ICT/SKILLS Workshop (IT profiles and curricula)

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Assistant:
Amelle MOURADI
Direct line : 01 41 62 84 28
amelle.mouradi@afnor.org

Your contact:
Philippe MAGNABOSCO
Direct line : +33 1 41 62 85 02
philippe.magnabosco@afnor.org

Fostering the ICT Profession in Europe

COMMENTARIES /

DECISIONS

Brochure edited by CEPIS and IVI on behalf of the European Commission, presented during the 2012-06-06 CEN Workshop Plenary meeting.

During the meeting, it was reported that thorough consultation of the documentation available on http://cepis.org/professionalism was recommended by EC/DG Enterprise.

FOLLOW UP   2012-06-06

e-Skills & ICT Professionalism

Fostering the ICT Profession in Europe

INNOVATION VALUE INSTITUTE

CEPIS

European Commission

Foreword

The European Union needs to ensure that the knowledge, skills, competence and creativity of the European workforce – especially its ICT practitioners – meet the highest global professional standard and are constantly updated in a process of effective lifelong learning.

The European Commission adopted in September 2007 a Communication on "e-Skills for the 21st Century" presenting a long term e-skills agenda for Europe and including key action lines at EU level. The Competitiveness Council of Ministers welcomed this Communication and adopted Conclusions on a long term e-skills strategy at its meeting on 22-23 November 2007. Stakeholders also welcomed this initiative and have mobilised themselves to contribute to implementing the strategy.

To take full advantage of the strategic and operational opportunities offered by information and communication technologies (ICT), it is clear that more and better qualified ICT practitioners as well as e-skilled managers and entrepreneurs are needed.

The European Union must remain an attractive place to live and do business. To this end it is necessary to continue to work at providing a rich science and technology environment and the availability of a breadth and depth of skilled labour force performing well in the latest technologies.

The e-skills strategy has progressed with several good achievements and the European e-Skills Week which (26-30 March 2012) delivered very positive messages of encouragement in today's challenging times. Europe is increasingly developing its human capital to be globally competitive and is making significant progress towards the important goal of implementing a long-term e-skills strategy.

Michel Catinat
Head of Unit
ICT for Competitiveness and Industrial Innovation
DG Enterprise and Industry European Commission

Contents

1. The imperative for change

There are strong motives for maturing the ICT profession:

- ICT skills gaps of up to 13% are forecast[1] over the period 2010-2015; this may act as a brake on European competitiveness given ICT's role as an enabler of business value.
- Poor public image of the ICT profession, impacting the numbers entering the profession.
- Low levels of ICT expertise and/or siloed knowledge, restricting practitioners in seeing the 'big picture' of ICT, its interconnectedness, and its role in enabling organizational capability.
- Incidence of failed ICT projects, with recent reports identifying patterns of 'ICT black swans' (failed ICT projects resulting in failure of the business or severe reputational damage).

The most important reason for change however, stems from the extent to which ICT has the potential to harm society. Professions have traditionally emerged when failure to apply domain-specific knowledge successfully would have an adverse impact on society. Imagine, for example, the concerns that would be raised if surgeons and civil engineers lacked relevant knowledge or the ability to apply that knowledge competently. As we now enter the next wave of computing, known as pervasive computing, the extent to which ICT is embedded in society will grow significantly. Failure to take steps to mature the profession now would likely result in the risks to society from ICT growing to unacceptable levels – as such, the call for action is clear.

Fig. 1 Concerns over e-competence levels
In a 2011 CEPIS survey[2], only 21% of practitioners surveyed had the e-competences to match their declared ICT role profile… suggesting that 79% might not possess the required e-competences.

[1] G. Cattaneo, M. Kolding, R Lifonti, T. Husing, and W. Korte, 'Monitoring e-skills demand and supply in Europe,' Foresight Report for the European Commission, November 2009.

[2] CEPIS, 'CEPIS Survey of Professional e-Competence in Europe', 2011

'When we look back at the past forty years, ICT has transformed the way we live our lives, but it's fair to say that the profession itself, the ways its organized and the way it works have not evolved at the same speed' – Martin Curley, Intel

2. Establishing a profession

Our research identified four basic building blocks which are common across professions such as engineering, law and medicine.

