EUCIP: A Model for Definition and Measurement of ICT Skills
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http://www.upgrade-cepis.org/pages/upenet.html
Editorial Section

Editorial

European Certification of Informatics Professionals

It is a great pleasure to welcome readers to this special edition of UPGRADE, the journal of informatics from CEPIS, since this edition is focused on the European Certification of Informatics Professionals (EUCIP), an initiative that CEPIS has taken a central role in developing and promoting since its inception. EUCIP as we know it today, was preceded by several initiatives such as the European Informatics Skills Structures (EISS) competence framework, the European Informatics Continuous Learning programme (EICL) and the European Professional Informatics Certificate Service (EPICS), all of which paved the way and allowed for the development of EUCIP. A further satisfaction regarding EUCIP is that by developing this Programme CEPIS is fulfilling an important mission that led to its establishment nearly twenty years ago, namely to represent European IT professionals. Results are reaching beyond Europe already and by presenting them in the WCC 2008 they are sure to be visible worldwide. At the same time this development is in line with a conclusion of the meeting of presidents of CEPIS Member Societies held in Vienna a few years ago where they agreed that professionalism is an extremely important direction to be pursued by CEPIS in the future.

The collaborative development of EUCIP followed on from the successes already experienced in the development of the European Computer Driving Licence (ECDL), in which Subject Matter Expertise, drawn together by CEPIS from its member societies, contributed to creating the world’s leading end-user digital skills certification. A similar model was used in EUCIP development and used expertise from countries such as Italy, Finland, Norway, United Kingdom, Estonia, Germany and Ireland to develop the initial syllabus and test base for what would become the EUCIP Core certification.

EUCIP is an initiative which links closely to the current CEPIS activity areas of Skills and Professionalism, specifically:

- In the Skills domain, EUCIP provides a vendor independent certification offering to meet the needs of prospective and current IT Professionals. The Harmonise project, recently completed by CEPIS on behalf of DG Education and Culture, highlights the value that the EUCIP Professional offering can bring to the harmonization of the IT Professional eSkills certification domain.

- In the Professionalism domain, EUCIP can contribute to reducing the potential shortfalls in supply of suitably qualified IT Professionals entering the labour market, which has been highlighted as a potential issue in the eSkills Foresights Scenarios for the ICT Industry, a CEPIS study completed for DG Enterprise and Industry. EUCIP Services highlighted in articles in the following issue of UPGRADE also point to ways in which EUCIP can be used to promote competence development in organizations.

EUCIP is currently available in eight countries across Europe and opportunities to expand the programme further are continually being assessed by the ECDL Foundation, who now has operational responsibility for the programme, through its existing global network of national operators.

As well as further diffusion of the programme in Europe and beyond, CEPIS is currently planning to offer a version of the EUCIP eCCO tool via the CEPIS website to offer a competence evaluation service, based on the EUCIP Professional profiles. This tool, which has been piloted in Italy, will offer the opportunity to highlight skills gaps, which can then be addressed through the completion of EUCIP certification.

As you will discover from reading the following edition of UPGRADE, EUCIP is now well positioned to continue to meet the needs of the IT Professional, the IT Professional Labour Market, along with the individual competence and career development needs of members of the CEPIS member societies.

A really heartfelt thanks goes to authors and editors of this issue that have succeeded to put together such a comprehensive review of EUCIP which CEPIS will continue to enthusiastically support.

Niko Schlamberger
President of CEPIS
<president AT cepis DOT org>
Presentation

Introducing EUCIP

Renny Bakke Amundsen, Neil Farren, and Paolo Schgör (with contributions by Niko Schlamberger)

When Geoff McMullen and Llorenç Pagés-Casas asked us to support the editorial team of UPGRADE and Novática for the composition of this special issue on EUCIP, our first enthusiastic reaction was quickly followed by concern about the big challenge ahead: it’s not easy to choose and summarize the most important facts and experiences earned in various years of EUCIP projects in various countries.

We knew from the beginning that, in spite of the ample availability of pages, only a few selected projects could be presented, others simply mentioned, and many more excluded. On the other hand, this monograph is not intended to recollect everything about EUCIP (which would be simply impossible); the main goal is to give a comprehensive view on all aspects of the EUCIP model.

