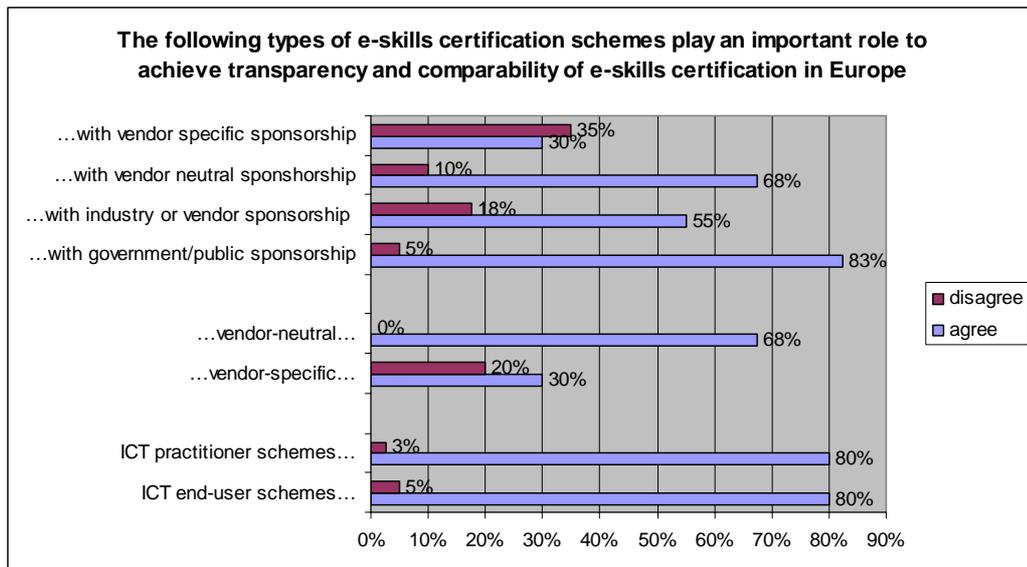
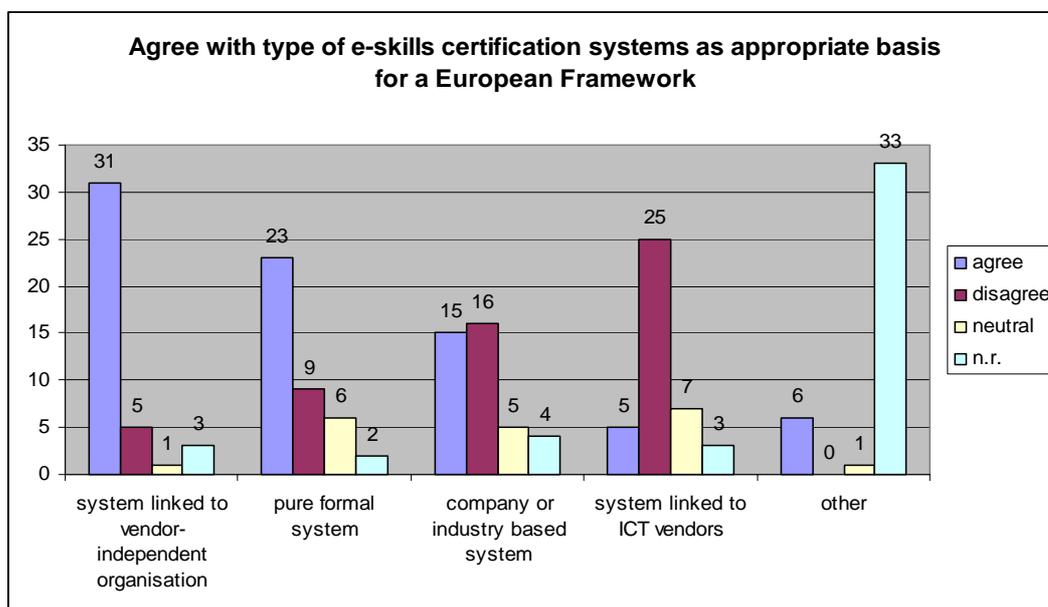


Figure 27 e-Skills certification systems that play an important role

<sup>58</sup> See Figure 2, page 30.

Both ICT practitioner and ICT end-user schemes play an important role. Concerning sponsorship, the analysis showed that eighty-three per cent (83%) of respondents support *government/public sponsorship*. Although *industry or vendor sponsorship* is not generally neglected (supported by fifty-five per cent (55%) of respondents, but at the same time significant opposition, eighteen per cent (18%)), *vendor-neutral sponsorship* is supported by sixty-eight per cent (68%). However, the analysis showed that thirty-five per cent (35%) of the respondents disagree with *vendor-specific sponsorship*, only thirty per cent (30%) agreed. Vendor-neutral e-skills certifications are supported by sixty-eight per cent (68%) of the respondents to play an important role. Only thirty per cent (30%) of respondents support vendor-specific systems. In the sample a significant disagreement with vendor-specific systems can be observed supported by twenty per cent (20%) of respondents. Furthermore, the sample is analysed regarding what type of e-skills certification systems are an appropriate basis for a European Framework (see Figure 28).



**Figure 28 Type of e-skills certification systems as basis for a European Framework**

A system linked to a vendor-independent organisation is strongly supported by the respondents (31). A pure formal system is supported by 23 respondents and 15 respondents showed their agreement with company- or industry-based systems. A

significant opposition against company- or industry-based systems (16) and systems linked to ICT vendors (25) can be observed.

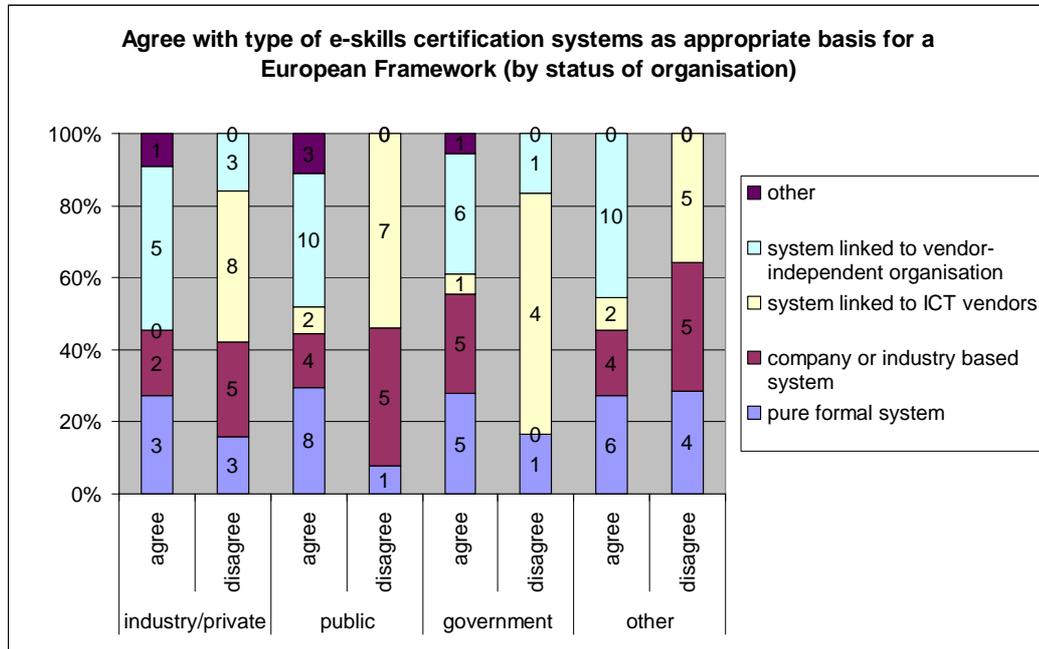


Figure 29 Type of e-skills certification systems as basis for a European Framework

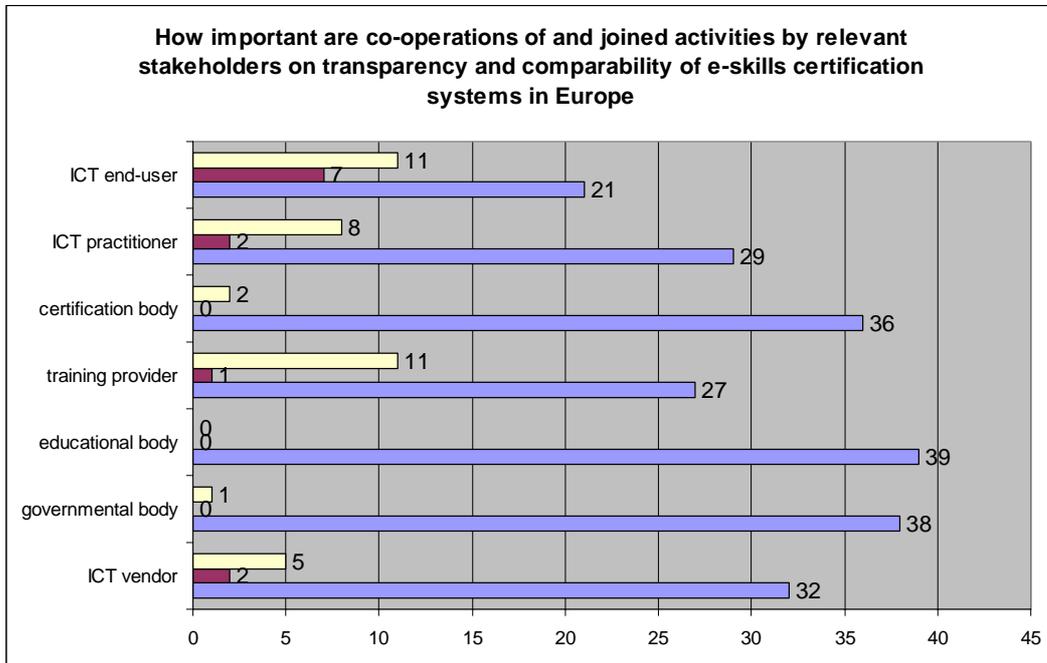
It is of interest to analyse the sample concerning the preferred type of e-skills certification systems by status of organisation (see Figure 29). Organisations independent of their status show significant support of systems linked to a vendor-independent organisation. Even respondents from industry/private organisations showed significant support (5). There is an observed tendency by respondents to disagree with systems linked to ICT vendors.

### 4.3. Co-operation and Joint Activities

The aforementioned results underline the existing diversity and complexity in discussing e-skills certification systems. Hence, the required harmonisation and comparability of e-skills certifications is predominantly achieved by co-operation and joint activities of relevant stakeholders. In this context multi-stakeholder partnerships are discussed [49], [30].

The majority of the answers received, seventy-three per cent (73%), support the general perception that transparency, portability and compatibility of e-skills certifications in Europe and beyond can only be achieved by co-operation of

stakeholders on the basis of public-private partnerships. Only ten per cent (10%) of the respondents disagreed, fifteen per cent (15%) having a neutral position.



**Figure 30 Importance of co-operations and joined activities by relevant stakeholders**

The experts surveyed were asked to rate the importance of co-operation of and joint activities by relevant stakeholders on transparency and comparability of e-skills certification systems in Europe. Figure 30 displays the results of the analysis. The respondents significantly support the co-operation and joint activities of *educational* (39) and *governmental bodies* (38), *certification bodies* (36), *ICT vendors* (29). *Training providers* (27) and *ICT practitioners* (29) are also seen as important to be considered for partnerships and joint activities.

The results of the analysis of the received questionnaires as to who should take the lead in the initiatives towards comparable European e-skills certification systems show that *governmental/public bodies* are significantly seen by the respondents to take the lead (57.5%).

The issues to be addressed by a relevant framework for e-skills certification are depicted in Figure 31. From the respondents perspective learning outcomes (36) and certification scheme (34) are the issues to be mainly addressed by a European Framework. Concept of validation (29) and certification process (28) are also seen as important issues to be addressed.

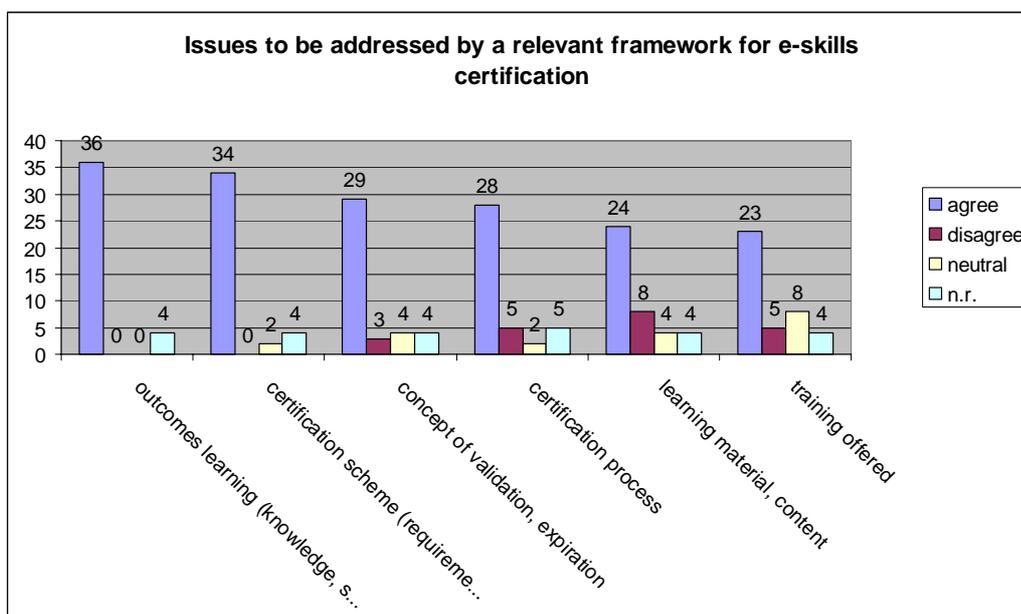


Figure 31 Issues to be addressed by a relevant framework for e-skills certification

#### 4.4. Quality Standards

Recognised formal *quality standards* and related common criteria are likely to be a solution to achieve harmonisation of existing e-skills certification systems. Europe needs recognised formal quality standards and related common criteria and requirements for e-skills certification. This statement is supported by fifty-three per cent (53%) of the respondents in the sample, twenty-five per cent (25%) disagreed, eighteen per cent (18%) indicated having a neutral position. e-Skills certification stands at the end of the learning process. In the sample sixty-eight per cent (68%) of the respondents support that Europe needs recognised formal quality standards and related common criteria and requirements for training providers. Only fifteen per cent (15%) of the respondents disagreed with this statement, eighteen per cent (18%) indicated having a neutral position.

