



CEPIS
Council of European Professional
Informatics Societies

CEPIS Position Paper on Universities

ICT Industry Relations – October 2008



University Education and the Information and Communications Technology Industry

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1 Why a Position Paper on Universities and the ICT Industry?

Information and Communications Technologies (ICT) have a distinct and unique role to play in the overall advancement of Europe, in its efforts to ensure economic and social success. Much of Europe's progress is based on the large-scale deployment of technologies, a highly sophisticated workforce and on providing computer training to enable all users to fully exploit what technologies offer. Entrepreneurship is fully embraced by enterprises in the ICT sector where the role of small and medium enterprises (SMEs) is remarkably important for its development, and where challenge and competition are its main engines of growth.

Europe is under pressure from both the American and Asian continents. Higher salaries in Europe depend on its capacity for innovation. Recent developments in Eastern Europe hardly compensate for the impact of new sources of ICT manpower in Asia and South America. Europe needs to invest in ICT and it is up to the European industry and universities to provide leadership. Industry produces technologies and applications, but the competencies to use these technologies and creating professionals that possess these competencies are key elements of future progress. No other industry has such a high rate of evolution, which is reflected in changes in the skills, and in the need for retraining, during the working life of a person.

European higher education institutions, generally called universities, play the primary role of producing the professionals with the knowledge, skills and competencies needed by the ICT industry. Their role in this respect is vital and should continually be strengthened. Yet despite a significant quantitative and qualitative offering by European universities, the demand for professionals increases constantly and exceeds their offerings. Estimating supply and demand levels in 2010 and 2015, CEPIS believes that Europe could face shortages of up to 70,000 ICT practitioners per year.¹

Cooperation between European universities and the ICT industry is very important and is of mutual interest to both parties as well as to public authorities, whose active engagement is essential.

CEPIS notes that in both industry and university communities, divergent opinions exist between the output of formal educational institutions and the needs industry for ICT professionals. This divorce is considered by some to be at the origin of the scarcity of ICT professionals in many ICT specialties. Other opinions take into account the fact that too few young people in developed countries want to study engineering subjects to supply the needs of the industry. On the other hand, the educational background of an ICT professional must be multidisciplinary - to address student needs, and highly specialised - to address industry needs - a disparity that is hard reconcile.

While the teaching of e-skills for basic ICT use is not the task of universities, but of high-schools, CEPIS notes that, in several European countries, there are still university

¹ 'E-Skills in Europe: Matching Supply to Demand'. CEPIS, 2007



graduates that do not have all the necessary basic skills to use ICT in their personal or professional lives.

An increase in investment is needed to enable universities to provide students with the appropriate ICT skills; such investment can be sourced with the support of public policies, universities and of industry. The fact that a large portion of ICT graduates now come from Asia has also a potentially deep impact on the future of the ICT industry.

Europe should continue to work towards ensuring that universities can contribute to the goals of the i2010 strategy².

1.1 University – ICT Industry Partnership

For decades, the best method of interaction between universities and the ICT industry has been a much-debated topic in Europe. In general, universities enjoy a good relationship with the ICT industry. This is reflected in the high level of training of ICT graduates and in the various forms of cooperation between university and industry.

Yet, there are still voices affirming that universities and industry do not cooperate at a sufficient level. Similar opinions exist in the USA, even if, for European observers US university-industry relations seem ideal. It is certain that universities and industry have different objectives and they may naturally be on different sides, but given that industry is an important stakeholder in the academic world it is worthwhile finding a compromise that can benefit both.

European universities must effectively compete with universities in the US and around the world. Europe can achieve a competitive advantage by increasing University-Industry cooperation and by working in partnership with the relevant authorities.

1.2 Universities in a Changing World

Universities were the birth place of the Digital Era, bringing worldwide access to information and limiting the ex-cathedra approach to learning. However, Universities operate in a changing world. Students nowadays are less ready to accept what universities offer, if it does not fit in with their set of values. There is a growing trend towards part-time studies, in particular for computer-related studies.