The Guest Editors and Special Contributor

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Neil Farren is Programme Development Executive for ECDL Foundation, the global governing body and licensing authority for certifications including ECDL, the global standard in end-user computer skills, and EUCIP. He is closely involved in the development of ECDL Foundation programmes, including EUCIP. Prior to joining ECDL Foundation, he worked for the Irish government Department of Communications and was involved in the development of the Irish Digital Terrestrial Television platform. He holds a B.B.S. in Information Technology from Letterkenny Institute of Technology and an M.B.S. in Electronic Commerce from NUI Galway. <neil.farren@ecdol.org>.

Paolo Schgör, born in 1963, lives in Milan with his wife and their 4 children. After graduating with summa in Electronic Engineering, he worked for 5 years as a software designer at TXT e-solutions S.p.A. From 1992 to 2003 he worked for several consulting companies, including KPMG Consulting, as a manager in charge of enterprise applications (ERP, e-business,….) and as project manager for several international clients, mostly industrial groups. In this period, he got several personal certifications, among which Apics Cpm. More recently, Paolo started working as an independent consultant, collaborated with Politecnico di Milano for various teaching activities, and started a collaboration with AICA, the Italian Association for Informatics, where he is currently in charge of managing the ECDL & EUCIP certification programmes. <p.schgor@acicnet.it>.

Niko Schlamberger holds a university degree in mechanical engineering of the University of Ljubljana, Slovenia. After having worked shortly in manufacturing industry, his professional experience is in the field of information technology in programming, application development, consulting, project management, and general management in IT industry, in business, and in government. His career experience includes various positions: head of software development in the major Slovenian bank, IT consultant, assistant to general manager of the former Yugoslavian federal clearing agency, and head of a Slovenian government information technology office. His present formal position is Secretary at the Statistical Office of the Republic of Slovenia, in charge of special projects. He is president of the national computer society — Slovenian Society INFORMATIKA (SSI), a member of Language Chapter of SSI, a member of Board of Editors of the Society’s professional journal Uporabna informatika (Applied Informatics) and of journal Information Technology and Control published by Bulgarian Academy of Sciences. In 2003 he was elected Vice-President of International Federation for Information Processing (IFIP) for a three year term where he is also chair of Member Societies Relations Committee and a member of various standing committees. The office has been extended for another three years in 2006. In 2004 he was elected Secretary Honorary of Council of European Professional Informatics Societies (CEPIS) and appointed a member of the board of European Network Information Security Agency (ENISA). In 2006 he was elected President Elect of CEPIS, to start his two-year presidential mandate in November 2007. He is now president of CEPIS. He was a visiting lecturer at the High School of Administration at the University of Ljubljana and has written a textbook on computer programming fundamentals. He is member of programme committees of national and international computing and informatics conferences, and has contributed papers for national and international conferences. His bibliographical record shows over fifty papers, reports and reviews.
We acknowledge that a high number of people from around a dozen European countries have contributed to the development of EUCIP from the beginnings up to its current stage: our sincere apologies for not mentioning each of them individually. We’re confident that the growing success of EUCIP initiatives can nurture some justified pride, especially in those who contributed voluntarily, when the EUCIP model was just an interesting idea for possible future applications.

The first two articles of this issue of UPGRADE will explain about the history of EUCIP development and its current status as a certification programme for ICT professionals.

EUCIP literally stands for the "European Certification of Informatics Professionals", but the plain explanation of the acronym is not sufficient. To create this programme, the dedicated CEPIS taskforce had to find a shared position on complex issues, such as professionalism, competences and ICT certification: these three are all hot themes, on which a lively debate is currently taking place.

To mention a few examples, IFIP has recently launched a taskforce on ICT Professionalism, CEN/ISSS has undertaken a complex project for the European Commission to define ICT professional competences, and in the USA (the homeland of all largest ICT multinationals) some experts are reflecting on issues that stem from a "vendor" approach to certification.