Bodies of Knowledge	Professional Ethics
Education and Training	Competences
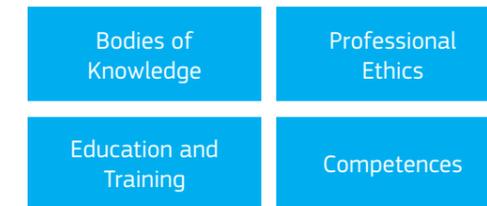
Bodies of knowledge (BOKs) – One method of establishing a profession is to first define an appropriate body of knowledge, which may then be used to set standards and certification processes. A BoK is more than simply a collection of terms; a professional reading list; a collection of websites; or even a collection of information.

It is the accepted ontology for a specific domain. In essence, a BoK forms a considerable repository for the professional knowledge as used by various professionals.

Competences – An understanding of the capability and competency needs of individuals working in various roles is essential for organizations to effectively recruit and develop suitable employees. Understanding the core areas of expertise required by various roles and maintaining appropriate levels of competences through commitment to continuous professional development is necessary to building any profession.

Education and Training – Certifications, qualifications, non-formal learning and informal learning are mutually supportive components of a professional's career development and they attest to an individual's competences and skills.

Professional Ethics – A defining aspect of any profession involves adhering to professional ethical conduct. The need for professional ethics and adherence to established Codes of Ethics/Conduct, which specify principles of individuals behaviour within various professions, societies and organizations, is paramount to maturing any profession and to garnering positive public perception.

These same four building blocks are proposed as forming the foundations for maturing the ICT profession.

Definition: ICT Professionals

- Possess a comprehensive and up-to-date understanding of a relevant body of knowledge[1]
- Demonstrate on-going commitment to professional development[2] via an appropriate combination of qualifications, certifications, work experience, non-formal and/or informal education;
- Adhere to an agreed code of ethics/conduct[3] and/or applicable regulatory practices and,
- Through competent practice[4] deliver value for stakeholders.

1. The term relevant body of knowledge encompasses the requirement for a broad and deep knowledge base which is up-to-date, accommodating both a common ICT body of knowledge, and pertinent specialist knowledge and skills.
2. Professional development focuses on improving professional competence in a professional role, with the objective of enhancing personal performance and career progression opportunities. It can encompass both technical aspects (e.g. keeping abreast of latest technological trends) as well as non-technical aspects (e.g. developing better presentation skills).
3. Professionals are accountable to themselves, the ICT Profession and society, through an agreed code of ethics/conduct or applicable regulatory practices.
4. Competent practice communicates the concept of quality of products and services being delivered by practitioners.

3. Proposals for a European Framework for ICT Professionalism

The above four building blocks for any profession are reflected in the proposed European Framework for ICT Professionalism. The key components of this framework include:

- Recognition of relevant ICT Bodies of Knowledge (BoKs) and Standards, and development of a foundational (meta) level ICT BoK, to which education courses can align.
- Recognition of multiple educational paths and alignment of education courses with national and European frameworks, in particular the European e-Competence Framework (e-CF).
- Establishment of ICT professional profiles and career development streams for ICT.
- Alignment of national Codes of Ethics/Conduct with a meta-framework of ethical issues.

Navigating through the professionalism framework
Bodies of Knowledge (BoKs) and Standards

- BoKs reflect documented accepted good practices and support enhanced understanding in a subject area. Hence, BoKs often inform course syllabi and serve as a basis for proficiency standards against which industry certifications and higher education qualifications can be issued. Other professions require all members to possess a shared understanding and language of their respective domain. The proposed framework recommends the definition and adoption of a foundational ICT BoK that would encompass a broad range of topics. Given the dynamic nature of ICT, a meta-modelling approach is proposed. It is also envisaged that education course providers may map their course offerings to this foundational level BoK in future years.