In general the respondents agreed to the establishment of a central co-ordination organisation of e-skills certification in Europe (see Figure 32). The setting up of a voluntary European certification body is agreed by 31 of the respondents, 28 encourage a central repository, and 26 an ePortfolio. The establishment of a

permanent EU agency receives only weak support (18 agree, 11 disagree) by the respondents.

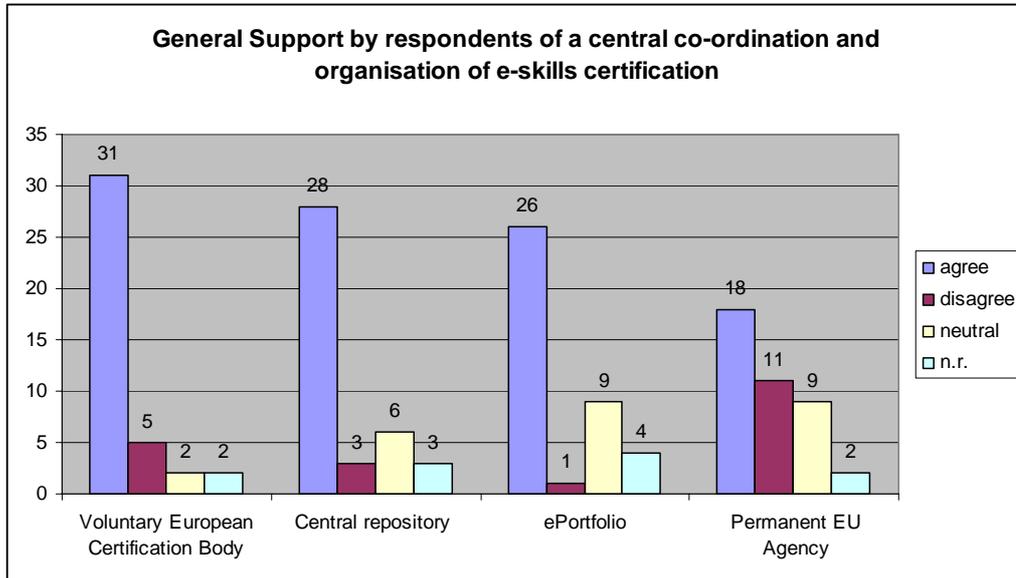


Figure 32 General support by respondents of a central co-ordination and organisation

The survey suggested the setting up of an *International or European Testing and Certification Board*. The respondents show a strong support and agreement (31). Only six (6) respondents answered that they disagree.

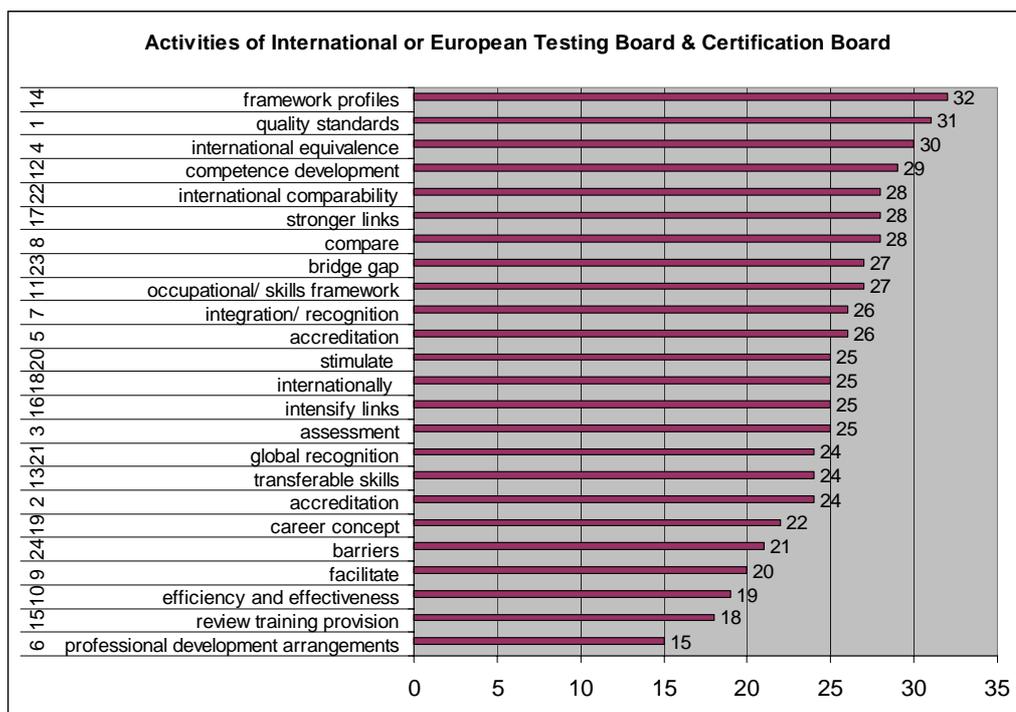


Figure 33 Activities of International or European Testing Board and Certification Board.

If looked into, what should be the task and activities of the board, there is significant support by 31 respondents to offer a European reference framework for ICT job profiles and qualifications which is widely recognised by public bodies and private industry. The establishment and maintenance of common quality standards for ICT training and certification (31) and the enablement of international equivalence of ICT qualifications to support international mobility (30) are strongly supported by the respondents in the sample.



## 5. Recommendations

*“Genius without education is like silver in the mine.”*

Benjamin Franklin

Based on the achieved results and outcome of the conducted study, we propose and illustrate a possible path towards internationally agreed certifications and recognised qualifications throughout Europe.

At the European Council in Lisbon in March 2000, Heads of State and Government of the European Union launched a strategy to prepare the EU for the challenges of the new century. This has become known as the “Lisbon strategy”. The objectives set at Lisbon – higher growth, more and better jobs and greater social inclusion – were ambitious. Information and communication technologies (ICT) were identified as playing a key role in achieving them. This key role of the ‘Information Society for all’ was confirmed at the Spring Council 2004 and by the recent Wim Kok report [59].

There are a number of initiatives which are attempting to ensure harmonisation and comparability of qualifications across Europe. The Bologna Process is one such initiative at the University Level. This initiative attempts to establish common structures for degree programmes and also uses ECTS (European Credit Transfer System) to allow students move between Member States and retain credit for their studies. The Copenhagen Process attempts to do the same for the Vocational Sector and the comparability is achieved through the use of ECVET. The European Credit Transfer system (ECTS) was introduced as a tool within the framework of the ERASMUS/SOCRATES programme between 1988 and 1995. It was hoped that this would facilitate the recognition of the courses for exchange students when returning home to their own institution. However, under the framework of the Bologna Process it became a tool that could be used for all

students, and not only for the purposes of recognition. It should however be noted that the implementation of ECTS has been fairly problematic in most countries.

*“ECTS implementation differs from country to country, mainly depending on the existence or non-existence of a national credit system and on the lack of information about the consequences. When governments are trying to introduce ECTS without first having a national credit system, the whole process feels forced and rather untransparent.*

*One of the main ECTS aims set by the European Commission - ECTS guarantees academic recognition of studies abroad - is still not fully achieved. Sometimes, institutions still think that courses from certain universities are better than those from others – with no objective criteria to underpin these claims. This all leads to a need for more solidarity and trust between institutions.”<sup>59</sup>*

There is anecdotal evidence together with the above mentioned surveys which indicate that the ECTS system is not working as successfully as was hoped. The operation of ECTS depends on a degree of trust between cooperating Universities and works well on a bi-lateral basis but is not a general solution which can have wide implementation. It is even more likely that the ECVET approach will also run into difficulties because of the larger number and wider diversity of the Vocational Training Institutions across the Member States. It is against this background and with the support of the results of this survey that a different approach to recognition of certification across Europe is suggested.

### **5.1. Towards Internationally Agreed Certification**

A number of sectors are examining the possibility of pan-European Certifications and indeed there is already agreement that there should be one such Certification for the ICT area. The Presidency Conclusions following the Lisbon European Council 23 and 24 March 2000 included the following:

“A European framework should define the new basic skills to be provided through lifelong learning: IT skills, foreign languages, technological culture, entrepreneurship and social skills; **a European diploma for basic IT skills, with**

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<sup>59</sup> ESIB Survey February 2003.

**decentralised certification procedures, should be established in order to promote digital literacy throughout the Union.”**

In Feira, **June 2000**, the European Council endorsed the eEurope Action Plan 2002 with a specific action line which provided the mechanisms and deadlines for achieving some of the Lisbon goals such as: "**Establish a European diploma for basic information technology skills, with decentralised certification procedures.** With: actors – European Commission, Member States and deadline: end 2001”

Several initiatives are in progress at the moment which could lead to the implementation of European Certification in a number of sectors.

At the Council Meeting Education, Youth and Culture (only Education and Youth items) Brussels, 15 November 2004 it was agreed that priority at European Level be given to the development of an open and flexible European qualifications framework, founded on transparency and mutual trust, which will stand as a common reference covering both VET and higher education, based mainly on competencies and learning outcomes.

Also there was a symposium in Strasbourg on 30 September/01 October 2004 to discuss the Construction of European Qualifications. Among the items discussed were the following:

1. Construction of qualifications at European level:
2. Various approaches to the links between prevailing national systems and developing European Qualifications.

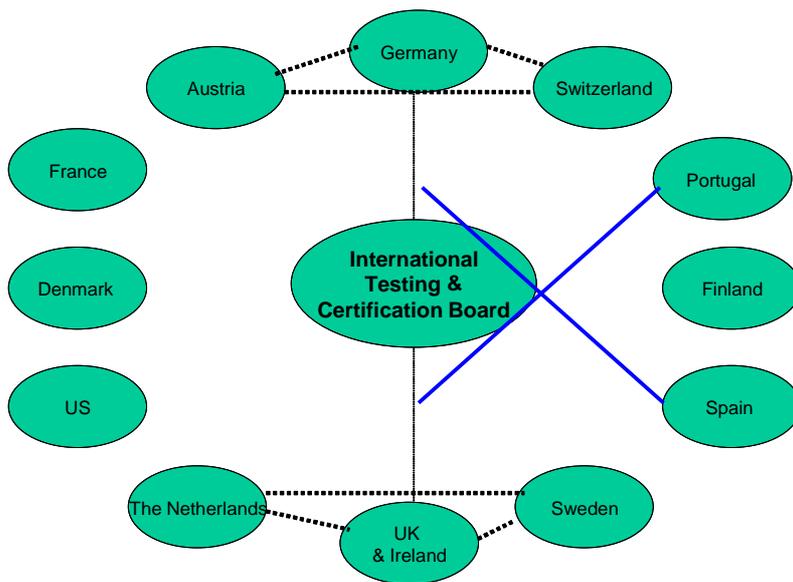
Against this background and with the results of the survey in mind it is proposed that there is a better way forward for some sectors than using ECVET. The way forward for the ICT sector could include the following.

1. The construction of an eSkills Meta Framework for Europe (already planned through CEN/ISSS);
2. The creation of a European Qualifications Framework for eSkills;
3. The creation of a European Syllabus and Curriculum for eSkills Courses so that teaching could be harmonized. (Career Space have already created a proposed curriculum for certain ICT Courses at University Level);

4. The creation of a European Mechanism to oversee the implementation of European Certification for a number of eSkills Areas.

### 5.2. *International Testing Board*

The European Mechanism (central body) could be an International Testing Board and could be responsible for standards and definitions and could also monitor testing so that the process would be unbiased and transparent. Certifications recognised by the central body would be similarly recognised in all Member States and thus lead to enhanced mobility and a means to ensure the alleviation of skills mismatches. It would mean that certification for Europeans would be under the direction and control of a European Body and could deal with European Social issues as well as the particular needs of European Industry. The Central Body could provide a repository for Definitions and Curriculum Guidelines for VET.



**Figure 34 Lack of international connections in e-skills certification**

Core subjects could be agreed and defined and there could be an open curriculum for additional modules. The Central Body could monitor an agreed Skills Framework and could develop an agreed Qualifications Framework. Within the agreed Skills and Qualification Frameworks there could be room for National Qualifications and Vendor Certifications. The task of setting up such a body

would be considerable. It would require Political Lobbying in the Member States and in the European Parliament. It would require the approval of industry and commerce. The Central Body could not only monitor certifications but could also promote the image of ICT as a suitable career for young Europeans.

It would also

- Update definitions
- Update curriculum guidelines
- Update skills framework
- Update register of approved qualifications
- Monitor testing procedures
- Quality assure and audit the process
- Promote value of European Certification

There are regional frameworks being developed based on geographical and language factors and these will lead to small regional areas of competence and mobility. It is the contention of this report that the alternative of a European Central Body would be a considerably better solution and lead to true mobility and transparency.

### ***5.3. Available Approaches for General Framework***

CEPIS has worked on developing a framework leading to the EUCIP (European Certificate for Informatics Professionals) Certification. This framework could be developed to embrace modules from a variety of sources and also cope with existing Industry Certifications. The development of the EUCIP Framework into a European framework for ICT qualifications is proposed and it is believed that this can be achieved in a relatively short timescale.

The adoption of English as the common language at the practitioner level of ICT will make the establishment of a Central Body very much easier. It is, of course, essential that the majority of qualifications should be available in as many languages as possible.