ICT is a vital element of universities' infrastructure and courses tend to become world assets through Internet postings. In this way, and in many other ways, ICT has increased competition among universities. However, Europe has much progress yet to make on this front as US and Asian universities take significant steps to update their courses and infrastructures.

² COM/2005/0229 final. Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - [‘i2010 – A European Information Society for growth and employment](#).



Students now have unparalleled access to information and services and their expectations are harder to fulfil than ever before. Rapid transformations brought about by the availability of online learning have led to changes in student demographics. People may become students at any age and universities have to be prepared to offer them what they need.

The demands of students are influenced by industry job offers. Updating Skills is a continuous process, even in the same decade. ICT students graduating before 1995 were not exposed to some of today's concepts and technologies during their studies. Interestingly, currently very few universities in the world still teach several old technologies, even though they are still in use.

Universities are facing their most dramatic challenge yet: a highly-connected, 24/7 digital world. Industry creates competitors to universities through the so-called 'infomediaries',³ operating online 24 hours a day with very user-friendly interfaces. These are financially attractive for students who need more skills and less formal diplomas. As a result, online course use is growing by a double digit figure.

Universities preparing students for the ICT industry are confronted with ever-increasing reliance on technology. Discrepancies arise between those universities that can afford the necessary technological updates without industry support and those that can't. One of the barriers to updating technological equipment in universities is cost. Most European universities cannot afford to update their hardware, software and telecom infrastructure on an annual basis.

There is a view that Industry support, through for example the provision of technology and equipment to universities via sponsorship and donations, is in some respects, handicapped by EU procurement legislation, albeit it does ensure value for money, transparency and fairness.

2 Universities and the ICT Industry

2.1 Universities and ICT High Innovation Rate

Universities keep up with new technological waves and applications. Any lack of adaptation creates or widens the gap between the level of skills industry expects from new graduates and the actual skills provided by universities. The ICT industry innovates rapidly and the extent to which institutions of higher education should adapt to new trends and technologies is debatable. This does not mean that universities should blindly follow every new industry trend; instead they should look "beyond the hype".

Many universities rely on research as a primary focus. From a simplified perspective universities could focus on science and reflective research, while leaving the ICT industry to handle the more practical subjects. Nevertheless, one might question whether professors and instructors should remain focused on highly specialised PhD subjects for

³ Infomediary: a combination of 'information' and 'intermediary'



decades, while possibly excluding new market-relevant features from their research and their lectures. This seems to be the present state of the differences between what European universities offer and what the ICT industry needs in the work force. There is a trend for universities to favour basic research while leaving applied research to industry. In some cases, European universities have researchers able to perform any kind of project and seek industry contracts as an additional source of funding.

One solution could be for universities to grant easier access to more practical expert personnel. This would require universities to set up expert panels to evaluate the way in which new technological waves could add to the knowledge of existing research fields or even constitute the basis for entirely new research areas. These panels could be affiliated with ICT industry personnel who could support the integration of academic studies with practical up-to-date exercises. Models similar models to this have been initiated, with quite some success, in the past.

CEPIS is in the position to act as catalyst of such panels.

2.2 Universities and Entrepreneurship (SMEs)

ICT industry growth is fed by innovation carried out in SMEs. Most large ICT companies around the world, including those in Europe, started out as SMEs. SMEs act as innovation poles; they gather the skills and entrepreneurial spirit that make ICT grow.

Universities are one of the main source of entrepreneurs in ICT. Most entrepreneurs start their ventures even before they graduate. European universities can increase their contribution to the development of the SME sector in ICT, firstly by giving their students a solid scientific and technical background to allow them to innovate, and secondly by preparing them with the managerial skills needed to run small enterprise.

Universities are also the catalysts of entrepreneurship through technology parks that are frequently established in cooperation with universities. These parks allow entrepreneurs to keep in contact with professors and benefit from their research output.

CEPIS believes that governments and the European Union should foster, in various forms, the development of such entrepreneurial centres around universities as they become incubators for many ICT companies in the industry.