Fig.2 Overview of proposed European ICT professionalism framework
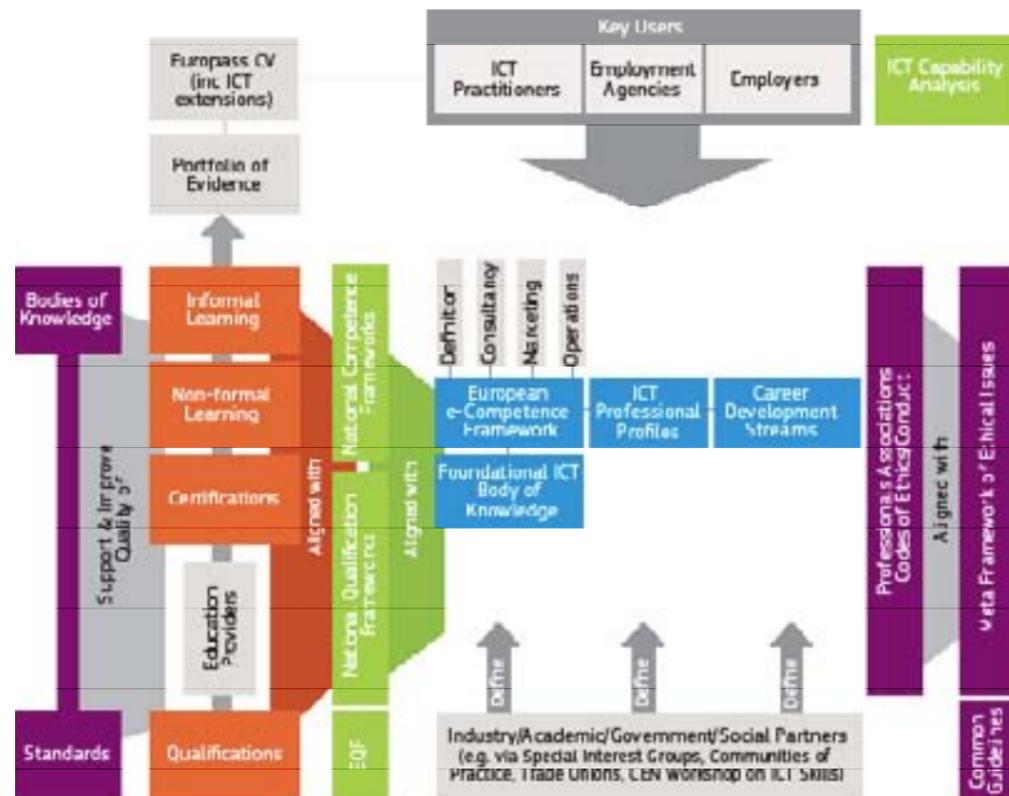
Education and Training

- Because many aspiring ICT professionals may have acquired considerable expertise but few formal qualifications throughout their careers, the proposed framework recognises and supports lifelong learning and different educational paths. These include formal qualifications from higher education institutions (HEIs), certifications from industry providers, as well as non-formal and informal learning.

- The framework proposes that the various forms of education should be aligned with different national and European frameworks, with particular emphasis on alignment with the European e-Competence Framework (e-CF). In this respect, education providers can provide visibility into the competences and proficiency levels developed through various education routes.

Competences

- Reflecting the pivotal role of competences within a profession, the e-CF is a core component of the proposed framework. ICT professionals can assess themselves against the e-CF's 36 ICT competences and five proficiency levels. Hence, the e-CF supports the promotion of a common language and shared understanding of ICT competences across Europe.

- It is envisaged that an eco-system of organizations will develop around the e-CF in order to provide toolsets to facilitate its use among stakeholders, and support and promote its adoption.

- Employers could use the e-CF as a basis to define role profiles in terms of the e-CF competences and proficiencies. Furthermore, they can leverage from the existing ICT Professional Profiles project, currently responsible for defining a series of typical ICT role profiles. The definition of a series of ICT career streams, highlighting progression/paths in terms of various role profiles, would provide important insight into potential career opportunities.

Ethics

- Given the diverse cultures across Europe, a single common ethical code is unrealistic. However, alignment against a core set of ethical issues specified in a meta-framework of ethical issues, will help inform the nature and content of codes of ethics/conduct in the many national professional informatics associations/computer societies, via a series of common guidelines.

Factors shaping the design of the framework

Sustainability – the proposals are aimed at establishing a profession which is essentially self-sustaining and driven by market demand, rather than developed and maintained through large-scale central investment. Implicit in constructing a sustainable model is the identification of clear value-streams for each stakeholder in order to foster its adoption.