At the end-user level the qualifications would certainly need to be available in the native language of the participants.

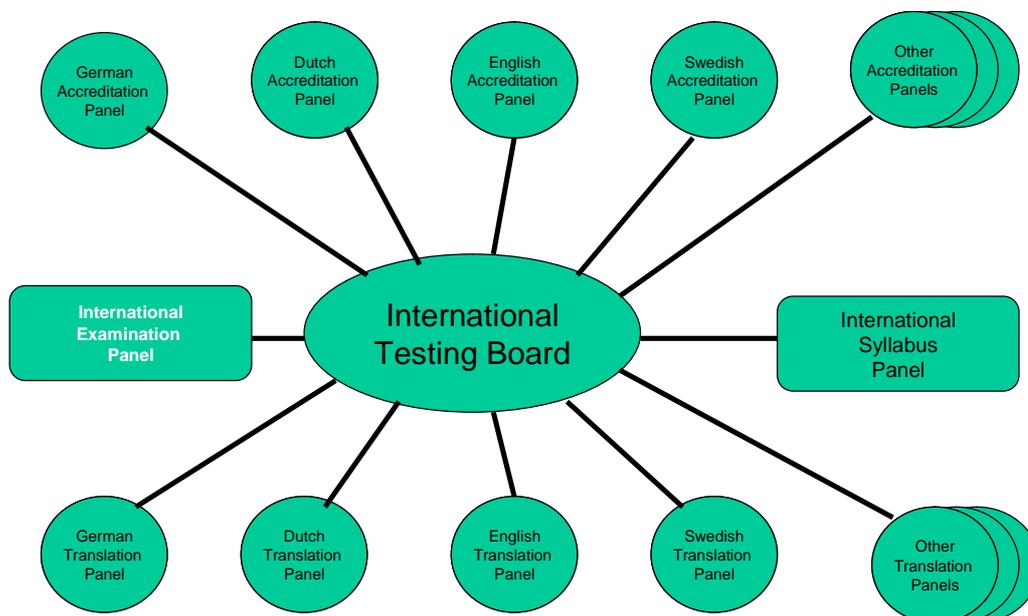


Figure 35 Possible way forward to internationally recognised e-skills certification

#### 5.4. *General Framework to Setting European Level Quality Standards*

The ECDL Foundation has created a widely respected set of quality guidelines for the creation of syllabi and the conducting of tests. It is considered that a European framework for quality standards can be built based on existing materials and could be in place in a relatively short timescale. Such a set of quality standards would require a Central Body to ensure adherence and to conduct audits in this regard.

It is clear that much progress has been made with ECTS and to a lesser extent with ECVET. It is therefore appropriate that any proposed framework should include these elements. This would allow the existing arrangements to continue.

In addition to the above it is proposed to set up an International structure together with the proposed *European Central Body* to coordinate qualifications and certifications in Europe.



**Figure 36 Proposed structure of a general framework**

The framework proposed will ensure that there can be widely recognised qualifications and, with the introduction of a suitable testing environment with strong guidelines and a strong emphasis on quality, the possibility of internationally recognised Certifications.

The introduction of automated test procedures using existing tried and tested ICT testing engines would go a long way to ensuring the transparency of the testing processes. There is a wealth of experience in Europe at the moment regarding automated testing and this approach would be an essential element within a European Certification process. Automated testing is particularly suited to testing for ICT practitioners and ICT end-users. It should be appreciated that it does not consist only of multiple choice questions. There can be a variety of question types including multiple choice, hotspots, drag and drop and simulation. In addition great strides have been made by European Testers in the area of automatically assessing free text (essay type) answers.

It is clear that for the future of Europe there is a need for transparency and mobility in all areas of the workforce. This proposal can lead to the setting up of such transparent qualifications and certifications that it will contribute to the mobility of the European workforce in the ICT area.

In order for these recommendations to succeed the establishment of the proposed European Meta eSkills Framework should be followed by the creation of a European eSkills Qualifications Framework. With these two pre-requisites a European eSkills Certification can be created.

## **6. Glossar**

### **Accreditation**

Assessment of conformity of an object of interest with specific obligatory or voluntary standards. Process of accrediting an institution of vocational education or training, a programme of study, or a service, showing it has been approved by the relevant legislative and professional authorities by having met predetermined standards.

### **Assessment**

The sum of methods and processes used to evaluate the attainments (knowledge, know-how, skills and competences) of an individual, and typically leading to certification.

### **Certification (of skills and competences)**

Certification results from a voluntary evaluation process whereby an individual's knowledge and/or skill in a particular area of interest are validated against a set of predetermined skills requirements e.g. skills standards by means of an objective assessment.

### **Certification process**

The certification process comprises all activities by which a certification body establishes that a person fulfils specified competence requirements.

### **Certification system**

Set of procedures and resources for carrying out the certification process as per a certification scheme, leading to the issue of a certificate of competence including maintenance.

**Certification scheme**

Specific certification requirements related to specified categories of persons to which the same particular standards and rules, and the same procedures apply.

**Certification process**

All activities by which a certification body establishes that a person fulfils specified competence requirements, including application, evaluation, decision on certification, surveillance and recertification, use of certificates and logos/marks.

**Certificate/ diploma**

An official document, issued by an awarding body, which records the achievements of an individual following a standard assessment procedure.

**Competence**

Demonstrated ability to apply knowledge and/or skills and, where relevant, demonstrated personal attributes in an habitual or changing situation, and/or as defined in the certification scheme.

**Comparability**

The extent to which it is possible to establish equivalence between the level and content of formal qualifications (certificates or diplomas) at sectoral, regional, national or international levels.

**e-Skills**

e-skills encompasses a wide range of capabilities (knowledge, skills and competences) and issues with an e-skills dimension span over a number of economic and social dimensions. The term e-Skills includes ICT Practitioner Skills, ICT User Skills and e-Leadership Skills.

**Education**

Education is responsible and lays the foundation for the initial transfer of core knowledge and basic understanding (know-how) of ICT workers. Education

teaches concepts, theories, problem solving capabilities and constitutes the prerequisite to be trained on specific job requirements.

### **Formal learning**

Learning that takes place in the form of physical, face-to-face, teacher-centred classroom training (instructor-led training).

### **Informal learning**

Learning which takes place in the work context, relates to an individual's performance in their job and/ or their employability, and which is not formally organised into a programme or curriculum by the employer. Learning resulting from daily activities related to work, family or leisure. It is not organised or structured (in terms of objectives, time or learning support). Informal learning is in most cases unintentional from the learner's perspective. It typically does not lead to certification.

### **ICT skills**

The skills needed for efficient use of ICT. Professional ICT skills: ability to use advanced ICT tools, and/or to develop, repair and create such tools. Applied ICT skills: ability to use simple ICT tools in general workplace settings ( in non-IT jobs). Basic ICT skills or "ICT literacy": skills needed to use efficiently the basic functions of information and communication technologies (ICT). Ability to use ICT for basic tasks and as a tool for learning.

### **ICT**

Information and communication technology (ICT) is technology which provides for the electronic input, storage, retrieval, processing, transmission and dissemination of information.

### **ICT practitioners**

ICT practitioners possess the capabilities required for specifying, designing, developing, installing, operating, supporting, maintaining, managing, evaluating and

researching ICT systems, for the benefit of others. ICT Practitioners include both professional ICT (“Informatics”) and non-professional ICT workers.

**ICT users**

ICT users need the capabilities required for effective use by the individual of ICT systems and devices. ICT users make use of the systems as tools in support of their own work, which is, in most cases, not ICT. User skills cover the utilisation of common generic software tools, such as word processing, spreadsheets, presentations, e-mail and internet, and use of specialized tools supporting business functions within user sectors.

**Knowledge**

Knowledge summarises the capabilities and skills applied by individuals to provide solutions for specific problems. Two major categories for knowledge are: explicit and implicit. Explicit knowledge can be accessed and transferred by other individuals; implicit knowledge is bound to the personal capacities and experience of a certain individual.

**Know-how**

Practical knowledge or expertise.

**Learning**

Learning is a cumulative process whereby individuals gradually assimilate increasingly complex and abstract entities (concepts, categories, and patterns of behaviour or models) and/or acquire skills and competences.

**Learning outcome(s)/ learning attainments**

The set of knowledge, skills and/or competences an individual acquired and/or is able to demonstrate after completion of a learning process.

### **Lifelong learning**

All learning activity undertaken throughout life, with the aim of improving knowledge, skills and/or qualifications for personal, social and/or professional reasons.

### **Non-formal learning**

Non-formal learning includes any organised, learner-centred, more flexible educational activity outside the established formal system.

### **Qualification**

Demonstration of personal attributes, education, training and/or work experience. Qualification as certificates or diplomas or other evidence linked to the delivery and assessment of training received. The requirements for an individual to enter or progress within an occupation.

### **Quality standards**

Quality standards are provided in formal way by independent standardisation bodies and sector associations documented in form of normative documents. De facto standards are offered by public and/or private initiatives and are achieved through a broad acceptance by the actors in a specific sector/field. Quality standards can be distinguished concerning their focus e.g. on process, method, content.

### **Recognition**

The process of granting official status to skills and competences either through the award of certificates or through the grant of equivalence, credit units, validation of gained skills and/or competences (formal recognition). The acknowledgement of the value of skills and/or competences by economic and social stakeholders (social recognition).

### **Skills**

The knowledge and experience needed to perform a specific task or job. Capabilities of an individual, definable by content, to be acquired and activated through related professional training. In this context, capabilities are the physical or psychological attributes of an individual to be applied in activity-related approaches.

**Test**

Provision of information about an individual's standing with respect to a specific set of knowledge, skills, and competence as defined by a specific job profile or occupational role.

**Validation of informal/ non-formal learning**

The process of assessing and recognising a wide range of knowledge, know-how, skills and competences, which people develop throughout their lives within different environments, for example through education, work and leisure activities.

**Vocational and education and training (VET)**

Education and training which aims to equip people with skills and competences that can be used on the labour market.

**Work experience**

Continuously gathered by individuals fulfilling their occupational role, and gained in the daily working process, but as well by informal learning and continuous professional development.

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## **9. Appendix 1 - Questionnaire**



# Survey

## e-Skills Certification in Europe

Conducted by



**CEPIS**

Council of European Professional Informatics Societies

On behalf of



**Cedefop**

European Centre for the Development of  
Vocational Training

**July 2004**

Dear Colleague,

Multiple **Certification programmes and systems** are known throughout the ICT practitioner/ user community as highly important for getting into the information technology field and build a solid professional career. CEPIS<sup>60</sup> studies and compares, on behalf of Cedefop<sup>61</sup>, existing approaches to e-Skills certification on a European and International level. The survey intends to contribute to the current debate by investigating existing modes, procedures, methods and institutions responsible for **e-Skills certification**.

The results of the survey will be addressed at current European working groups and are intended to inform Cedefop and the European Commission on further steps to be taken in the framework of promoting **ICT skills training, recognition and transparency**<sup>62</sup> as well as social cohesion and mobility of labour and last but not least the competitiveness of European enterprises. This activity is closely linked to the outcomes of the *e-Skills Forum, which was set up by the European Commission in 2003* and to the current work of the European Standardisation Committee linked to the Information Society standardisation system.<sup>63</sup>

The questionnaire is primarily aimed at members of *CEPIS*, the *e-Skills Forum* and the *CEN-ICT skills workshop*. However, we would appreciate if you send us names and addresses of other stakeholders (bodies of public services, non-governmental bodies, training providers, private industry-led certifying or training bodies), which are knowledgeable and competent in the field.

We would like you as an expert to answer the following questions on purely basis of your knowledge and experience. The data gathered will be kept and processed strictly confidential and anonymously throughout the entire survey and analysis task.

The questionnaire is composed of elements for qualitative information in five sections:

1. Details on respondent;
2. European e-Skills certification: problems, issues, solutions;
3. Existing recognised e-Skills certification systems in your country;
4. Future of e-Skills certification;
5. Recommendations

The completion of the questionnaire will require about **20 minutes** of your precious time.

Thank you for your support in advance.

Sincerely yours,

The CEPIS project team

Signed by  
Peter Bumann,  
CEO, CEPIS

For Cedefop, this text was seen by Burkart Sellin, Principal Administrator and Project Manager, contact: bs@cedefop.eu.int

**Please return the questionnaire  
by email to [weiss@aifb.uni-karlsruhe.de](mailto:weiss@aifb.uni-karlsruhe.de).**

|                               |
|-------------------------------|
| <b>Deadline: 31 July 2004</b> |
|-------------------------------|

**Contact** concerning this questionnaire are:

**Peter Weiß** (weiss@aifb.uni-karlsruhe.de) or **Ralf Trunko** (trunko@aifb.uni-karlsruhe.de).

<sup>60</sup> CEPIS stands for Council of European Professional Informatics Societies: <http://www.cepis.org>.

<sup>61</sup> The European Union's Thessalonica based Agency: European Centre for the Development of Vocational Training: <http://www.cedefop.eu.int/>.

<sup>62</sup> In this interrelation is comprehended as precondition to achieve comparability and transferability of e-Skills.

<sup>63</sup> See also <http://cedefop.communityzero.com/esf> and <http://cedefop.communityzero.com/cen-ict>.

## Definition of Concepts<sup>64</sup>

### Certification System

Set of procedures and resources for carrying out the certification process as per a certification scheme, leading to the issue of a certificate of competence including maintenance.

### Certification Scheme

Specific certification requirements related to specified categories of persons to which the same particular standards and rules, and the same procedures apply.

### Certification Process

All activities by which a certification body establishes that a person fulfils specified competence requirements, including application, evaluation, decision on certification, surveillance and recertification, use of certificates and logos/marks.

### Competence

Demonstrated ability to apply knowledge and/or skills and, where relevant, demonstrated personal attributes, as defined in the certification scheme.