2.3 Research in Universities

Universities are actively engaged in research. The research activity, both theoretical and applied, is the most important pillar sustaining teaching and bringing educators close to current industrial practice. The European R&D framework programmes have helped bringing universities and industry together in funding research that is mutual useful. Speeding up the application of the research, characteristic to ICT high innovation rates, is seemingly benefiting the industry and forcing the universities to industry-like time frames.



Bringing the Industry closer to Universities, stimulates innovation in learning and research as Universities understand better the marketplace and develop new types of learning systems. However, this paper focuses on the educational role of the universities therefore the research aspects will not be further developed.

2.4 Universities and ICT skills

Universities are an important supplier of the ICT skills demanded in the marketplace. The European Commission divides ICT skills into 3 categories⁴:

- **ICT practitioner skills:** these are the capabilities required for researching, developing, designing, strategic planning, managing, producing, consulting, marketing, selling, integrating, installing, administering, maintaining, supporting and servicing ICT systems;
- **ICT user skills:** these are the capabilities required for the effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work. User skills cover the use of common software tools and of specialised tools supporting business functions within industry. At the general level, they cover “digital literacy”;
- **E-business skills:** these are the capabilities needed to exploit opportunities provided by ICT, notably the Internet; to ensure more efficient and effective performance of different types of organisations; to explore possibilities for new ways of conducting business/administrative and organisational processes; and/or to establish new businesses.

The ICT industry counts on universities to produce professionals with ICT practitioner skills, but also equip them with entrepreneurial and managerial skills

It is not the task of universities to prepare their students to use basic ICT applications, i.e. to have user or e-business user skills. However, European countries have no uniform level of digital literacy. There are significant differences in levels of digital literacy between the EU27 and differences also exist compared with non-EU countries.

Due to the high levels of student mobility all universities should assess the level of ICT skills of their new students on admission and bring all students to the necessary levels of basic user and e-business ICT skills. CEPIS considers appropriate selections of ECDL modules to be a good tool for assessing digital literacy levels.

This implication of universities in assessing or teaching basic skills is important in line with the European Commission’s i2010 initiative that states the “Information Society is for all”.

⁴ COM(2007) 496 final. Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions – e-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs.



2.5 Universities and the increasing scarcity of ICT professionals

CEPIS has repeatedly mentioned the strategic importance of contemporary e-skills for Europe. Estimating supply and demand levels in 2010 and 2015, CEPIS believes that Europe could face shortages of up to 70,000 ICT practitioners, because of inadequate qualification and certification infrastructures⁵. Various reports confirm the gap in ICT skills preparation in Europe and underline that there is another gap in the so-called e-business skills.

Although universities are prudent about the qualitative aspects of ICT skills needed, they are also pressured by the market to adapt and provide solutions for the increasing scarcity of ICT professionals within the market. The foreseeable lack of ICT skills in years to come shows that universities and policy makers are far from agreeing on what actions are urgent, both in terms of the diversification of ICT profiles and annual output. In some countries, the supply/demand disequilibrium of ICT students is expected to deepen even more dramatically as the number of accepted ICT students continues to increase only marginally, or in some cases even drop.

The different approaches of universities and industry to the skills required in graduates only increases the gap between what universities offer and what industry needs. Industry has pragmatic goals and expectations. In several countries, industry looks for young employees that are immediately employable and functional without much additional investments into their professional training. As a result they would like to influence curricula to make them more practical and relevant. Industry would also like to identify the most promising students and potential employees in advance of graduation. An appropriate preliminary selection of graduates would significantly lower industry's risk in investing in new employees. For many companies this is the main objective in their relationship with universities.

Within the university environment, especially in the new European Union states, there are still calls for a high level of student training for everybody. This is why some professors criticise the fact that very good students are hired by companies during their second or third years, therefore neglecting theoretical education and moving away from a potential scientific career.