To explore these issues in greater depth, please refer to the articles written in the last twelve months by Emmett Dulaney on Redmondmag.com and by Warren Wyrostek on InformIT. Both of these authors are advocating a new certification system that really focuses on the skills required to work as an ICT practitioner, not on those "pushed" by companies interested in selling their products (and the respective latest versions, regardless of real market demand).

It appears that the independent researchers on both sides of the Atlantic ocean – the Americans mentioned above, and the Europeans who worked in the Harmonise project (see Table 1 on the next page) – come to very similar conclusions: the market, and especially the organizations using IT to support their business, can no longer understand where the value is, due to the real jungle caused by an overwhelming variety on the supply side. There are currently thousands of different ICT certifications available, and even for experts it is hard work to compare one with another.

To answer the initial question, EUCIP is certainly about ICT certification, but is not limited to just ICT certification. We prefer to say that EUCIP is a model, proposing a viable approach to the definition and measurement of ICT professional competences. In fact, all other articles in this edition describe applications of the EUCIP model; in a sense, every single application (ranging from a country approach to local implementation, up to offering a full set of services around ICT competences) requires the involvement of several partners. EUCIP is therefore a unique example of a multiple multi-stakeholder partnership, having different forms in different countries. This example has recently been endorsed by the inclusion of EUCIP in a benchmarking study on policies on multi-stakeholder partnerships for e-skills in Europe1.

The various articles from Ireland, Estonia, Spain, Poland, Romania, Croatia, plus the article on Cisco/EUCIP co-operation, and the final article on e-learning tools and projects show how the involvement of different institutions is a key success factor for the introduction of the more usual types of EUCIP certifications (Core and IT Administrator).

The remaining articles from Italy and Norway report on how broad the discussion may become when talking of the professional profiles and of all services to organizations that can be built around the management of human resources and of their respective competences.

Conclusions

The EUCIP programme has probably reached its main turning point. It can either continue as a traditional certification offering (and face fierce competition in a narrow market, where customers are disorientated by an excess of proposals) or achieve a unique position as a shared model around which a number of stakeholders are building original solutions to the complex issues of professionalism and effective management of ICT competences.

The second option has an evident higher value, but its achievement does not depend on CEPIS only: it depends on an open attitude from other stakeholders, who can either exploit the value of this thorough model, or continue to conceive new projects from scratch to cope with the arduous task of defining and measuring ICT professional competences.

Harmonise

The Harmonise project (aiming at the harmonisation of e-skills certification market) was approved in 2004 for European Commission funding through the Leonardo da Vinci programme (DG Education and Culture). CEPIS led a project consortium involving other 8 partners from Austria, Estonia, Germany, Hungary, Ireland, Italy, and UK.

The final report (over 360 pages) was delivered at the end of 2007, and its official approval by the EC was formalized in July 2008.

Harmonise reviews existing qualification and certification schemes in the context of learning provision that leads to certification, and clarifies the underlying profiles, terminology and curricula. The project’s aims involve clarifying existing arrangements to support greater transparency, and influencing the harmonisation of vocational learning and qualification schemes for ICT professionals at the European Union level.

Having assembled a comprehensive knowledge base in this area that can help stakeholders, employers and individuals better understand what is available, Harmonise defines options for achieving greater transparency within the EU and proposes ways of clarifying the feasibility of a widely acceptable European approach to qualification and certification for ICT professionals which can draw and build on the successful experience of the ECDL <http://www.ecdl.org/publisher/index.jsp>.

The following are just few little clippings taken from the final report:

“... Our survey revealed 62 certification suppliers, delivering 617 types of certification for a total volume of more than 5 million in the last 6 years...”

“... This turns the certification landscape into a 'jungle' (Tittel, 2006), (Povalej and Weiß, 2007b) and makes it difficult for individuals and employers to get a good overview of it...”

“... EUCIP, as one of the most recent 'Vendor Independent' models, promotes an open, collaborative model, using an 'inclusive' concept which aims at valuing the role of the numerous subjects (vendors first of all) operating autonomously in the field of training and education, and in the definition of ICT certifications. As well as collaboration with commercial companies and organisations, the EUCIP model also tends to involve editors, universities, schools and public and private training centres...”