Self-assessment – from the perspective of aspiring professionals, the framework is entirely based on self-assessment rather than through the introduction of new regulations; practitioners will be offered the opportunity to self-assess their competences against the European e-CF and their baseline knowledge against the Foundational ICT Body of Knowledge meta-model.

Parity – acknowledging the multiple entry paths into the ICT profession and the importance of life-long learning, equal recognition and importance is given to formal qualifications and certifications as well as non-formal and informal learning.

Compatibility – the framework is aligned with and builds on existing national mechanisms. Recognising the different levels of maturity of Member States, the e-CF does not replace national competence frameworks, but provides a mechanism for translation between countries.

Straightforward – A more complex framework might offer more sophisticated functions and value to specific industry segments, but by adopting a straightforward framework, capable of being understood and adopted by individuals, SMEs, corporates and governments, the framework stands a greater chance of being more widely adopted, and therefore delivering on the anticipated benefits.

4. Basis for progression and transparency

European e-CF
The European e-Competence Framework is one of the key components of the proposed solution, against which ICT practitioners can assess their respective level of professionalism. The same five layer descriptions used in the e-CF will also be used as the basis for the five layers of ICT Professionalism: Associate, Professional, Senior Professional/Manager, Lead Professional/Senior Manager, and Principal.

As practitioners progress in their career, they will be expected to demonstrate increasing responsibility, influence and/or expertise. Another key component of the solution is the Foundational ICT Body of Knowledge, which will support a common, broad understanding of relevant ICT topics for people wishing to develop their careers in ICT. Practitioners must possess this understanding before being considered eligible to progress from 'Associate' to 'Professional'.

Employer and Practitioner Perspective
Self-assessment against the e-CF enables practitioners to identify what competences/ proficiencies they possess as well as understanding what gaps need to be addressed to develop professionally for given roles. Optionally, external assessments can be undertaken to provide further assurance.

A set of typical ICT role profiles are currently being defined for employers by the CEN Workshop for ICT Skills[3]. Using the role profiles (which are aligned with e-CF competences and proficiencies) will support employers in defining role descriptions and in assessing/planning ICT workforce capabilities.

[3] CEN (the European Committee for Standardisation) provides a platform for the development of European Standards and technical specifications. The CEN Workshop on ICT Skills brings together relevant stakeholders from industry, human resources, academia and professional associations/ societies to contribute to the long term e-skills agenda of the European Commission.

European e-Competence Framework – Level Descriptions

Associate – Able to apply knowledge and skills to solve straight forward problems; responsible for own actions; operating in a stable environment

Professional – Operates with capability and independence in specified boundaries and may supervise others in this environment; conceptual and abstract model building using creative thinking; uses theoretical knowledge and practical skills to solve complex problems within a predictable and sometimes unpredictable context.
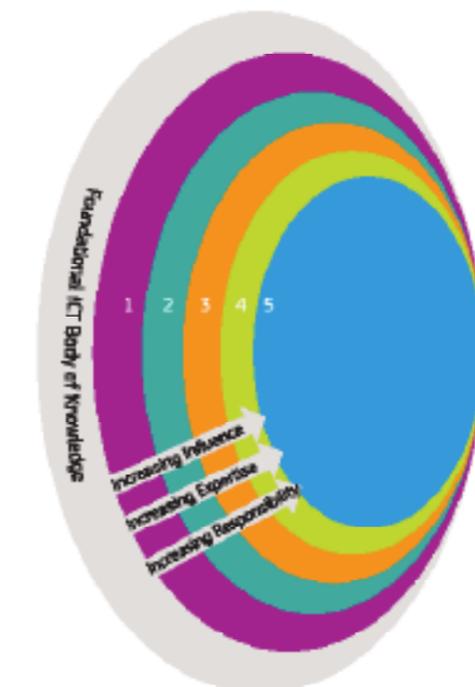
Senior Professional/Manager – Respected for innovative methods and use of initiative in specific technical or business areas; providing leadership and taking responsibility for team performances and development in unpredictable environments.

Lead Professional/Senior Manager – Extensive scope of responsibilities deploying specialized integration capability in complex environments; full responsibility for strategic development of staff working in unfamiliar and unpredictable situations.

Principal – Overall accountability and responsibility; recognised inside and outside the organization for innovative solutions and for shaping the future using outstanding leading edge thinking and knowledge.