Reconciling these divergent tendencies for reducing the gap between the demands of industry and the skills that universities offer in ICT graduates is difficult or impossible to achieve. One way dealing with this would be that universities offer a wide, market-driven variety of types of graduates and that industry takes these graduates and adds appropriate training and development to suit their needs. Industry has short term goals, whereas universities educate for life.

⁵ E-Skills in Europe: Matching Supply to Demand'. CEPIS, 2007



2.6 Profile of ICT graduates

The universities aim to produce well-qualified scientists and engineers with a strong background in the basic sciences, thorough knowledge of current and emerging technology. Recently, there is a trend to develop communication skills, the ability to effectively interact and interoperate with scientists of other disciplines, and with management and leadership skills.

Normally this is what industry would need. However, this is not always the case and we see a gap between what industry wants as a profile of graduates and what universities deliver. In fact, industry has no homogenous requests. A number of large ICT companies ask for a solid scientific background as they have resources to further train their staff to undertake a broad range of tasks and projects. Then again, several smaller ICT companies prefer specialised ready-to-work ICT graduates who provide return without incurring additional training expenses.

It is impossible to reconcile opposing requirements to produce ICT graduates that are both flexible and immediately usable.

European universities train their ICT students in a variety of ways and a continuous process of interaction between universities, industry and society is paramount. Every university has to decide what kind of professional they want to offer to industry and adapt their curricula to best fit to the requirements within the type of profession chosen. Internships or industrial placements are considered essential, and can either be integrated into degree courses or completed in addition to the course.

As regards non-ICT graduates, industry (both large and small companies) demands graduates with basic ICT skills, i.e. graduates that need no further training to use ICT tools for simple tasks and as an educational tool. The same is required in society at large – in public administration, in educational systems, the media, etc.

2.7 Graduate level vs. certifications

Industry needs highly skilled people ready to perform specific tasks and projects. One possible way to meet this demand is through the process of certification. The ICT industry has developed a full series of vendor certifications; most of which are related to a particular company or product and are not suited for new graduates who will specialise later after some activity in the industry.

Yet European ICT graduates are characterised by a variety of specialisations and certification is the only way of skilling them for specific tasks. Ideally, a graduate would already have gained certification during university, but this would mean a fundamental change in the roles and duties of universities towards students, making them simply an industry service provider. However, students are not precluded from taking vendor certification while working in the industry or as an extra optional subject during their studies.



The main advantage of certification can become the main disadvantage. On the one hand, a certification validates that the defined competences are actually possessed by the individual certified (credibility is ensured by the certifying body). This increases the mobility of the person who is certified, as competences can be recognised even abroad. On the other hand, certification hides any difference between those who are certified: it simply tells the potential employers that all those certified possess at least the competences defined by the syllabus, but tells nothing about possible deeper levels of knowledge by one person with respect to another. Universities have a natural tendency, to keep away from vendor-oriented industry certifications.

Industry vendor-oriented certifications that relate to specific proprietary technologies in the ICT field are likely to continue, while those not related to proprietary technologies may not be successful in industry. Even in the USA, many feel that industry certifications are useless from an employment point of view.

However, a more general certification based less on company-specific competences and more on general professional competence could build a university-industry bridge.

E-business skills are not enough covered by universities because they require a deep context knowledge that comes from on-the-job experience and is frequently offered by IT vendors as a consultancy service. This is a category of professionals most appreciated by the market and it is also the most inclined to the certification approach.

Such a certification is proposed by CEPIS through EUCIP⁶ and trying to bring closer graduate skills to EUCIP-like skills seems one obvious step to harmonise university-industry needs.

2.8 Curricula - is the Bologna process moving in the right direction?

Curricula differentiate universities and raise the level of professionalism of the future graduate.

The rapid advance of ICT and the high rate of innovation induce industry almost unanimously to ask universities to frequently update their ICT curricula. Today's curricula are seen by many in industry as not being adaptive enough to the new trends in ICT industry.

A major consideration is that university curricula pay too much attention to the theoretical training and not enough to industry internships and thus tend to produce super-skilled graduates. The industry needs such people, but only in small numbers, as graduates that are too highly skilled become unsatisfied with the routine work that is predominant in many companies.