### Qualification

Demonstration of personal attributes, education, training and/or work experience. Qualification as certificates or diplomas or other evidence linked to the delivery and assessment of training received.<sup>65</sup>

### ICT Practitioners

ICT practitioners possess the capabilities required for specifying, designing, developing, installing, operating, supporting, maintaining, managing, evaluating and researching ICT systems, for the benefit of others.<sup>66</sup> ICT Practitioners include both professional ICT (“Informatics”) and non-professional ICT workers.

### ICT Users

ICT users need the capabilities required for effective use by the individual of ICT systems and devices. ICT users make use of the systems as tools in support of their own work, which is, in most cases, not ICT. User skills cover the utilisation of common generic software tools, such as word processing, spreadsheets, presentations, e-mail and internet, and use of specialized tools supporting business functions within user sectors.

### e-Skills

The term e-Skills includes ICT Practitioner Skills, ICT User Skills and e-Leadership Skills. e-Skills can be categorised by four different levels of complexity, in brackets the related qualification level is indicated for both ICT practitioner and end-user level: A: Basic level (assistant, end-user), B: Core level (technician, end-user), C: Advanced level (specialist, end-user), D: Expert level (professional, end-user). ICT end-users are people which are using e-Skills only to support their primal profession whereby ICT is not the main focus of their jobs. e-Skills are acquired and assessed in a number of ways, including courses in tertiary (and other) education, commercial training provision (mainly in relation to the use of specific software) and industry certification.<sup>67</sup>

### Quality Standards

Quality standards are provided in formal way by independent standardisation bodies and sector associations documented in form of normative documents. De facto standards are offered by public and/or private initiatives and are achieved through a broad acceptance by the actors in a specific sector/field. Quality standards can be distinguished concerning their focus e.g. on process, method, content.

---

<sup>64</sup> Mainly based on ISO/IEC 17024 “Standard for the certification of persons” and the CEPIS survey “I.T. Practitioner Skills in Europe”. The term e-Skills is defined according to a definition by the European e-Skills Forum.

<sup>65</sup> Cedefop: Draft Final Report: Towards a Comprehensive European level E-Skills Framework, page 101, restricted Report for CEN/ISSS ICT skills working group, May 2004.

<sup>66</sup> CEPIS Report „IT Practitioner Skills in Europe“, page 95f. Definition according to the e-Skills Forum, May 2004.

<sup>67</sup> Meeting Global IT Skill Needs – the Role of Professionalism. IFIP, OECD, WITSA, Joint Working Conference. Summary of Proceedings.

## 1 Details on Respondent and Organisation

The information given on this page will be kept strictly confidential and is processed anonymously throughout the survey and analysis task. We kindly ask you to provide us with the required information in the table below. The fields indicated by a (\*) are obligatory fields for the statistical analysis.

### Respondent and organisation

|                                  |  |
|----------------------------------|--|
| (*) Position within organisation |  |
| Email <sup>68</sup>              |  |
| Name of affiliated Organisation  |  |

### Details of your organisation

|   |  |
|---|--|
| (*) Type of organisation  | <input type="checkbox"/> certifying body <input type="checkbox"/> test center <input type="checkbox"/> training provider<br><input type="checkbox"/> ICT vendor <input type="checkbox"/> education <input type="checkbox"/> government<br><input type="checkbox"/> ICT (supplier) company <input type="checkbox"/> ICT (end-)user organization<br><input type="checkbox"/> other _____ |
| (*) Status of organisation  | <input type="checkbox"/> industry/private <input type="checkbox"/> public <input type="checkbox"/> government<br>Other _____   |
| (*) Business Sector (if applicable, e.g. IT, Manufacturing, etc.)   |  |
| <b>(*) What is your place of residence?</b>   |  |
| <input type="checkbox"/> Old EU Member States <input type="checkbox"/> New EU Member States<br><input type="checkbox"/> Associated countries <input type="checkbox"/> Other |  |

|  |  |
|--|--|
| <b>(*) Please indicate your membership in relevant working group(s)/ association(s) on an international/ European or national level related to e-Skills certification?</b>   |  |
| <input type="checkbox"/> e-Skills Forum <input type="checkbox"/> CEN ISSS ICT <input type="checkbox"/> CompTIA <input type="checkbox"/> Career-Space<br><input type="checkbox"/> EICTA <input type="checkbox"/> Uni Europa <input type="checkbox"/> Other(s): [                      ] |  |

<sup>68</sup> If you wish to receive information about the results of the survey and the project in the near future.

## 2 European e-Skills Certification: Problems, Issues, Solutions

The following questions investigate the importance and future role of e-Skills certification on a European level. **The questions should be answered concerning e-Skills certification at all levels and over all categories of e-Skills: ICT Practitioner Skills, ICT User Skills and e-Leadership Skills.** Please answer the questions purely on the basis of your experience, best practice and knowledge.

### 2.1 General Statements

**Q2.1** How do you agree with the **following statements** in relation to the current debate towards comparable e-Skills certification for **ICT practitioners/ end-users** on an European and International level?

|   |   |  |    |   |    |    |      |
|---|---|--|----|---|----|----|------|
|   |   | -2   | -1 | 0 | +1 | +2 | n.r. |
| 1 | Today, Europe is facing a <b>multitude</b> of available e-Skills certification schemes.   |  |    |   |    |    |      |
| 2 | Europe needs <b>fewer</b> , but more relevant e-Skills certification schemes.   |  |    |   |    |    |      |
| 3 | The <b>importance (level of acceptance and usage)</b> of e-Skills certification differs significantly amongst member states and other countries.                                  |  |    |   |    |    |      |
| 4 | The <b>comparability and transparency</b> of e-Skills certification schemes on a European and International level is given too much <b>priority</b> in the current debate.        |  |    |   |    |    |      |
| 5 | On a European level, in short-term compatible and recognised e-Skills certificates are <b>strongly</b> needed.  |  |    |   |    |    |      |
| 6 | The following <b>types of e-Skills certification schemes</b> play an important role to achieve transparency and comparability of e-Skills certification in Europe (a+b+c):        |  |    |   |    |    |      |
| a | ICT end-user schemes...   |  |    |   |    |    |      |
|   | ICT practitioner schemes...   |  |    |   |    |    |      |
| b | ...vendor-specific...   |  |    |   |    |    |      |
|   | ...vendor-neutral...  |  |    |   |    |    |      |
| c | ...with government/public sponsorship   |  |    |   |    |    |      |
|   | ...with industry or vendor sponsorship  |  |    |   |    |    |      |
|   | ...with vendor neutral sponsorship  |  |    |   |    |    |      |
|   | ...with vendor specific sponsorship   |  |    |   |    |    |      |
| 7 | <b>Transparency, portability and compatibility</b> of e-Skills certificates can only be achieved by co-operation of stakeholders on basis of <b>public-private partnerships</b> . |  |    |   |    |    |      |
| 8 | The <b>current initiatives and current debate</b> are still far away from a European reference framework of promoting e-Skills training, recognition and transparency.            |  |    |   |    |    |      |

|    |  |  |    |   |    |    |      |
|----|--|--|----|---|----|----|------|
|    |  | -2   | -1 | 0 | +1 | +2 | n.r. |
| 9  | Europe needs <b>recognised formal quality standards</b> and related common criteria and requirements for e-Skills certification.   |  |    |   |    |    |      |
| 10 | Europe needs <b>recognised formal quality standards</b> and related common criteria and requirements for <b>training providers</b> .   |  |    |   |    |    |      |
| 11 | The current marketplace is characterised by a <b>focus on vendor certification and industry-accredited courses</b> .   |  |    |   |    |    |      |
| 12 | There is a obvious void in terms of <b>accepted e-Skills certification schemes</b> and the current market need.  |  |    |   |    |    |      |
| 13 | In your country <b>vocational qualification</b> and related training is generally specified and regulated through legislation involving licensing and certification.   |  |    |   |    |    |      |
| 14 | In your country the <b>cost of certification is in many cases a barrier</b> for many <b>ICT practitioners/ end-users</b> (self-employed, employees, individuals) to pass through an e-Skills certification system. |  |    |   |    |    |      |
| 15 | In your country the <b>cost of certification is in many cases a barrier</b> for many <b>ICT employers</b> to offer certified vocational training for employed ICT practitioners/ users.                            |  |    |   |    |    |      |

**Q2.2** Wherein do you see important differences in **e-Skills certification schemes** for **ICT practitioners** and **ICT end-users** to be addressed to achieve improved comparability and transferability?

*[your comments]*

**Q2.3** From your perspective, how important are cooperations of and **joined activities** by relevant stakeholders on transparency and comparability of e-Skills certification systems in Europe?

|   |                            |  |    |   |    |    |      |
|---|----------------------------|--|----|---|----|----|------|
|   |                            | -2   | -1 | 0 | +1 | +2 | n.r. |
| 1 | ICT vendor/industry        |  |    |   |    |    |      |
| 2 | governmental/public bodies |  |    |   |    |    |      |
| 3 | educational bodies         |  |    |   |    |    |      |
| 4 | training provider          |  |    |   |    |    |      |
| 5 | certifying body            |  |    |   |    |    |      |
| 6 | ICT practitioner           |  |    |   |    |    |      |
| 7 | ICT end-user               |  |    |   |    |    |      |

## 2.2 Problems

**Q2.4** Which **problems mainly hamper** the transparency and comparability of certificates/diploma for ICT practitioners/ end-users on a European level?

*[your comments]*

**Q2.5** Which **problems have to be solved by the stakeholders** in view of the transparency and comparability of e-Skills certificates on a European and International level?

*[your comments]*

**Q2.6** Which other **problems have you identified** towards a European framework of promoting ICT skills training, recognition and transparency?

*[your comments]*

## 2.3 Issues

**Q2.7** Which are the **key issues to be addressed by the stakeholders** towards the comparability and transparency of e-Skills certificates on a European and International level?

**...in the short term...?**

*[your comments]*

**....and in the long term?**

*[your comments]*

## 2.4 Solutions

**Q2.8** Which are **possible solutions** towards the comparability and transparency of e-Skills certificates on a European and International level?

e.g. European e-Skills meta-framework, design of innovative e-skills training solutions, promotion of European e-Skills multi-stakeholders partnerships, improve planning and data availability for the ICT sector market, develop long-term strategic approaches to ICT sector.

**...in short term...?**

*[your comments]*

**...and in long term?**

*[your comments]*

### 3 Existing Recognised e-Skills Certification Systems in Your Country

**Q3.1** Which e-Skills certification systems for ICT practitioners/ end-users you know are being widely applied in your country? (Please mention max. five (5) of the most important or recognised systems).

**A.** Please fill in the name of the **mostly recognised e-Skills certification system** for ICT practitioners/ end-users in your country and name the **certifying body** if to you are aware of it.

**B.** Please note the **degree of market recognition** per certification system in your country by employers and by employees.

**C.** Please categorise the **level of recognition**: regional, national, European, International.

| A   |          | B   |    |         |   |      | C                    |          |        |               |
|---|----------|---|----|---------|---|------|----------------------|----------|--------|---------------|
| 1) Name of certification system<br>2) Name of certifying body |          | Degree of market recognition in your country? |    |         |   |      | Level of recognition |          |        |               |
|   |          | low   |    | neutral |   | high | regional             | national | Europe | International |
|   |          | -2  | -1 | 0       | 1 | 2    |                      |          |        |               |
| 1   | 1)<br>2) |   |    |         |   |      |                      |          |        |               |
| 2   | 1)<br>2) |   |    |         |   |      |                      |          |        |               |
| 3   | 1)<br>2) |   |    |         |   |      |                      |          |        |               |
| 4   | 1)<br>2) |   |    |         |   |      |                      |          |        |               |
| 5   | 1)<br>2) |   |    |         |   |      |                      |          |        |               |

**Q3.2** Wherein do you see important differences in e-Skills certification systems for ICT practitioners/ end-users in your country?

None

Do not know

Yes.

If answered 'yes' which major differences do you see?