Fig.3 Professional Progression
1 Associate
2 Professional
3 Senior Professional /Manager
4 Lead Professional /Senior Manager
5 Principal

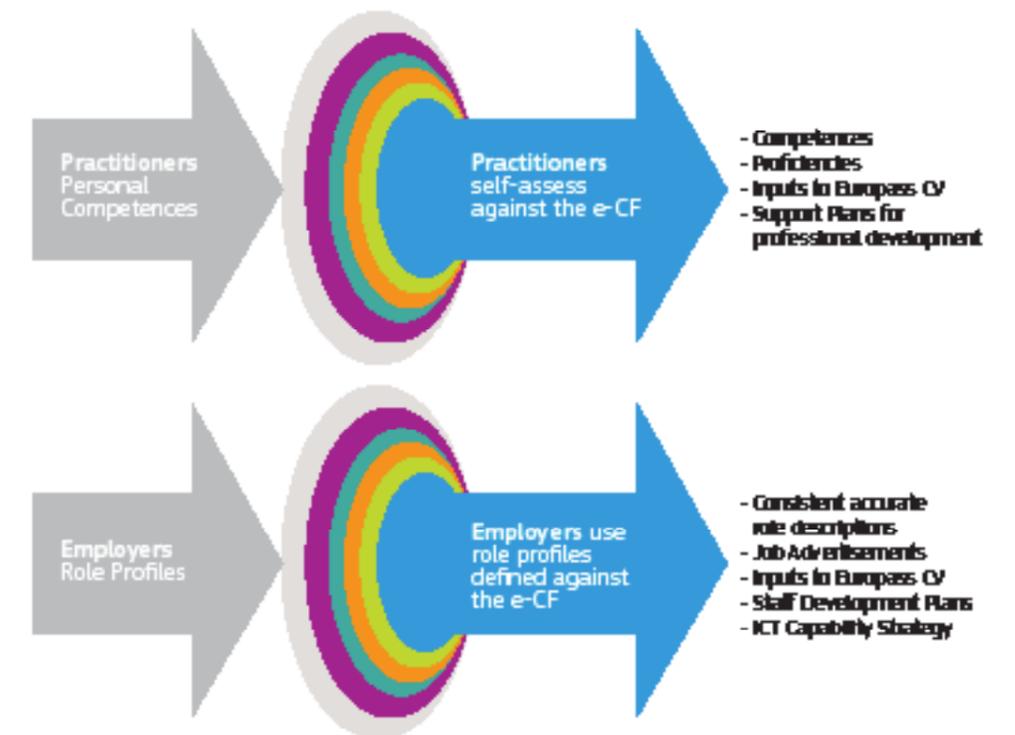Fig.4 Sample outputs derived from e-CF mapping

5. Tri-partite engagement and collaboration is key to driving maturity in the profession

Responsibility for maturing the ICT profession does not rest with any single stakeholder group. Instead, tri-partite engagement and collaboration involving industry, education providers, and government is essential if a maturing profession is to emerge.

Examination of the Action Points on the following pages highlights the need for such cooperation. Virtually every action requires the engagement of multiple stakeholder communities.

Industry, Government and Education Providers must align themselves successfully if the profession is to be self-sustaining. No single stakeholder can drive success in isolation.

For this reason, identifying a clear value proposition is important to the continued engagement of stakeholders. Details of the different value/revenue streams are provided in the final report.