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Table 1: Overview of the Harmonise Project.
This article documents the historical development of EUCIP, how its development was influenced by initial development of the EISS (European Informatics Skills Structures) framework and the EICL (European Informatics Continuous Learning), all the way to the EPICS (European Professional Informatics Certificate Service) project and the subsequent evolution into the European Certification of Informatics Professionals (EUCIP). The article explains the development of the three certification offerings, namely, EUCIP Core, EUCIP Professional and EUCIP IT Administrator and gives an insight into future developments for EUCIP.

Keywords: EISS, EICL, EPIC, EPICS, EUCIP, IT Professionalism, EUCIP Core, EUCIP Professional, EUCIP IT Administrator.

1 Developing a Pan-European Certification Scheme

1.1 EUCIP Beginnings

The European Certification of Informatics Professionals (EUCIP) is a pan-European qualification scheme for people entering the IT profession and for IT professionals wishing to continue their professional development. EUCIP has been developed as an independent, European recognised scheme for IT professionals. The qualification enables IT professionals to document and confirm their knowledge and skills for employers and enhance their standing in the marketplace.

The need for professionalism in IT and the need for the recognition of an "IT Professional" is argued by Peter Morrogh in his paper "IT and Professionalism: An Industry View" [UPGRADE Vol. II. No. 4, Aug. 2001]. Although written seven years ago, the need for professional certification and an understanding of the value of Professionalism in the industry is even greater today, and has been highlighted by Charles Hughes in his paper "Professionalism in IT" [UPGRADE Vol. VII. No. 4, Aug. 2006]. Organisations are more and more dependent on IT to run their businesses and poor quality systems pose a serious risk to any organisation. The need for a high standard of technical skill, management ability and, a high standard of ethical practice underpinned the commitment of CEPIS to develop a professional certification programme for ICT practitioners to be recognised and validated as Professionals.

The objective of the EUCIP programme (see <http://www.eucip.com>) is to offer a recognised certification of IT competence for IT professionals at a standard prescribed by the ECSDL Foundation and CEPIS. The qualification is aimed at practitioners working in industry, government and public organisations alike.

The goals of the EUCIP programme are:

- To define an industry-driven standard for Informatics professionals.

Authors

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Giovanni Franza lives with his wife Marina Cabrini and their 6 cats in Lugano, Switzerland, working as a professional for Studio Informatico Cabrini e Franza. He was born in 1956 in Trieste where he took his formal education and started his career in designing digital telecommunication systems in late ’70s. In mid-’80s he moved to Milan where he continued to work mainly as an ICT consultant in system integration, and later for networking and security. In that period he managed the IT infrastructure of Ulrico Hoepli, a well known technical Italian publisher, and then became Technical Director of Psicom, one of the first PDA distributors in Italy. Later, in 1997, he founded his own IT company with Marina Cabrini. In this role he designed and developed the text-retrieval system for Mondadori, one of the biggest Italian publishers, and was part of the team which designed and developed the software that implements the PKI for one of the major financial companies in Italy. As part of his activity he has written various books with his wife covering different aspects of IT from office applications to operating systems and IT security, developing a strong interest in "Open Source" solutions and security in hybrid IT systems. As a member and collaborator of AICA, he is also involved in the development of the IT Administrator certification programme, being one of the authors of the textbooks. <gfranza@mgeng.com>.
To meet the demands of the fast changing market for IT professionals across Europe.

To contribute to closing the IT skills gap in Europe.

To offer a vehicle for life-long learning and competency enhancement for the IT profession.

EUCIP was developed by CEPI (the Council of European Professional Informatics Societies) and is operated by the ECDL Foundation which continues to enhance, promote and manage the EUCIP certification programme.

CEPI have for many years sponsored the idea of creating ICT Professional qualifications and promoting CPD (Continuous Professional Development) programmes for the informatics industry/profession.

It was the actions of CEPI in the area of certification programmes for IT Professionals which have lead to the current EUCIP certification programme.

1.1.1 Initial Work (1996-1999)

During the mid to late nineties the design of the EISS (European Informatics Skills Structures), a framework of competencies required by informatics practitioners and professionals covering the full range of IT activities took place. The EISS Project was supported by European Union funding.