[your comments]

e-Skills Certification in Europe

**Q3.3** Please describe the mentioned e-Skills certification system(s) by the following additional **categories**. Multiple answers are possible. If you do not know the answer please leave the table blank and/or provide a comment (optional)

| Name of category  | No. of mentioned e-Skills certification system in Q3.1 |   |   |   |   |
|---|--|---|---|---|---|
|   | 1  | 2 | 3 | 4 | 5 |
| At which <b>level of e-Skills</b> (qualification) does the system offer certification? (In brackets the related qualification level is indicated for both <b>ICT practitioner and end-user level</b> .) |  |   |   |   |   |
| ICT practitioner skills   | <input type="checkbox"/>                               |   |   |   |   |
| A<br>Basic level (assistant)  |  |   |   |   |   |
| B<br>Core level (technician)  |  |   |   |   |   |
| C<br>Advanced level (specialist)  |  |   |   |   |   |
| D<br>Expert level (professional)  |  |   |   |   |   |
| ICT end-user skills   | <input type="checkbox"/>                               |   |   |   |   |
| A<br>Basic level  |  |   |   |   |   |
| B<br>Core level   |  |   |   |   |   |
| C<br>Advanced level   |  |   |   |   |   |
| D<br>Expert level   |  |   |   |   |   |
| Other, please specify:  |  |   |   |   |   |
| Comments (optional)   | <i>[e.g. not to my knowledge]</i>                      |   |   |   |   |

| Name of category                                      | No. of mentioned e-Skills certification system in Q3.1 |   |   |   |   |
|---|--|---|---|---|---|
|   | 1  | 2 | 3 | 4 | 5 |
| What is the <b>geographic coverage</b> of the system? |  |   |   |   |   |
| <i>Regional</i>                                       |  |   |   |   |   |
| <i>National</i>                                       |  |   |   |   |   |
| <i>European</i>                                       |  |   |   |   |   |
| <i>International</i>                                  |  |   |   |   |   |
| Other, please specify: _____                          |  |   |   |   |   |
| Comments (optional)                                   | <i>[e.g. not to my knowledge]</i>                      |   |   |   |   |

|  |                                   |  |  |  |  |
|--|-----------------------------------|--|--|--|--|
| Select the type of <b>certifying body</b> / institution issuing certificates or diplomas |                                   |  |  |  |  |
| <i>Enterprise</i>  |                                   |  |  |  |  |
| <i>Social Partner's Committee</i>  |                                   |  |  |  |  |
| <i>Officially Recognised School</i>  |                                   |  |  |  |  |
| <i>Professional or Employer's Association</i>  |                                   |  |  |  |  |
| <i>Governmental Institution</i>  |                                   |  |  |  |  |
| Other, please specify: _____   |                                   |  |  |  |  |
| Comments (optional)  | <i>[e.g. not to my knowledge]</i> |  |  |  |  |

| How do you describe the available degree of <b>standardisation</b> ? |  |  |  |  |  |
|--|--|--|--|--|--|
| <i>Industry standard (e.g. de facto standard)</i>                    |  |  |  |  |  |
| <i>Formal standard (e.g. ISO, EAC)</i>                               |  |  |  |  |  |
| <i>Not to my knowledge</i>   |  |  |  |  |  |
| <i>None</i>  |  |  |  |  |  |
| Other, please specify: _____   |  |  |  |  |  |
| Comments (optional)  |  |  |  |  |  |

| Name of category | No. of mentioned e-Skills certification system |   |   |   |   |
|------------------|--|---|---|---|---|
|                  | 1  | 2 | 3 | 4 | 5 |

| How do you describe the <b>outcome</b> of the certification system? |                                   |  |  |  |  |
|---|-----------------------------------|--|--|--|--|
| <i>Certificate</i>  |                                   |  |  |  |  |
| <i>Diploma</i>  |                                   |  |  |  |  |
| Other, please specify: _____  |                                   |  |  |  |  |
| Comments (optional)   | <i>[e.g. not to my knowledge]</i> |  |  |  |  |

|                              |                                   |  |  |  |  |
|------------------------------|-----------------------------------|--|--|--|--|
| <i>Vendor-neutral</i>        |                                   |  |  |  |  |
| <i>Vendor-specific</i>       |                                   |  |  |  |  |
| <i>Public</i>                |                                   |  |  |  |  |
| <i>Private/Industry</i>      |                                   |  |  |  |  |
| Other, please specify: _____ |                                   |  |  |  |  |
| Comments (optional)          | <i>[e.g. not to my knowledge]</i> |  |  |  |  |

| Which is (are) the <b>target group(s)</b> of the mentioned e-Skills certification system? |                                   |  |  |  |  |
|---|-----------------------------------|--|--|--|--|
| <i>Students</i>   |                                   |  |  |  |  |
| <i>Non-users</i>  |                                   |  |  |  |  |
| <i>ICT users</i>  |                                   |  |  |  |  |
| <i>ICT practitioners</i>  |                                   |  |  |  |  |
| <i>Lateral entries</i>  |                                   |  |  |  |  |
| <i>Re-entries</i>   |                                   |  |  |  |  |
| <i>Self-employed</i>  |                                   |  |  |  |  |
| <i>Unemployed people</i>  |                                   |  |  |  |  |
| <i>Learning advisors/trainers</i>   |                                   |  |  |  |  |
| Other, please specify: _____  |                                   |  |  |  |  |
| Comments (optional)   | <i>[e.g. not to my knowledge]</i> |  |  |  |  |

**Q3.4** Which of the mentioned e-Skills certification systems would you put forward and should be considered in the current discussion of **voluntary approaches setting standards** for European e-Skills certification?

 None

 [Please fill in the name of the system]

Additional comments (optional)

e-Skills Certification in Europe

|  |    |    |   |    |    |      |
|--|----|----|---|----|----|------|
|  |    |    |   |    |    |      |
|  | -2 | -1 | 0 | +1 | +2 | n.r. |

|  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|
| <b>Q3.5</b> In your country, is the achievement of <b>vocational qualification</b> (e.g. certificate, diploma) a precondition for ICT practitioners/ end-users for employment in a relevant job?<br><i>[your comments]</i> |  |  |  |  |  |  |
|--|--|--|--|--|--|--|

**Q3.6** How do you agree with the following **success factors** for e-Skills certification systems?

|  |    |    |   |    |    |      |
|--|----|----|---|----|----|------|
|  |    |    |   |    |    |      |
|  | -2 | -1 | 0 | +1 | +2 | n.r. |

|                                |                            |  |  |  |  |  |
|--------------------------------|----------------------------|--|--|--|--|--|
| Relevance                      |                            |  |  |  |  |  |
| Global coverage and acceptance |                            |  |  |  |  |  |
| Consistency                    |                            |  |  |  |  |  |
| Security                       |                            |  |  |  |  |  |
| Robustness                     |                            |  |  |  |  |  |
| Flexibility                    |                            |  |  |  |  |  |
| Price/ costs                   |                            |  |  |  |  |  |
| Benefit for                    |                            |  |  |  |  |  |
|                                | <i>Employers</i>           |  |  |  |  |  |
|                                | <i>Individuals</i>         |  |  |  |  |  |
| Independency                   |                            |  |  |  |  |  |
|                                | <i>Vendor-neutral</i>      |  |  |  |  |  |
|                                | <i>Vendor-specific</i>     |  |  |  |  |  |
| Support by ....                |                            |  |  |  |  |  |
|                                | <i>Industry/ Employers</i> |  |  |  |  |  |
|                                | <i>Government</i>          |  |  |  |  |  |
|                                | <i>Professionals</i>       |  |  |  |  |  |
|                                | <i>Education</i>           |  |  |  |  |  |
| <i>[your comments]</i>         |                            |  |  |  |  |  |

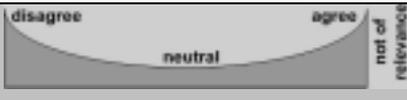
## 4 Future of e-Skills certification

### 4.1 Quality Standards

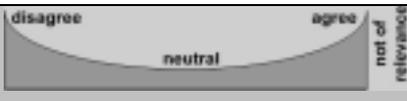
**Q4.1** From your point of view, which e-Skills certification system(s) would be an **appropriate basis for a framework** of promoting e-Skills training, recognition and comparability on a European level?

*[your comments]*

**Q4.2** How do you agree with the below shown types of e-Skills certification systems as an **appropriate basis for such a framework**?

|                              |   |  |    |   |    |    |      |
|------------------------------|---|--|----|---|----|----|------|
|                              |   | -2   | -1 | 0 | +1 | +2 | n.r. |
| 1                            | A <b>pure formal</b> system linked to public education and training qualifications  |  |    |   |    |    |      |
| <i>[Examples, comments]:</i> |   |  |    |   |    |    |      |
| 2                            | A self-controlled <b>company or industry based</b> system                           |  |    |   |    |    |      |
| <i>[Examples, comments]:</i> |   |  |    |   |    |    |      |
| 3                            | System linked to <b>ICT vendors</b>   |  |    |   |    |    |      |
| <i>[Examples, comments]:</i> |   |  |    |   |    |    |      |
| 4                            | An e-Skills certification system linked to a <b>vendor independent</b> organisation |  |    |   |    |    |      |
| <i>[Examples, comments]:</i> |   |  |    |   |    |    |      |
| 5                            | Other system, if yes which one?   |  |    |   |    |    |      |
| <i>[Examples, comments]:</i> |   |  |    |   |    |    |      |

**Q4.3** How do you agree with the following issues to be addressed by a relevant **framework** for e-Skills certification?

|   |  |  |    |   |    |    |      |
|---|--|--|----|---|----|----|------|
|   |  | -2   | -1 | 0 | +1 | +2 | n.r. |
| 1 | certification process                                    |  |    |   |    |    |      |
| 2 | certification scheme (requirements, job profiles, etc. ) |  |    |   |    |    |      |
| 3 | learning material, content                               |  |    |   |    |    |      |
| 4 | outcomes of learning (knowledge and skills)              |  |    |   |    |    |      |
| 5 | training offered   |  |    |   |    |    |      |
| 6 | concept of validation, expiration                        |  |    |   |    |    |      |
| 6 | other, please comment:                                   |  |    |   |    |    |      |

*[your comments]*

| Q4.4 How far do you agree with the following statements? |  |  |    |   |    |    |      |
|--|--|--|----|---|----|----|------|
|  |  |  |    |   |    |    |      |
|  |  | -2   | -1 | 0 | +1 | +2 | n.r. |
| 1  | There should be a permanent EU Agency to be entrusted with e-Skills certifications' comparability and recognition/standards issues.  |  |    |   |    |    |      |
| 2  | Transparency and comparability should be achieved by establishing a <b>voluntary European Certification Body</b> (e.g. European ICT Qualifications and Certifications Network, International/European Testing & Certification Board?). |  |    |   |    |    |      |
| <i>[your comments]</i>                                   |  |  |    |   |    |    |      |
| 3  | All individual learners should get access to an <b>ePortfolio</b> to be handed out by a European e-Skills certification body/network   |  |    |   |    |    |      |
| 4  | A central <b>repository</b> listing and categorising offered and available e-Skills certification in Europe is needed.   |  |    |   |    |    |      |
| <i>[your comments]</i>                                   |  |  |    |   |    |    |      |

The following questions refer to your agreement with the **goals and related tasks of an assumed central European body/ board** responsible for achieving recognition, transparency and comparability of e-Skills certification for ICT practitioners/ end-users.

**Q4.5 Do you support the setting up of an International or European Testing & Certification Board?**

**No, because....**

*[your comments]*

**Yes. Please rate the following statements.**

|    |  |  |    |   |    |    |      |
|----|--|--|----|---|----|----|------|
|    |  | -2   | -1 | 0 | +1 | +2 | n.r. |
| 1  | To <b>establish</b> and to <b>maintain</b> common <b>quality standards for ICT training and certification.</b>   |  |    |   |    |    |      |
| 2  | To <b>accredit</b> other organizations who train the individual learners in accordance with the standards.   |  |    |   |    |    |      |
| 3  | To <b>assess</b> and certify the practitioners who meet agreed quality standards.  |  |    |   |    |    |      |
| 4  | To enable international equivalence of ICT qualifications to support international mobility.   |  |    |   |    |    |      |
| 5  | To <b>accredit</b> or register current competence assessment approaches.   |  |    |   |    |    |      |
| 6  | To achieve “ <b>professional development</b> ” arrangements enabled by computer societies and stakeholders and measurement against national and “regional” standards.            |  |    |   |    |    |      |
| 7  | To improve the mutual <b>integration/recognition</b> of public and private, professional and industry certification.   |  |    |   |    |    |      |
| 8  | To <b>provide</b> mechanisms, methods and tools as a basis to <b>compare</b> different occupational or job profiles.   |  |    |   |    |    |      |
| 9  | To <b>facilitate</b> an ePortfolio and career management for ICT practitioners and ICT users.  |  |    |   |    |    |      |
| 10 | To examine <b>efficiency and effectiveness</b> in reconciling systems for training of individuals with existing industry e-Skills requirements in the different sectors.         |  |    |   |    |    |      |
| 11 | To contribute to a <b>universally-acceptable occupational or ICT skills framework.</b>   |  |    |   |    |    |      |
| 12 | To observe competence development issues for ICT practitioners and ICT users and to achieve <b>higher professional mobility</b> of the ICT workforce.                            |  |    |   |    |    |      |
| 13 | To enable the acquisition of <b>transferable e-Skills</b> that are recognized globally.  |  |    |   |    |    |      |
| 14 | To offer a European reference framework for <b>ICT job profiles and qualifications which is widely</b> recognised by public bodies and private industry.                         |  |    |   |    |    |      |
| 15 | To review regularly the <b>education/training provision</b> in the light of changing requirements of the marketplace   |  |    |   |    |    |      |
| 16 | To establish and <b>intensify links</b> between certification vendors, employers, recruitment agencies and training providers on a European and International level.             |  |    |   |    |    |      |
| 17 | To develop <b>stronger links</b> between qualification and ICT skills frameworks.  |  |    |   |    |    |      |
| 18 | To offer <b>internationally</b> accepted certification.  |  |    |   |    |    |      |
| 19 | To create a sustainable lifelong learning and career concept, to promote and implement <b>business awareness factors</b> of e-Skills.  |  |    |   |    |    |      |
| 20 | To co-operate with and <b>stimulate</b> existing certification schemes, to achieve public and governmental support.  |  |    |   |    |    |      |
| 21 | To achieve <b>global recognition</b> of e-Skills certification systems and related vocational qualifications.  |  |    |   |    |    |      |
| 22 | To acquire greater international comparability (in particular on the e-Skills classification systems – e.g. occupations and educational achievement), and better migration data. |  |    |   |    |    |      |
| 23 | To <b>bridge the gap</b> between bodies of knowledge and occupational frameworks by elaborating pathways to greater relevance of tertiary education curricula.                   |  |    |   |    |    |      |
| 24 | To identify and overcome existing (e.g. governmental, marketplace) <b>barriers to professional mobility.</b>   |  |    |   |    |    |      |

[your comments]

**Q4.6** Which **organisations/initiatives** should be represented in the central European body/board?

*[your comments]*

#### E-Portfolio

Training suppliers are looking increasingly at providing broader career management and qualification development services. An ePortfolio is defined as an inventory of ICT practitioners/ end-users skills and qualifications . Such a Portfolio may support international mobility and co-operation.

**Q4.8** Do you agree with the idea of setting up a **European ePortfolio**?

No

Do not know

Yes.

#### Initiatives

**Q4.9** Who should be, from your point of view, the **leading and entrusted certifying bodies/ organisations** offering e-Skills certification in Europe?

**Q4.10** Who are the leading **industry-led initiatives** addressing e-Skills certification on a European and International level ?