Fig.5 Tri-partite Collaboration
Tri-partite involvement and collaboration is key to driving increased levels of ICT professionalism
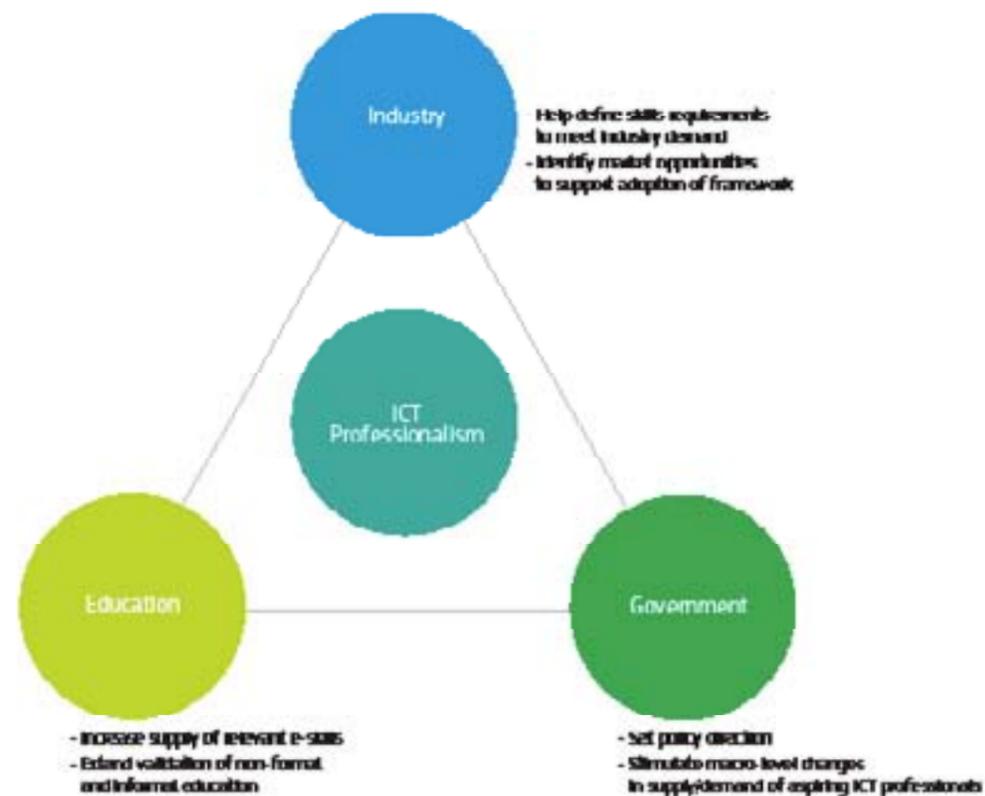
Action Point 1
Establish a sustainable operating model for ICT professionalism

The research project has identified a number of components aimed at strengthening professionalism and maturing the ICT profession in Europe: e.g. foundational ICT BoK meta-model, e-competence framework, ICT professional career streams, educational and training mapping, ethics meta-model, etc. In order for these components to be constructed and maintained, each stakeholder must identify a clear role and value proposition: this will drive the creation of a scalable and sustainable operating model for ICT professionalism. The project identified a series of possible revenue and value streams for different stakeholders: these proposals now have to be refined further, better articulating the roles and value proposition for each stakeholder, so that further engagement and mobilization of resources is sustained.

Approach
The European Commission and CEN should act as catalysts helping to bring together the different stakeholders and Member State organizations. In doing so, these stakeholders can work to identify potential roles for their organization and related value/benefit streams, as well as potential partnerships required to achieve common goals. Ultimately, each stakeholder must assume clear and well defined responsibilities for a specific part of the overall picture if the model is to be successful.

European Commission
- Facilitate discussion on governance and sustainability and promote components of the model
- Promote creation of relevant national/European level stakeholder communities

European Standardisation Committee (CEN)
- Represent national perspectives and assume responsibility for engaging relevant national bodies (e.g. auditing)

European Union Member States
- Assume responsibility for coordinating development of e-CF content
- Facilitate development of foundational ICT Body of Knowledge meta-model

Industry
- Self-organization; promotion of framework; identification of potential value/revenue streams arising from framework
- Develop toolsets, value-added services, consultancy services, benchmarking etc. and represent perspectives of employers and practitioners

Education and Training Providers
- Facilitate mechanisms for improving transparency of educational offerings and confidence in professionalism framework
- Encourage adoption within organizations and by practitioners.

Professional Informatics Associations/Computer Societies
- Provide input to development of framework representing practitioners; as well as supporting promotion/adoption

Action Point 2
Drive adoption of a common language for e-competences across European organizations and ICT practitioners

The adoption of the e-CF among organizations, ICT practitioners and educational providers will facilitate the use of a common language for describing e-competences in Europe. In doing so, ICT practitioners will be able to describe themselves in terms of a set of e-competences, employers will be able to recruit for roles defined in terms of e-competences, and educators will be able to develop offerings to target gaps in e-competences.