The Bologna process, currently being implemented across Europe, may help to solve this problem. The Bologna process is expected to be fully implemented

⁶ European Certification of Informatics Professionals. See <http://www.eucip.org/>



by 2010 and aims to eliminate obstacles to the free movement of people and to help them to find jobs consistent with their education, regardless of their country of origin.

In general, many universities claim to have adapted their curricula to the requirements of the Bologna recommendations. Some plan to carry out the revisions at the end of the cycles (3+2+3), others plan a curricula revision every year.

In some EU countries it is true that the new Bologna scheme (3+2+3) does not yet produce the best results for ICT specialisations. The first 3 years are filled with courses repeating secondary school topics and students do not get the specialisation skills required by industry. This results in dissatisfaction for both the student and industry.

Many members of the academic community view that the tendency towards three-year bachelor degree programmes is appropriate for the humanities, but not acceptable for other areas of study, such as medicine, engineering and computing that cannot be imagined without serious internships. Several universities in various countries have declared that for computer science or engineering they will continue with 4 or 5 year bachelor programmes.

The Bologna process could incorporate curricula for ICT graduates that take into account the best interests of both European universities and industry. Curricula can then be systematically revisited to ensure harmonisation of graduate skills with market demands in Europe. This brings the discussion to continuing education and mobility.

2.9 The role of continuing education and mobility

As an industry with short technological cycles, the ICT industry has a stake in lifelong learning. Lifelong e-skills, competence-building and certification become essential as businesses face the need to respond to the shortening of technology life-cycles and the accompanying obsolescence of related knowledge, skills and competences of their employees. This creates new opportunities for work-based and non-formal learning.

The option of updating professional training through a continuous educational process is not available in many European universities, with some noted exceptions. Master and doctoral studies are mostly aimed at students with a high potential for research and universities rarely engage in adult ICT education through university courses. One exception is Executive MBA courses with ICT specialisations.

However, continuous education with short cycles is a necessity in ICT. On one hand, people who graduated 10-15 years ago received an education based on technologies that are now obsolete. Training in the new technologies, frequently requiring revising basic concepts, is left to industry training schools. Universities should be encouraged to offer master courses to students or graduates of other disciplines as a conversion course. Many of these could be offered through e-learning.

On the other hand, the lack of skills brings an important number of non-ICT university graduates into the ICT field, mostly in emerging countries. They enter the field mostly



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retrained through industry certifications that are lacking basic training in computing concepts. Universities could play a major role in the ICT education of people who have already worked in the industry for years or are undergoing professional re-conversion. Indeed, universities could play a significant role by opening their doors to all groups in need of ICT education.

New advances in e-learning technologies allow and favour distance learning, and such transformations are generating serious competition for universities in adult and continuous education. Proper financing can lead universities to offer free high-level courses on new technologies, an approach currently reserved for companies and professional associations.

CEPIS believes that universities can play a more important role in the post-graduate training of ICT professionals.

Mobility, in the sense of movement of people between universities and industry, is to be encouraged. Universities enjoy a large degree of autonomy, and this should encourage people from industry to bring their fresh innovative ideas and experience to students and to universities to apply their ideas in industry. It is difficult for university staff to get a good grasp of the priorities of industrial ICT if they are not well-embedded in industrial work; this applies in particular to the more “heavy engineering” aspects, which require methods and tools for team collaboration.

This could change the perception in many European universities of educators as civil servants with good and bad characteristics, among which immovability, even when they are incompetent or lacking a business approach, and the perception of universities as essentially only as a scientific and research environment isolated from the market. This has a negative impact on the human resource needs of the ICT industry in particular, and even on the needs of industry and services in general.

CEPIS believes that mobility of people between universities and ICT industry is beneficial, will promote innovation, and should be encouraged through a supporting framework.