The EISS divided the field into nine Streams and each of the Streams was further divided into between one and twelve Sub-streams. Finally, each Sub-stream contains up to ten possible levels. The levels range from Unskilled Entry (0), to Fully Skilled Practitioner (4), to Senior Manager/Director (9).

For each Stream, Sub-stream, and Level covered by the EISS, there are four sections:

- Recommended Academic Background.
- Experience and Level of Skill at Entry.
- Tasks/Attributes.
- Training and Development Required.

The EISS activity was followed by initial development of a continuous learning program to be known as EICL (European Informatics Continuous Learning).

1.1.2 EPIC (2000)

The EISS and EICL projects were then followed by the development of EPIC (European Professional Informatics Certificate) aimed at providing a basic level of IT professional certification [see Informatik/Informatique journal, 3/2001]. The EPIC model involved a foundation level of IT knowledge with "higher" levels addressing particular topics. The project was seen as a way to offer a new entry route into the IT profession and for this reason, EPIC was seen by CEPI as a way to have a positive impact on addressing the IT skills shortage. At this time several studies were pointing to the potential for upcoming IT skills shortage issues including EITO/IDC (2001)¹, Microsoft/IDC (2000)², and CareerSpace (2000).

1.1.3 EPICS (2001 - 2003)

EPICS (European Professional Informatics Certificate Service) became the next step in the road to developing EUCIP. During the EPICS phase, development of what was soon to become the EUCIP Core syllabus began. This activity involved input from several European Subject Matter Experts. In addition, the EPICS project applied for financial support from the EU, through the TEN-telecom program. As a result of this funding, a market validation project took place to prepare a business plan for a limited market in six European countries.

1.1.4 EUCIP (2002 - Present)

The name was changed to EUCIP in late 2001 and a EUCIP central organization was created as part of CEPI. An initial meeting of early adopters was held in Athens in January 2002 and the work of creating the EUCIP product (based on the initial activities from the EPICS) began.

During 2002, a central year of development activity for EUCIP, an initial Question Test Base was developed and extensive piloting activities took place in Italy, Finland, Norway, UK, Estonia and Germany. Later in the year, the working groups which had been involved in designing the product were transformed into a more structured form and EUCIP moved into office space in the BCS (British Computer Society) headquarters in Swindon.

The first official tests took place in Italy in July '03, soon followed by Norway.

During 2004 CEPI decided to merge EUCIP with the ECDL Foundation operations. The involvement of the ECDL Foundation led to further revision to the EUCIP Core Syllabus in June 2006, followed by enhancements to the Question Test Base.

1.2 EUCIP IT Administrator Development

1.2.1 The Beginning

At the beginning of 2001 Associazione Italiana per l’Informatica ed il Calcolo Automatico (AICA) had some contacts with AIPA (former name for CNIPA, the Italian Authority for Informatics in Public Administration) to develop a competence profile to help ARAN (the Italian agency which negotiates with trade unions in public administration) to define a job role for employees that must support colleagues within local branches or small entities (up to 20 people).

The first meeting took place at AICA premises at May, 18th. 2001. This was the original starting point for IT Administrator and lead to the development of what was originally called "LAN Administrator" and became, after several changes, EUCIP – IT Administrator "Module 4 - Expert Network Use".

The development started with the syllabus and was carried out by a group of more than 10 experts, including people from academies, universities, ICT firms and consultants, companies using ICT to have an all-round sight of the LAN Administrator job role. The syllabus and the Question

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Test Base were developed with both theoretical and practical aspects of the LAN administrator job role.

1.2.2 A First Join

During this early phase, ECDL Foundation had set up a committee to understand how to develop a higher certification level to add to ECDL. This new level was intended not only for mere ICT users but also to cover some basic technical knowledge.

The works of this committee lead to what is now known as "ECDL Advanced" and, now, is devoted to a sound user level knowledge of ICT tools, but, at the time, a working group of this committee was working on a certification which expanded modules 1, 2 and 7 of ECDL Core, working with systems, networks and IT security: the scheme included modules about PC hardware, Operating System, LAN and IT Security with some contributions from Ireland, United Kingdom and some North European companies interested in a "low level" certification scheme on IT Security for employees.