Approach
Adoption of the e-CF across Europe will require concerted effort and collaboration among stakeholder groups, with emphasis placed on recognising that the greater the level of adoption, the greater the potential benefits obtained for all stakeholders.

A spectrum of adoption is likely: some organizations already have similar competence frameworks in-house and have no desire to swap to a new model – however, such organizations will still be able to map to the e-CF to support external recruitment. ICT practitioners must see that the development of e-competences supports their long-term career goals, and therefore the e-CF must be seen to be embedded within recognised ICT professional career streams, building on work which has already been undertaken with respect to defining a series of European ICT professional profiles.

Moreover, organizations are likely to benefit from understanding the role of e-competences within the context of their overall ICT organizational capability and further research in this area should be undertaken to facilitate adoption of the e-CF.

European Commission
- Encourage partnerships and joint ventures among industry participants wanting to develop tools and services to support organizations in adopting the e-CF

European Standardisation Committee (CEN)
- Development and maintenance of e-CF content; Support transition of e-CF to a European Standard
- Facilitate definition of ICT professional career streams

European Union Member States
- Align national competence frameworks against e-CF
- Encourage local and national adoption of e-CF for human resources management purposes (where applicable)

Industry
- Adopt e-CF for human resources management practices (particularly, external recruitment)
- Support development of toolset and services to facilitate adoption of e-CF

Education and Training Providers
- Develop and promote educational offerings tied to e-CF
- Establish skills to support mapping process

Professional Informatics Associations/Computer Societies
- Promote and drive adoption to national associations and practitioners

Action Point 3
Development of a Foundational Meta-Level ICT BoK

In contrast to many other professions, there is currently no shared ICT body of knowledge (BoK) understood by all ICT professionals. This has fostered the creation of a silo-mentality within ICT whereby practitioners do not always appreciate the impact of their actions. Establishing a foundational ICT BoK would facilitate improved communication and understanding between professionals, thereby reducing risk. This BoK would solely define the base-level of knowledge required for all ICT professionals.

Given the expectation that all aspiring ICT professionals must possess an understanding of the foundational ICT BoK, it is also important that education providers map their respective offerings to this meta-level BoK. This mapping process will facilitate transparency of the various educational and training offerings; thereby supporting practitioners to better understand what they could learn from each provider.

Approach
In the first instance, a research project should be undertaken to identify and define the precise nature of a meta-level ICT BoK that meets relevant stakeholders' requirements and that is sustainable. Identifying a suitable structure for the BoK is critical – any attempt to generate detailed content across the whole of ICT would be unsustainable given the range and depth of content required. A high-level meta-model approach (e.g. defining the BoK in terms of a syllabus/bibliography) would facilitate its on-going maintenance and relevance to practitioners. In terms of providing the content for the meta-model, a workgroup comprising education providers and industry should be established. The development effort should build upon existing syllabi for ICT education; however, the scope of the ICT BoK would also include non-ICT topics: given the growing demand and importance of so-called 'dual-thinkers', it is vital that ICT professionals understand non-technical aspects of organizations in order to deliver value successfully.

Once such a BoK was established, education providers would be encouraged to map courses against the BoK to support practitioners in their development from Associates to Professionals.

European Commission
- Facilitate discussion and identification of good practices
- Launch initiative to drive ICT BoK mapping initiative

European Union Member States
- Provide input to BoK definition
- Facilitate implementation of BoK mapping on a national basis

Industry
- Provide input on industry requirements for foundational BoK

Education and Training Providers
- Provide input on the nature and content of the BoK based on perceived requirements of market gaps.
- Lead the mapping of courses to the foundational BoK.

Professional Informatics Associations/Computer Societies
- Provide input on practitioner expectations

Action Point 4
Map education courses to the e-CF and audit the mapping process

The current volume of industry and vendor-neutral ICT certifications as well as tertiary education courses makes it difficult for individuals to select the courses that optimally fit with their competence development requirements. Mapping of education courses to the e-CF would improve the transparency, relevance and comparability of courses in terms of developed e-competences and associated proficiency levels, and would support more informed course selection decisions.

The transparency and consistency of this mapping of courses to the e-CF are essential to its successful adoption. With the involvement of different parties, such a process needs to be effectively audited in order to ensure quality and to build and maintain confidence in the mapping initiatives.