3 Universities and ICT basic skills

An inclusive information society cannot be achieved without overall dissemination of basic ICT skills. These skills are essential for all citizens and the lack of these skills has a profound negative economic impact especially for SMEs. Due to their limited resources, SMEs cannot afford to invest in basic ICT education for their personnel and require help to get the necessary education. e-Inclusion policies have been successful to varying degrees within the European Union, yet there are still cases where secondary school graduates and even non-ICT university graduates lack fundamental skills.

Providing training in basic skills for ICT and e-business is not the task of universities, but that of primary and secondary education. The majority people lacking digital literacy skills are at an age where going back to secondary school is not an option. One could argue that universities cannot be asked to participate in the effort to disseminate basic ICT skills after student graduation because this does not conform to their main research and education priorities.

Universities will bring a notable contribution to the dissemination of basic ICT skills, when all non-ICT graduates in Europe will have these basic skills. ICT has to be considered as important enabler for all professions and in all industrial and social activities. Secondary schools should refocus their education programmes around these enabling technologies and be open to partnerships with industry and public services for the dynamic development of skills in a continuously changing environment. Universities can do much to assist in curricular design, pedagogy and also defining and explaining the core body of knowledge for other branches of education.

CEPIS has developed a programme called ECDL, which has been developed and continues to be developed from the national computer associations of Europe; we strongly believe that all secondary school and university graduates have to be digitally literate, at least to the level of several appropriate ECDL modules or equivalent.

The role of universities in this area will end when all secondary school graduates reach the required level of basic ICT skills; this is currently a distant objective as latest reports show that even in the USA, high schools graduates lack the required ICT skills.



4 Role of the EU and Governments in university-industry relationships

Governments can profoundly influence the university-ICT industry relationship. In Europe, where a high number of universities are public, the role of the EU and governments goes far beyond facilitating the relation. Particularly as in addition to national governments, the European Union plays an important role in providing financial incentives, and different R&D and regional programmes. Their regulatory role has an important function to maintain and support an educational infrastructure that can supply sufficient numbers of highly qualified people for all social and economic needs. Governments and the European Union can dramatically change university-industry relations by providing focused incentives, mainly derived from their funding schemes.

ICT skills now have a well defined impact on the economy and society. The lack of e-business and ICT skills at country levels could lead to a potential loss of at least 1% of the GDP and the delay of major national or European e-projects. A focus on ICT skills is therefore a high-priority action for national governments and the European Union.

5 Summary and CEPIS position

ICT has a distinct and unique role to play in the overall advancement of Europe, in its efforts to ensure economic and social success. Much of Europe's progress is based on the large-scale deployment of technologies, a highly sophisticated workforce and on providing general ICT training to enable all users to fully exploit the benefits of technology. Entrepreneurship is fully embraced by enterprises in the ICT sector. There is no other industry with such a high rate of evolution, which is reflected in changes in the skills, and in the need for retraining, during the working life of a person.

Despite a significant quantitative and qualitative offering by European universities, the demand for professionals increases constantly and exceeds their offerings. Estimating supply and demand levels in 2010 and 2015, CEPIS believes that Europe could face shortages of up to 70,000 ICT practitioners.⁷

Cooperation between European universities and the ICT industry is very important and is of mutual interest to both parties as well as to public authorities, whose active engagement is essential.

5.1 Main findings

University-industry cooperation: Universities and industry do not cooperate at a sufficient level.

⁷ E-Skills in Europe: Matching Supply to Demand'. CEPIS, 2007



European universities must effectively complete with universities in the US and around the world. This effectiveness can be achieved through increased cooperation with the ICT industry and through working in partnership with the relevant authorities.

Changing world Universities operate in a changing world. There is a growing trend towards part-time studies, in particular for computer-related studies.

Basic and applied research: Several universities have the tendency to favour theoretical research and leave applied research to industry. This seems to be the current state of the differences between what European universities offer and the ICT industry needs in the work force. One solution could be for the universities to grant easier access to more practical expert personnel. The research activity in universities, both theoretical and applied, is the most important pillar sustaining teaching and bringing educators close to current industrial practice. The European R&D framework programmes have largely succeeded in bringing universities and industry together in funding research that is useful to both. Speeding up the application of the research, characteristic to ICT high innovation rate, is seemingly benefiting the industry and forcing the universities to industry-like timeframes.