**Q4.11** What are the leading **public-led initiatives** addressing e-Skills certification on a European and International level ?

## 5 Recommendations

### 5.1 Government

**Q5.1** What **recommendations for activities and/or initiatives** do you propose **for governmental bodies** to achieve the **transparency and comparability** of e-Skills certifications?

**...in the short term....?**

*[your comments]*

**....and in the long term?**

*[your comments]*

### 5.2 Industry

**Q5.2** What **recommendations for activities and/or initiatives** do you propose **for industry** to achieve the **transparency and comparability** of e-Skills certifications?

**...in the short term....?**

*[your comments]*

**....and in the long term?**

*[your comments]*

### 5.3 Education

**Q5.3** What **recommendations and activities** do you propose **for educators/training providers** to achieve the **transparency and comparability** of e-Skills certifications?

**...in the short term....?**

*[your comments]*

**....and in the long term?**

*[your comments]*

**Q5.4** Who should take the **lead in the initiative towards** comparable European e-Skills certification systems?

|                            |                          |                                      |                          |
|----------------------------|--------------------------|--------------------------------------|--------------------------|
| ICT vendor/industry        | <input type="checkbox"/> | certifying body                      | <input type="checkbox"/> |
| governmental/public bodies | <input type="checkbox"/> | ICT practitioner                     | <input type="checkbox"/> |
| educational bodies         | <input type="checkbox"/> | ICT end-user                         | <input type="checkbox"/> |
| training provider          | <input type="checkbox"/> | other(s):<br><i>[Please specify]</i> | <input type="checkbox"/> |

*[your comments]*

## 5.4 Feedback

**Please give if convenient feedback and your opinion concerning this questionnaire:**

*[your comments]*

If you are interested, we will send you (by request) the results of our survey via email. In this case please indicate your email-address in the corresponding field on page 4.

Thank you for your patience and for answering our questionnaire!

The CEPIS project team

**Please return the questionnaire  
by email to [weiss@aifb.uni-karlsruhe.de](mailto:weiss@aifb.uni-karlsruhe.de).**

**Deadline: 31 July 2004**



## **10. Appendix 2 – List of Vendor-Specific Certifications**

In this appendix a list of vendor-specific certifications is given. The list is the result of a performed desktop research of available vendor-specific certifications. The list does not claim to be comprehensive. There might be some vendor-specific certifications missing, however the list documents the existing diversity of certificates offered on the training and learning market.

|  |  |
|--|--|
| 3Com   | <a href="#">Master of Network Science(MNS)</a>   |
| Ascend   | <a href="#">Ascend Certified Technical Expert (ACTE)</a>   |
| Adobe  | <a href="#">Adobe Certified Expert (ACE)</a><br><a href="#">Adobe Certified Training Provider (ACTP)</a>   |
| Adaptec  | <a href="#">Adaptec Certified Engineer</a>   |
| American Society for Quality                       | <a href="#">Software Quality Engineer</a>  |
| Association For Project Management                 | <a href="#">Certificated Project Manager (CPM)</a>   |
| Association of Web Professionals (AWP)             | <a href="#">Certified Web Designer (CWD)</a><br><a href="#">Certified Web Manager (CWM)</a><br><a href="#">Certified Web Technician (CWT)</a>  |
| Baan Company                                       | <a href="#">Baan ERP Certification</a><br><a href="#">Baan IV Certification</a><br><a href="#">Baan Supply Chains Solutions (SCS) Certification</a>  |
| Banyan   | <a href="#">Certified Banyan Specialist (CBS)</a><br><a href="#">Certified Banyan Expert (CBE)</a><br><a href="#">Certified Banyan Instructor (CBI)</a>                                      |
| BIGHelpDesk.com                                    | <a href="#">BIGHelpDesk.com Certified Developer</a>  |
| BICSI  | <a href="#">Registered Communications Distribution Designer (RCDD)</a>   |
| Building Industry Consulting Service International | <a href="#">Registered Communications Distribution Designer (RCDD)</a>   |
| Cabletron Systems                                  | <a href="#">Cabletron Specialist (CS)</a><br><a href="#">Cabletron Systems Engineer (CSE)</a><br><a href="#">Spectrum Engineer (SE)</a><br><a href="#">Spectrum Solutions Engineer (SSE)</a> |
| Callware Technologies                              | <a href="#">Certified Network Telephony Engineer (CNTE))</a>   |
| Canadian Information Processing Society (CIPS)     | <a href="#">Information Systems Professional of Canada (ISP)</a>   |
| Centura Software/Gupta                             | <a href="#">Centura DBA Certification</a><br><a href="#">Centura Developer Certification</a>   |
| Chauncey Group                                     | <a href="#">Associate Technology Specialist</a><br><a href="#">Certified Technical Trainer (CTT)</a>   |
| Check Point Software                               | <a href="#">Check Point Certified Network Traffic Engineer</a>   |

|                |   |
|----------------|---|
|                | <a href="#"><u>(CCAE)</u></a><br><a href="#"><u>Check Point Certified Security Administrator (CCSA)</u></a><br><a href="#"><u>Check Point Certified Security Engineer (CCSE)</u></a><br><a href="#"><u>Check Point Certified Quality of Service Engineer (CCQE)</u></a>   |
| Cisco Systems  | <a href="#"><u>Cisco Certified Network Associate (CCNA)</u></a><br><a href="#"><u>Cisco Certified Network Professional (CCNP)</u></a><br><a href="#"><u>Cisco Certified Internetwork Expert (CCIE) - ISP Dial</u></a><br><a href="#"><u>Cisco Certified Internetwork Expert (CCIE) - Routing and Switching</u></a><br><a href="#"><u>Cisco Certified Design Associate (CCDA)</u></a><br><a href="#"><u>Cisco Certified Design Professional (CCDP)</u></a><br><a href="#"><u>Certified Cisco Systems Instructor (CCSI)</u></a><br><a href="#"><u>Cisco Learning Partner Connection</u></a> |
| Citrix         | <a href="#"><u>Citrix Certified Administrator (CCA)</u></a><br><a href="#"><u>Citrix Certified Enterprise Administrator (CCEA)</u></a><br><a href="#"><u>Citrix Certified Instructor (CCI)</u></a>  |
| CIW            | <a href="#"><u>Certified Internet Webmaster</u></a>   |
| CNX Consortium | <a href="#"><u>Certified Network Expert (CNX)</u></a>   |
| Cognos, Inc.   | <a href="#"><u>Cognos Certified Professional Program (CCPP)</u></a>   |
| Compaq         | <a href="#"><u>Compaq Associate Accredited Systems Engineer (Associate ASE)</u></a><br><a href="#"><u>Compaq Accredited Systems Engineer(ASE)</u></a><br><a href="#"><u>Compaq Master Accredited Systems Engineer (Master ASE)</u></a><br><a href="#"><u>Accredited Compaq Technician Program (ACT)</u></a>   |

|   |   |
|---|---|
| CompTIA -<br>Computing Technology Industry<br>Association | <a href="#">A+ Service Technician Certification</a><br><a href="#">Certified Document Imaging Architect (CDIA)</a><br><a href="#">Network+</a><br><a href="#">i-Net+</a><br><a href="#">Find Training Resources for CompTIA</a>   |
| Computer Associates International                         | <a href="#">Certified Unicenter Engineer (CUE)</a><br><a href="#">Certified Opal Developer (COD)</a><br><a href="#">Certified Unicenter Administrator (CUA)</a><br><a href="#">Certified Professional Desktop Specialist (CACP-<br/>Desktop Specialist)</a><br><a href="#">Certified Professional Help Desk Specialist (CACP-<br/>Help Desk Specialist)</a><br><a href="#">Certified Professional Network Specialist (CACP-<br/>Network Specialist)</a><br><a href="#">Certified Professional Security Specialist (CACP<br/>Security Specialist)</a><br><a href="#">Certified Professional Storage Specialist (CACP<br/>Storage Specialist)</a> |
| Computer Telephony Institute, Inc.                        | <a href="#">Computer Telephony Engineer (CTE)</a>   |
| Corel Corporation   | <a href="#">Corel Certified Proficient User</a><br><a href="#">Corel Certified Expert User</a><br><a href="#">Corel Certified Instructor (CCI)</a>  |
| CyberTech Institute, Inc.                                 | <a href="#">CyberTech Certified (various applications)</a><br><a href="#">CyberTech Linux Certification</a>   |
| Dialogic  | <a href="#">CT Professional/Solutions Developer</a>   |
| Digital Equipment Corporation (DEC)                       | <a href="#">DIGITAL-Certified</a>   |
| Digital Metrics   | <a href="#">Digital Metrics Certified Linux Administrator</a>   |
| Disaster Recovery Institute<br>International (DRI)        | <a href="#">Associate Business Continuity Planner (ABCP)</a><br><a href="#">Certified Business Continuity Planner (CBCP)</a><br><a href="#">Master Business Continuity Planner (MBCP)</a>   |
| DSDM Secretariat  | <a href="#">Dynamic Systems Development Method (DSDM)</a>   |
| Enterprise Certified Corp.                                | <a href="#">Enterprise Certified Administrator</a><br><a href="#">Enterprise Certified Architect</a>  |

|                   |   |
|-------------------|---|
|                   | <a href="#"><u>Enterprise Certified Professional</u></a>  |
| EXIN              | <a href="#"><u>Foundation Certificate in IT Service Management</u></a><br>(ITIL Foundation)<br><a href="#"><u>Practitioner's Certificate in IT Service Management</u></a><br>(ITIL Practitioner)<br><a href="#"><u>Manager's Certificate in IT Service Management</u></a><br>(ITIL Service Management)  |
| FileNET           | <a href="#"><u>FileNET Certified Professional (FCP)</u></a>   |
| FORE Systems      | <a href="#"><u>FORE Systems LAN Certified Engineer</u></a><br><a href="#"><u>FORE Systems WAN Certified Engineer</u></a>  |
| Gartner Institute | <a href="#"><u>Gartner Certified Associate in Project Management</u></a>  |
| Global Knowledge  | <a href="#"><u>TCP/IP Network Analyst Certification</u></a>   |
| HelpDesk 2000     | <a href="#"><u>Certified Field Support Technician (CFST)</u></a><br><a href="#"><u>Certified Help Desk Director (CHDD)</u></a><br><a href="#"><u>Certified Help Desk Manager (CHDM)</u></a><br><a href="#"><u>Certified Help Desk Professional (CHDP)</u></a><br><a href="#"><u>Help Desk 2000 Certified Instructor</u></a>   |
| Hewlett Packard   | <a href="#"><u>HP Certified IT Professional - HP-UX System Administration</u></a><br><a href="#"><u>HP Certified IT Professional - MPE/iX System Administration</u></a><br><a href="#"><u>HP Certified IT Professional - OpenView Network Management</u></a><br><a href="#"><u>HP Certified IT Professional - OpenView Unix Server &amp; Applications Management</u></a><br><a href="#"><u>HP Certified IT Professional - OpenView Unix/NT Integration</u></a><br><a href="#"><u>HP Certified IT Professional - OpenView Windows NT Server &amp; Applications Management</u></a><br><a href="#"><u>HP OpenView Certified Consultant</u></a><br><a href="#"><u>HP STAR - Certified Cluster Installer (CLU)</u></a><br><a href="#"><u>HP STAR - NetServer Technology Professional (NTP)</u></a><br><a href="#"><u>HP STAR - Digital Workplace Professional (DWP)</u></a><br><a href="#"><u>HP STAR - Information Storage Professional (ISP)</u></a> |

|   |  |
|---|--|
|   | <a href="#">HP STAR - Network Connectivity Professional (NCP)</a>  |
| HyCurve Inc.  | <a href="#">HyCurve Administration Specialist</a><br><a href="#">HyCurve Applications Specialist</a><br><a href="#">HyCurve Security Specialist</a><br><a href="#">HyCurve Web Design Specialist</a> |
| IBM Corporation   | <a href="#">AIX Professional Certification</a><br><a href="#">Object Technology Certifications</a><br><a href="#">Professional Certification Program</a>   |
| iGeneration Certified Professional Program                          | <a href="#">All Internet Certifications</a>  |
| Information Systems Audit and Control Association                   | <a href="#">Certified Information Systems Auditor (CISA)</a>   |
| Informix Software, Inc.   | <a href="#">Informix Certified Professional</a>  |
| Inprise Corporation   | <a href="#">Certified Inprise Consultant (CIC)</a><br><a href="#">Certified Inprise Instructor</a>   |
| Institute for Certification of Computing Professionals              | <a href="#">Associate Computing Professional (ACP)</a><br><a href="#">Certified Computing Professional (CCP)</a>   |
| Institute for Configuration Management(ICM)                         | <a href="#">Configuration Management II Certification (CMII)</a>   |
| Institute for Interconnecting & Packaging Electronic Circuits (IPC) | <a href="#">IPC PWB Designer</a>   |
| Intel Corporation   | <a href="#">Intel Certified Integration Specialist</a><br><a href="#">Intel Certified Solutions Consultant</a><br><a href="#">Intel Training Center Locator</a>                                      |
| International Function Point Users Group (IFPUG)                    | <a href="#">Certified Function Point Specialist (CFPS)</a>   |
| International Information Systems Security Certification Consortium | <a href="#">Certified Information Systems Security Professional (CISSP)</a>  |
| International Programmers Guild (IPG)                               | <a href="#">Certified Programmer</a>   |
| International Society of Certified Electronics Technicians (ISCET)  | <a href="#">Certified Electronics Technician (CET)</a>   |
| International Webmasters Association                                | <a href="#">IWA Certified Web (CWP)</a><br><a href="#">IWA Certified Corporate Webmaster (CCW)</a><br><a href="#">IWA Certified Web Developer (CWD)</a>  |