Approach
Stimulating adoption by vendors of the e-CF and promoting the value of mapping their certifications to the e-CF needs to be further supported in order to assure the mapping process gains momentum. Whilst it is anticipated that in the future the leading vendors may undertake this mapping process themselves, independent 3rd party agencies, may also play a role in future mapping activities, particularly for smaller education providers. The mapping of higher education courses to the e-CF could also be fostered by the provision of an EU funded workshop, which would act as a forum for promoting and discussing issues.

Detailed plans on the auditing of the mapping of certifications and qualifications to the e-CF need to be developed, and bodies responsible for the audit process within each country identified. Similarly, to ensure consistency across national borders, an EU level governmental body may be required to act in a monitoring, or 'watchdog' role to oversee consistency in these initiatives across the EU.

European Commission
- Initiate a new EU project to drive e-CF mapping
- Facilitate workshops for promotion and discussion
- Support definition of an overarching framework for auditing

European Union Member States
- Develop national policies and practices to support mapping and auditing

Industry
- Undertake mapping of education and training courses and certifications
- Provide input on auditing practices
- Support development of toolsets and services to facilitate adoption of e-CF

Education and Training Providers
- Undertake mapping of education courses
- Establish skills to support mapping process

Audit Bodies/ NQAs
- Audit quality of mapping nationally
- Share best practices

Third Party Agencies
- Develop certification mapping offerings for companies without in-house expertise

Professional Informatics Associations/Computer Societies
- Audit quality of mapping nationally

Action Point 5
Align the Codes of Ethics/ Conduct of National Informatics Associations/Computer Societies with a meta framework of Ethical Issues

Developing a universal Code of Ethics/Conduct for ICT practitioners/ professionals is not feasible given the cultural, traditional, legal, social and political divergence across national boundaries. Nonetheless, a more consistent approach to ethics should be encouraged to ensure that a common core set of issues are addressed in the ethical codes.

Approach
National Informatics Associations/Computer Societies need to update their Codes of Ethics/ Conduct to ensure they address a common and core set of ethical issues, as outlined in a specified meta-framework of ethical issues.

In so doing, an obvious initial step is to establish a workshop on a European level to discuss an appropriate meta-framework of ethical issues, and to establish deadlines for re-alignment by National Informatics Associations/Computer Societies of their codes to encompass a core set of ethical criteria. Such a meta-framework may constitute, among others, the criteria/guidelines for defining Codes of Ethics/Conduct developed via IFIP initiatives.

European Commission
- Facilitate a workshop to agree a meta-framework of ethical issues

European Union Member States
- Participate in discussions to establish a European meta-framework for ethics, enabling accommodation of national perspectives

Industry
- Contribute to discussions on ethics to ensure proposals reflect industry demand and are workable

Professional Informatics Associations/Computer Societies
- Develop, maintain, and align Codes with a meta ethics framework and promote compliance among members
- Engage in dialogue to facilitate alignment with a global solution

Further information

To obtain further information and/or to request printed copies of this brochure, please contact:

Publications Office of the European Union
2, rue Mercier
2985 Luxembourg
Luxembourg

Tel +352 2929-1
E-mail info@publications.europa.eu

Electronic copies of this brochure can also be obtained at: http://ICTProf.eu

ICT Professionalism

While the technologies, tools and skills related to ICT have changed dramatically in the past forty years, the profession itself has not matured in parallel. Many of the concerns voiced twenty years ago relating to low levels of professionalism are equally valid today.

Given the importance of ICT as an enabler of productivity, this has important ramifications for European competitiveness. Moreover, the increasingly pervasive nature of computing today means that society is at greater risk than ever from low levels of professionalism. The risks now posed to society and economies, dictate that concrete steps are taken now to mature the profession.

The professional ICT landscape across Europe is complex – different countries are at differing levels of maturity, with a wide spectrum of relevant stakeholders.

The proposals contained in this document present a vision for maturing the ICT profession, and serve as a basis for discussion and action with the diverse range of stakeholders involved.

Maturing the profession will undoubtedly take time, but the time for engagement and action is now. Education providers, governments and industry must collaborate and cooperate to mature the ICT profession.