Mobility: Mobility, in the sense of movement of people between universities and industry, is worth encouraging. Mobility of people between universities and ICT industry is beneficial and could promote greater innovation if encouraged by a supporting framework.

Entrepreneurship in ICT: Universities are one of the the main source of entrepreneurs. European universities could better contribute to the increase of the SME sector in ICT, firstly by giving their students a scientific and technical background to allow them to innovate, and secondly by preparing them with the managerial skills they need to run a small enterprise. Universities are also the catalysts of entrepreneurship through technology parks established in universities. The development of such entrepreneurial centres around universities merits encouragement from governments and the EU, as they frequently become incubators for many new ICT companies.

Scarcity of ICT Skills: Universities are prudent about the qualitative aspects of ICT skills needed, but they are also pushed by the market to adapt and provide solutions for the increasing scarcity of ICT professionals within the market. The different approaches of universities and industry to the skills required in graduates only increases the gap between what universities offer and what industry needs. Reconciling these divergent tendencies for reducing the gap between the demands of industry and the ICT graduate skills that universities offer is difficult or impossible to achieve. It is probably better that universities offer a market-driven wide variety of types of graduates and that industry takes these graduates and adds appropriate training and development to suit their needs. Universities aim to produce well-qualified scientists and engineers with a strong scientific background. Normally this is what industry would need. However, large ICT companies ask for a solid scientific background as they have resources to further train their staff. Smaller ICT companies prefer specialised 'ready-to-work' ICT graduates who provide return without further incurring additional training expenses.



It is impossible to reconcile these two opposing requirements to provide ICT graduates who are both flexible and immediately usable. Every university has to decide what kind of professional they want to offer to industry and adapt their curricula to best fit to that requirement within the type of profession chosen. Internships or industrial placements are considered essential, as they can either be integrated into degree courses or completed in addition to the course.

Certifications: The ICT industry has developed a full series of vendor certifications. Universities have a natural tendency, for a variety of reasons, to keep away from vendor oriented industry certifications. A more general certification based less on company-specific competences and more on general professional competence could build a university-industry bridge.

Curricula: Curricula are what differentiate universities and define the level of professionalism of the future graduate. Today's curricula are seen by many in industry as not being adaptive enough to the new trends in ICT industry. The Bologna process, currently being implemented across Europe may solve this problem. In general, universities claim to have adapted their curricula to the requirements of the Bologna recommendations. In some EU countries, the new Bologna type scheme (3+2+3) does not yet produce the best results in ICT specialisations. The European tendency to move toward three-year bachelor degree programmes, may be appropriate for the humanities, but is problematic for engineering, including computing. The Bologna process could incorporate updated curricula for ICT graduates that take into account the best interests of both European universities and industry. Curricula can then be systematically revisited to ensure the best harmonisation of graduate skills with market demands in Europe.

Continuous education: The ICT industry is particularly appropriate for lifelong learning. Continuous education with short cycles is a necessity in ICT. On the one hand, people who graduated 10-15 years ago received an education based on technologies that are now obsolete. Universities should be encouraged to offer master courses to students or graduates of other disciplines as a conversion course. On the other hand, the lack of skills brings an important number of non-ICT university graduates into the ICT field, mostly in emerging countries. Universities could play a major role in the ICT education of people who have already worked in the industry for years or are undergoing professional re-conversion.

In addition, new advances in e-learning technologies allow and favour distance learning, enabling universities to play a more important role in the post-graduate training of ICT professionals.