e-Skills Certification in Europe

|  |   |
|--|---|
| Learning Tree International                                    | <a href="#">Learning Tree Int. Certifications (various)</a>   |
| Legato Systems (acquired Vinca)                                | <a href="#">Legato Certified Administrator (LCA)</a><br><a href="#">Legato Certified Operator (LCO)</a><br><a href="#">Legato Certified Specialist (LCS)</a>  |
| Linux Professional Institute                                   | <a href="#">Linux Professional Institute Certified Level 1 (LPIC1)</a><br><a href="#">Linux Professional Institute Certified Level 2 (LPIC2)</a><br><a href="#">Linux Professional Institute Certified Level 3 (LPIC3)</a>  |
| Lotus  | <a href="#">Certified Lotus Professional (CLP)</a><br><a href="#">Certified Lotus Specialist (CLS)</a><br><a href="#">Certified Lotus End-User Instructor (CLEI)</a><br><a href="#">Certified Lotus Instructor (CLI)</a>  |
| Lucent InterNetworking Systems (was Ascend Communications Inc) | <a href="#">Lucent Certified Solutions Expert (LCSE)</a><br><a href="#">Lucent Certified Technical Expert (LCTE) - ATM</a><br><a href="#">Lucent Certified Technical Expert (LCTE) - Frame Relay</a><br><a href="#">Lucent Certified Technical Expert (LCTE) - Remote Access</a><br><a href="#">Lucent Certified Technical Expert (LCTE) - VPRN</a>   |
| Marimba  | <a href="#">Certified Castanet Developer</a>  |
| MERANT   | <a href="#">Merant Certified Professional in PVCS</a>   |
| Mercury Interactive  | <a href="#">Certified Product Specialist (CPS)</a><br><a href="#">Certified Product Instructor (CPI)</a>  |
| Microsoft  | <a href="#">Microsoft Training &amp; Services</a><br><a href="#">Microsoft Certified Professional (MCP)</a><br><a href="#">Microsoft Certified Professional + Internet (MCP+I)</a><br><a href="#">Microsoft Certified Professional + Site Builder (MCP+SB)</a><br><a href="#">Microsoft Certified Solutions Developer (MCSD)</a><br><a href="#">Microsoft Certified Systems Engineer (MCSE)</a><br><a href="#">Microsoft Certified Systems Engineer + Internet (MCSE+I)</a><br><a href="#">Microsoft Certified Database Administrator (MCDBA)</a><br><a href="#">Microsoft Certified Trainer (MCT)</a><br><a href="#">Microsoft Office User Specialist (MOUS)</a> |

|  |   |
|--|---|
|  | <a href="#">Certification</a><br><a href="#">Find Microsoft Training and Testing Centers</a>  |
| Motorola   | <a href="#">ISG Certifications</a>  |
| National Association of Communications Systems Engineers (NACSE) | <a href="#">Network Certifications</a>  |
| Network Associates, Inc.   | <a href="#">Certified Network Expert (CNX)</a>  |
| Newbridge Networks   | <a href="#">Newbridge Remote Access Specialist</a><br><a href="#">Newbridge Wise for Broadband Network Administrator</a><br><a href="#">Newbridge Wise for Broadband WAN</a><br><a href="#">Newbridge Wise for Narrowband Network Administrator</a><br><a href="#">Newbridge Wise for Narrowband WAN</a><br><a href="#">Newbridge Wise for Switched Routing</a>   |
| Nortel Networks  | <a href="#">Nortel Networks Certified Design Expert (NNCDE)</a><br><a href="#">Nortel Networks Certified Design Specialist (NNCDS)</a><br><a href="#">Nortel Networks Certified Network Architect (NNCNA)</a><br><a href="#">Nortel Networks Certified Support Expert (NNCSE)</a><br><a href="#">Nortel Networks Certified Support Specialist (NNCSS)</a>   |
| Novell   | <a href="#">Certified Internet Professional (CIP)</a><br><a href="#">Certified Novell Administrator (CNA)</a><br><a href="#">Certified Novell Engineer (CNE)</a><br><a href="#">Certified Novell Instructor (CNI)</a><br><a href="#">Certified Novell Salesperson (CNS)</a><br><a href="#">Master CNE (MCNE)</a><br><a href="#">Master CNI (MCNI)</a><br><a href="#">Novell Education Authorized Training Locator</a> |
| Oracle   | <a href="#">Oracle Certified Enterprise Developer - Oracle Internet Platform</a><br><a href="#">Oracle Certified Professional (OCP) - Application Developer</a>   |

|                                   |  |
|-----------------------------------|--|
|                                   | <a href="#">Oracle Certified Professional (OCP) - Database Operator (DBO)</a><br><a href="#">Oracle Certified Professional (OCP) - DBA (Oracle 8 or 7.3)</a><br><a href="#">Oracle Certified Professional (OCP) - Financial Apps Consultant</a><br><a href="#">Oracle Certified Solution Developer - Jdeveloper</a>  |
| Paradyne                          | <a href="#">WAN Applications Certified Expert (WAN A.C.E.)</a><br><a href="#">FrameSaver Certification</a><br><a href="#">Hotwire Certification</a>  |
| ParcPlace-Digitalk                | <a href="#">Certified Smalltalk Developer (CSD)</a><br><a href="#">Certified Senior Smalltalk Developer (CSSD)</a>   |
| PC DOCS, Inc.                     | <a href="#">Certified DOCS Professional</a>  |
| PeopleSoft                        | <a href="#">PeopleSoft Business Analyst Pro</a><br><a href="#">PeopleSoft Database Administrator Pro</a><br><a href="#">PeopleSoft Programmer/Analyst Pro</a><br><a href="#">PeopleSoft Project Lead Pro</a><br><a href="#">PeopleSoft Quality Assurance Pro</a><br><a href="#">PeopleSoft System Administrator Pro</a><br><a href="#">PeopleSoft System Architect Pro</a><br><a href="#">PeopleSoft Technical Pro</a> |
| Pine Mountain Group, Inc.         | <a href="#">Certified NetAnalyst - Architect</a><br><a href="#">Certified NetAnalyst - Cross Technology</a><br><a href="#">Certified NetAnalyst - Internet</a>   |
| Project Management Institute(PMI) | <a href="#">Project Management Professional</a>  |
| Quality Assurance Institute(QAI)  | <a href="#">Certified Quality Analyst (CQA)</a><br><a href="#">Certified SPICE Assessor</a><br><a href="#">Certified Software Test Engineer (CSTE)</a>   |
| Red Hat Software                  | <a href="#">Red Hat Certified Engineer (RHCE)</a><br><a href="#">Red Hat Certified Engineer II (RHCEII)</a><br><a href="#">Red Hat Certified Examiner (RHCEX)</a>  |
| Rockwell Software                 | <a href="#">Training Certification</a>   |
| SAIR                              | <a href="#">Linux Certified Professional (LCP)</a><br><a href="#">Linux/GNU Certified Administrator (LCA)</a>  |

|                                       |  |
|---------------------------------------|--|
|                                       | <a href="#">Linux/GNU Certified Engineer (LCE)</a><br><a href="#">Linux/GNU Certified Trainer</a><br><a href="#">Master Linux/GNU Certified Engineer (MLCE)</a>  |
| Santa Cruz Operation (SCO)            | <a href="#">SCO Advanced System Engineer (ACE)</a><br><a href="#">SCO Certified UNIX System Administrator (CUSA)</a>   |
| SAP Partner Academy                   | <a href="#">SAP Certified Application Consultant</a><br><a href="#">SAP Certified Technical Consultant</a>   |
| SAS Institute Inc.                    | <a href="#">SAS Certified Professional - Application Development</a><br><a href="#">SAS Certified Professional - Business Intelligence</a><br><a href="#">SAS Certified Professional - Data Management V6</a><br><a href="#">SAS Certified Professional V6</a>   |
| Shiva                                 | <a href="#">Shiva Certified Professional</a>   |
| Siebel Systems                        | <a href="#">Siebel Certified Consultant</a><br><a href="#">Siebel Certified Instructor</a>   |
| Silicon Graphics                      | <a href="#">Certified IRIX System Administrator</a>  |
| Software Publishers Association (SPA) | <a href="#">Certified Software Manager (CSM)</a>   |
| Solomon Software                      | <a href="#">Solomon Certified Trainer</a><br><a href="#">Solomon IV Certified Application Developer (SCAD)</a><br><a href="#">Solomon IV Certified Systems Engineer (SCSE)</a>   |
| Sun Microsystems, Inc.                | <a href="#">Sun Certified Programmer for the Java Platform</a><br><a href="#">Sun Certified Developer for the Java Platform</a><br><a href="#">Sun Certified Enterprise Architect for Java 2 Platform</a><br><a href="#">Sun Certified System Administrator for Solaris, Part 1</a><br><a href="#">&amp; 2</a><br><a href="#">Sun Certified Network Administrator for Solaris</a><br><a href="#">Sun Educational Services Training Centers</a>                 |
| Sybase                                | <a href="#">Sybase Certified Professional Program</a><br><a href="#">Sybase Certification Exams</a><br><a href="#">Sybase Certification Exam Information</a><br><a href="#">Sybase Certified Adaptive Server Administrator</a><br><a href="#">Sybase Certified SQL Anywhere</a><br><a href="#">Certified PowerBuilder Developer 7.0</a><br><a href="#">Certified PowerBuilder Developer 6.0</a><br><a href="#">Sybase Certified Professional Program Study</a> |

e-Skills Certification in Europe

|                      |   |
|----------------------|---|
|                      | <a href="#">Guidelines</a>  |
| Symantec Corp        | <a href="#">ACT! Certified Consultant(ACC)</a>  |
| Sysoft               | <a href="#">Sysoft Certified Advanced Webmaster &amp; EBusiness Architect</a><br><a href="#">Sysoft Certified Internet Developer</a><br><a href="#">Sysoft Certified Webmaster &amp; E-Commerce Architect</a> |
| Texas Instruments    | <a href="#">Certified Composer Professional (CCP)</a>   |
| Tivoli Systems, Inc. | <a href="#">Tivoli Certified Consultant</a><br><a href="#">Tivoli Certified Enterprise Consultant</a><br><a href="#">Tivoli Certified Instructor</a><br><a href="#">Tivoli Certified Solutions Expert</a>     |
| Vinca                | <a href="#">Vinca Certified Engineer (VCE)</a>  |
| Xplor                | <a href="#">Electronic Document &amp; Printing Professional (EDPP)</a>  |
| Xylan                | <a href="#">Alcatel Certified Switch Expert (ACSE)</a><br><a href="#">Alcatel Certified Switch Specialist (ACSS)</a>  |

## **11. Appendix 3 – Description of Survey Sample**

### ***11.1. Survey Methodology***

The survey assessed the data on basis of a standardised questionnaire which was sent to stakeholders. The survey addressed primarily high level experts in Europe and was therefore sent to the members of the European e-Skills Forum, CEN/ISSS ICT Skills, CEPIS member societies and other groupings and working groups in Europe working on the field of qualification and certification of ICT workers.

The questionnaire covered several important aspects of e-skills certification in Europe. The questionnaire is attached to this report in annex 1. Forty (40) questionnaires were returned. For this study a questionnaire was established and agreed with CEDEFOP which received a reasonable response from 21 countries. While showing a well balanced European coverage the total number of responses was with 40 not as high as expected. However, the origin and character of stakeholders and quality of experts has to be taken into account. The quality of these responses seems to be convincing despite the lack of a broader representativeness.

### ***11.2. Structure of the Sample***

In the following the structure of the survey sample is analysed. The respondents are categorised with regard to *place of residence, position in organisation, type of organisation, membership in working group(s)/ association(s)* and *status of organisation*.

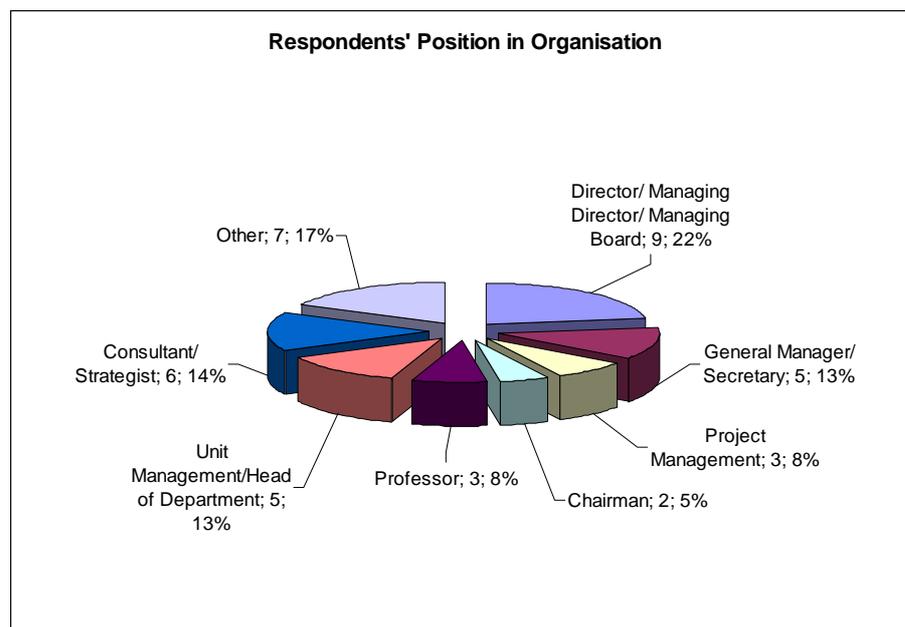
### 11.2.1. Position in Organisation

Table 7 shows the results of the analysis of respondents by position in organisation.

| Position in organisation                    |           |
|---|-----------|
| Director/ Managing Director/ Managing Board | 9         |
| General Manager/ Secretary                  | 5         |
| Project Management                          | 3         |
| Chairman                                    | 2         |
| Professor                                   | 3         |
| Unit Management/Head of Department          | 5         |
| Consultant/ Strategist                      | 6         |
| Other                                       | 7         |
| <b>Total</b>                                | <b>40</b> |

**Table 7 Position in organisation**

The frequencies are better illustrated in form of a pie chart as shown below in Figure 37. The analysis shows that primarily high level experts responded.