Basic ICT Skills: Providing training in basic skills for ICT and e-business is not the task of universities, but that of secondary education. The majority of people lacking in digital literacy skills are at an age where going back to secondary school is impossible. Universities can bring a notable contribution to the dissemination of basic ICT skills, if all non-ICT graduates in Europe could gain these basic skills. Secondary schools should refocus their education programmes around these enabling technologies and redesign new partnerships with industry and public services for the dynamic preparation of the



right skills in a permanently changing environment. Universities can do much to assist in curricular design, pedagogy and also defining and explaining the core body of knowledge for other branches of education.

e-Business Skills: E-business skills are not generally covered by university curricula because they require a deep context knowledge comes from on-the-job experience and is frequently offered by IT vendors as a consultancy service. This is a category of professionals most appreciated by the market and it is also the most inclined to the certification approach.

Role of Governments: Governments and the European Union can dramatically change university-industry relations by providing focused incentives, mainly derived from their funding schemes. A focus on ICT skills is a high-priority action for national governments and the European Union. New European Member States represent an important reservoir of ICT skills with proven competences and competitiveness. European Union could pay special attention to the ICT development needs of these countries, by implementing special programmes for ICT infrastructural development and ICT basic skills dissemination.

5.2 CEPIS Role

CEPIS is the most representative non-governmental body of ICT professionals in Europe with 37 member associations from 33 European countries representing more than 300,000 professionals.

CEPIS recognises the main role of universities in ICT education. Universities and the ICT industry are partners and the success of this partnership is sought by all. CEPIS believes that some actions can help align the university and industry expectations.

- CEPIS offers its services with the participation of the European Commission in a multi-stakeholder partnership as a pan-European mediator between universities and industry to define requirements for ICT skills at graduate and post-graduate levels. CEPIS can bring together academia and industry in order to ensure that the output from educational institutions satisfies the needs of the industry.
- CEPIS offers its assistance in standardising and homogenising European recognition of professionalism in the ICT sector.
- ICT curricula can be adapted to reflect the actual needs of future graduates as industry employees. CEPIS offers mediation through its EUCIP certification model that can be used as a tool for levelling up the curricula of ICT studies in European universities.
- CEPIS believes that governments and the EU should encourage, in any form, in the development of entrepreneurial centres around universities business incubators for many ICT companies.



- CEPIS supports e-learning as a continuing professional development methodology.
- CEPIS considers that universities can be encouraged to offer master or other post-graduate conversion courses to non-ICT graduates.
- Non-ICT students in universities should be assessed to determine if they have an adequate level of with ICT skills needed for the Information Society. CEPIS considers that its ECDL certification tool is very appropriate for checking the level of skills attained by non-ICT students.
- While recognising the positive role of the Bologna process, CEPIS asks for a review of the present content of curricula for ICT studies to ensure that the future of the ICT industry is positively impacted with graduates that have the proper theoretical background and practical training.
- CEPIS considers that the ICT vendor-oriented professional certifications should be organised outside universities, offering graduates, after having gained experience in the field, a professional status. CEPIS offers its vendor neutral EUCIP certification programme to enable a unified assessment, across Europe of professional level ICT skills. Such vendor-neutral certifications could be undertaken by universities during their evaluation of new students.
- CEPIS believes that mobility of people between universities and the ICT industry is beneficial and will promote greater innovation, if encouraged through a supporting framework.
- CEPIS highly appreciates the e-Inclusion initiative of the European Commission. CEPIS considers that all non-ICT students should be tested for their basic abilities to use ICT in their workplaces and at home. CEPIS considers its ECDL tool as an excellent solution for this assessment in universities.
- CEPIS recognises the role of new European Member States. They can represent an important supply of ICT skills with proven competences and competitiveness. However, their levels of digital literacy are not on a par with the older members of the EU and ICT skills emigration affect these countries. CEPIS asks the European Union to pay special attention to the ICT development needs of these countries, by implementing programmes for ICT infrastructural development and ICT basic skills dissemination. CEPIS has Member Associations in all of these countries and can define actions and assist with their implementation.

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The opinions were not always convergent; universities and the ICT industry are not necessarily on the same wavelengths. The paper tried to conciliate them in the interest of ICT as a whole and express the opinions of the majority.

Dr. Vasile Baltac
Vice-President for Education and Research

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