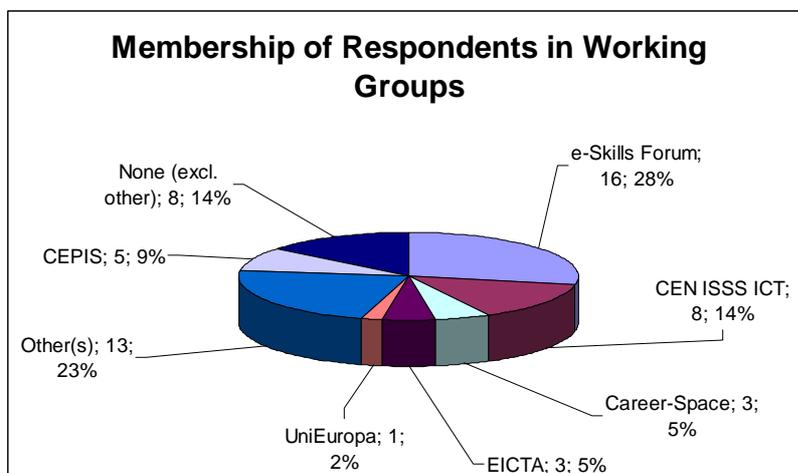


**Figure 37 Respondent by position in organisation**

### 11.2.2. Membership in Working Groups

Another important aspect to be looked into are the categorisation of respondents according to indicated membership in working groups. The questionnaire offered eight (8) identified working groups on a European level and gave the possibility

for respondents to indicate additional working groups using category 'other'. The chart below displays the result of this analysis:



**Figure 38 Membership in working group(s)/ association(s)**

The European eSkills Forum is well represented by 16 returned questionnaires, as well as the CEN/ISSS workshop ICT skills (8). Other groupings included in the survey sample are CEPIS (5), Career-Space (3), EICTA (3) and UniEuropa (1). Important to mention, that respondents may belong to two or more groupings at the same time.

Therefore the questionnaire allowed multiple answers. Eight (8) respondents indicated not being a member of a European working group or possibly did not indicate their membership. No contributions were received from CompTIA members. Table 8 below summarises the result of the analysis.

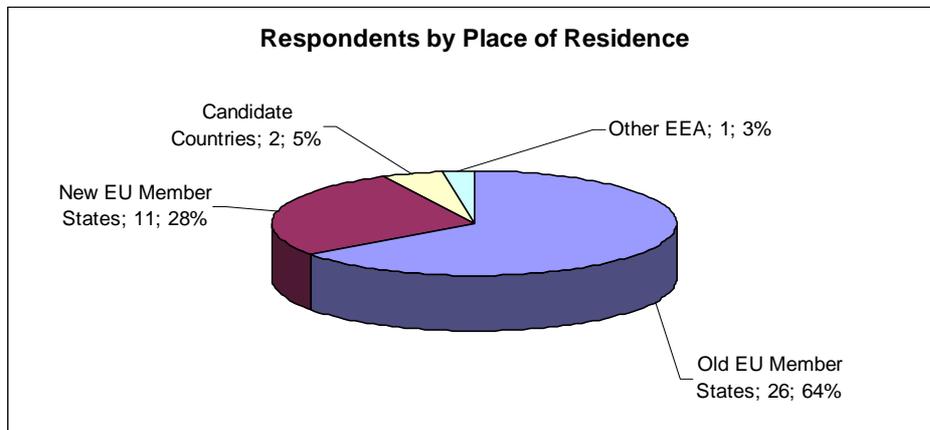
| <b>Membership</b><br>multiple answers possible |                    |           |               |
|--|--------------------|-----------|---------------|
| A  | e-Skills Forum     | 16        | 28,1%         |
| B  | CEN ISSS ICT       | 8         | 14,0%         |
| C  | CompTIA            | 0         | 0,0%          |
| D  | Career-Space       | 3         | 5,3%          |
| E  | EICTA              | 3         | 5,3%          |
| F  | UniEuropa          | 1         | 1,8%          |
| G  | Other(s)           | 13        | 22,8%         |
| I  | CEPIS              | 5         | 8,8%          |
| H  | None (excl. other) | 8         | 14,0%         |
|  | <b>total</b>       | <b>57</b> | <b>100,0%</b> |

**Table 8 Membership in working group(s)/ associations**

### 11.2.3. Place of Residence

Furthermore, the respondents were asked to indicate their place of residence by means of four categories: old EU member state, new EU member state, associated country, other. The responses given were analysed and sorted according to the country codes listed in the appendix<sup>69</sup>.

As shown in Figure 39, 64 per cent of the responses were received from old *EU member states* (26), 28 per cent from *new EU member states* (11), five (5) per cent from *candidate countries* (2). One (1) questionnaire was received from *Other EEA* (*European Economic Area*).



**Figure 39 Respondents by place of residence**

Table 9 displays in more detail the distribution of received questionnaires by country. In total responses were received from 21 European countries by the survey.

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<sup>69</sup> See page 158.

| Member States |           | New Member States |           | Candidate Countries |          | Other EEA countries |          |
|---------------|-----------|-------------------|-----------|---------------------|----------|---------------------|----------|
| BE            | 3         | CZ                | 4         | BG                  | 0        | IS                  | 0        |
| DK            | 1         | EE                | 1         | RO                  | 2        | LI                  | 0        |
| DE            | 4         | CY                | 1         | TR                  | 0        | NO                  | 1        |
| GR            | 1         | LV                | 0         | HR                  | 0        |                     |          |
| ES            | 2         | LT                | 1         |                     |          |                     |          |
| FR            | 0         | HU                | 2         |                     |          |                     |          |
| IE            | 1         | MT                | 0         |                     |          |                     |          |
| IT            | 3         | PL                | 0         |                     |          |                     |          |
| LU            | 1         | SI                | 2         |                     |          |                     |          |
| NL            | 2         | SK                | 0         |                     |          |                     |          |
| AT            | 1         |                   |           |                     |          |                     |          |
| PT            | 0         |                   |           |                     |          |                     |          |
| FI            | 3         |                   |           |                     |          | OT                  | 0        |
| SE            | 1         |                   |           |                     |          |                     |          |
| UK            | 3         |                   |           |                     |          |                     |          |
|               |           |                   |           |                     |          |                     |          |
|               |           |                   |           |                     |          |                     |          |
| <b>40</b>     | <b>26</b> |                   | <b>11</b> |                     | <b>2</b> |                     | <b>1</b> |

Table 9 Respondents sorted by country code

#### 11.2.4. Type of Organisation

The results of the analysis of the respondents by type of organisation are presented in this paragraph. The respondents were requested to indicate the type of organisation they represent. Again, for this question multiple answers were allowed. Table 10 below displays the frequencies for the following types of organisation:

| Type of Organisation      |                             |           |               |
|---------------------------|-----------------------------|-----------|---------------|
| multiple answers possible |                             |           |               |
| A                         | certifying body             | 9         | 18,8%         |
| B                         | test center                 | 1         | 2,1%          |
| C                         | training provider           | 3         | 6,3%          |
| D                         | ICT vendor                  | 0         | 0,0%          |
| E                         | education                   | 10        | 20,8%         |
| F                         | government                  | 8         | 16,7%         |
| G                         | ICT (supplier) company      | 1         | 2,1%          |
| H                         | ICT (end-)user organization | 2         | 4,2%          |
| I                         | other                       | 14        | 29,2%         |
|                           | <b>total</b>                | <b>48</b> | <b>100,0%</b> |

Table 10 Type of organisation

The analysis of respondents shows no direct involvement of ICT vendor industry. All other categories are reasonably represented. For the category 'other' primarily associations and bodies as e.g. Federation of European Professional Bodies were named. If necessary, this category might be further analysed in the case of shown added value. For the purpose of this study the analysis is adequate and no further

separation of cases appeared to be required. Figure 40 overviews the results of the analysis in form of a pie chart.

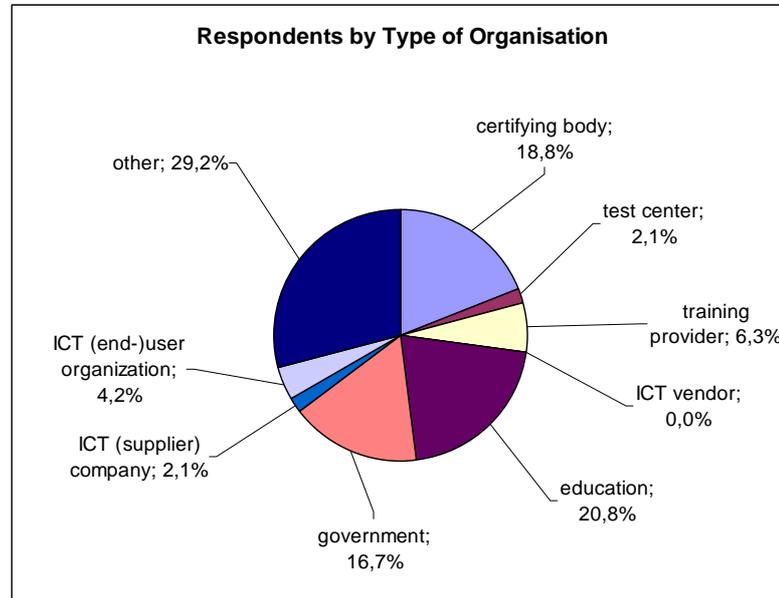
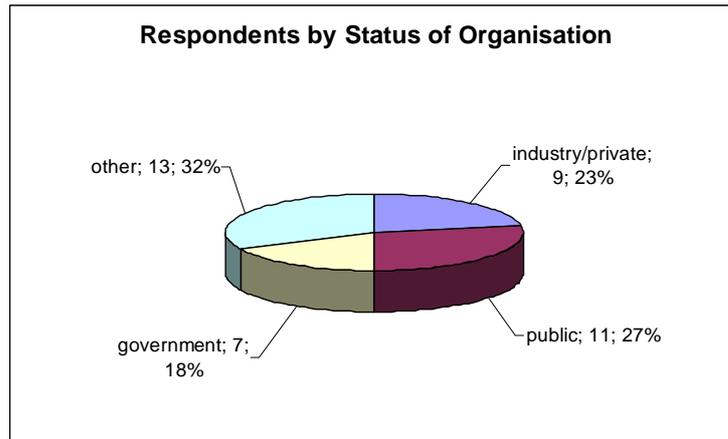


Figure 40 Type of organisation

#### 11.2.5. Status of Organisation

The pie chart in Figure 9 shows the respondents subdivided into four categories: *industry/private*, *public*, *government* and *others*. The analysis delivered useful results describing the sample to be composed of nine (9) organisations with status industry/private (23 per cent), ten (11) organisations with status public (27 per cent), seven (7 with status government (18 per cent) and thirteen (13) organisations with status other (32 per cent).



**Figure 41 Respondents by status of organisation**

Table 11 below shows again the status of organisation but in more detail displaying for each category frequency and percentage.

| Status of Organisation |                  |                  |
|------------------------|------------------|------------------|
| A                      | industry/private | 9 22,5%          |
| B                      | public           | 11 27,5%         |
| C                      | government       | 7 17,5%          |
| D                      | other            | 13 32,5%         |
|                        | <b>total</b>     | <b>40 100,0%</b> |

**Table 11 Respondents by status of organisation**

The preparatory analysis of the respondents by their status of organisation is an important factor with regard to the ensuing statistical main analysis (see chapter 3, page 67ff. and 4, page 85ff.). The applied categorisation allows to spot available tendencies and in the same way extract possible trends and supported opinions by the respondents. This is important for the envisaged development of recommendations based on the survey results and related more sophisticated investigations concerning attitudes and preferences of various groupings.



## 12. Appendix 4 – Country Codes

|   |    |                |                            |    |               |
|---|----|----------------|----------------------------|----|---------------|
| <b>European Union (Member States)</b>     |    |                | <b>Candidate Countries</b> |    |               |
| 1   | AT | AUSTRIA        | 1                          | BG | BULGARIA      |
| 2   | BE | BELGIUM        | 2                          | RO | ROMANIA       |
| 3   | DK | DENMARK        | 3                          | TR | TURKEY        |
| 4   | DE | GERMANY        | 4                          | HR | CROATIA       |
| 5   | ES | SPAIN          | <b>Other EEA countries</b> |    |               |
| 6   | FI | FINLAND        | 1                          | IS | ICELAND       |
| 7   | FR | FRANCE         | 2                          | LI | LIECHTENSTEIN |
| 8   | GR | GREECE         | 3                          | NO | NORWAY        |
| 9   | IE | IRELAND        | <b>Other</b>               |    |               |
| 10  | IT | ITALY          | 1                          | OT | OTHER         |
| 11  | LU | LUXEMBOURG     |                            |    |               |
| 12  | NL | NETHERLANDS    |                            |    |               |
| 13  | PT | PORTUGAL       |                            |    |               |
| 14  | SE | SWEDEN         |                            |    |               |
| 15  | UK | UNITED KINGDOM |                            |    |               |
| <b>European Union (New Member States)</b> |    |                |                            |    |               |
| 1   | CY | CYPRUS         |                            |    |               |
| 2   | CZ | CZECH REPUBLIC |                            |    |               |
| 3   | EE | ESTONIA        |                            |    |               |
| 4   | HU | HUNGARY        |                            |    |               |
| 5   | LV | LATVIA         |                            |    |               |
| 6   | LT | LITHUANIA      |                            |    |               |
| 7   | MT | MALTA          |                            |    |               |
| 8   | PL | POLAND         |                            |    |               |
| 9   | SK | SLOVAKIA       |                            |    |               |
| 10  | SI | SLOVENIA       |                            |    |               |

Table 12 Country Codes