Knowing that there were significant overlaps between the two works, the two working groups had a meeting during the November 2001 ECDL Foundation CEO Meeting in Dublin.

The agreement between the two working groups lead to a new international structure that included people from Italy, Ireland and United Kingdom. At the same time the two schemes merged. The original work by the ECDL Foundation group on PC hardware became "Module 1 – PC Hardware"; the original work of the AICA group became "Module 4 – Expert LAN Use". The module on Operating Systems was split in two parts: the first one, approaching client side operations, became "Module 2 – Operating Systems" and a second, approaching server side and LAN operations, became "Module 3 – LAN and Services". The two working groups also agreed that the level of the proposed IT Security content was too low, so the AICA group was put in charge of a new proposal.

An important part of the agreement was the decision to fully include competences about free software environment. It was also decided that for some modules there is no possibility to assess expertise without a certain amount of knowledge on FLOSS (Free / Libre / Open-Source Systems) platforms. AICA was in charge of verifying this aspect of the syllabus and integrating the QTB (Question and Test Base).

1.2.3 Improving IT Security

To strengthen the competence about IT Security, at the beginning of 2002 the Italian group was joined by experts from IMQ (Istituto per il Marchio di Qualità) one of the most known Italian agencies for standards certification.

A very important contribution to the IT Security module was given by the Hellenic Data Protection Agency (the Greek institutional body for Security in ICT and for privacy warranty): the module contents were deeply discussed in May 20th. 2002 meeting in Athens.

CLUSIT (Italian Information Security Association) an association that works with many experts, ranging from academy to security companies and certification bodies were also involved in the development of this module. CLUSIT continues to contribute to this module.

1.2.4 The First Pilots

In August 2002 the first courseware to support the certification was completed and sent to the publisher. Part of this courseware was a scheme that listed how the IT Administrator modules reflected the ongoing governmental initiative for teachers and ICT (project FORTIC – ICT technologies for the schools), particularly on the "C - Operate" area (how to maintain ICT infrastructures of the schools). This work was lead by OTE (Osservatorio Tecnologico, an agency of the Italian Ministry of Education for technology transfer to the schools).

During the 2002 summer a first workshop took place in Italy with 20 attendees. The aim of the workshop was to explain to a selected number of professionals the scope of the certification and its contents in order to allow them to successfully take the certification exams and become part of the certification infrastructure.

During the month of November the first pilot exams took place in Italy, near Milan and before the end of the year a dozen certifiers were awarded with their diplomas. More than 120 exams were taken, for a gross total of more than half a thousand of practical tasks and more than two thousand of theory tests.

These details were also used to assess the QTB quality; a complete quality assurance screening was performed and all the data available from the ECDL Foundation development processes was used to validate the certification.

1.2.5 A New Cooperation

Beside the fact that IT Administrator was carried out in conjunction with ECDL Foundation into the ECDL Advanced technical committee, during the development it became apparent that the certification scheme was too high for the advanced level of ECDL and that the level was quickly growing, pointing more to the EUCIP family than to ECDL one.

At the beginning, the developing groups were distracted by the fact that the program did not refer to an "all day long technician" but to some experts who also spend some time as "technical experts", and thought that this led more to a user area than a technical one. With the time it became apparent that the role of the "IT Administrator" could be a link between ECDL and EUCIP.

But, notably during the first pilot experiences, it became apparent that the level of knowledge required was definitely the level of a professional and not the level of a simple or of an advanced user. So, during the CEO meeting in Rome in November, 6th. 2003 the decision was taken to keep IT Administrator separate from ECDL in order to avoid confusion and facilitate the insertion into EUCIP program.

The end of the process was completed at the beginning of 2004, when IT Administrator became a Certification Program distributed by EUCIP ltd. and officially linked to EUCIP Certification Program.
The important thing to note is that IT Administrator is a certification aimed at people directly involved on practical operations and it covers most of items of EUCIP Core Operate, but on a much deeper and practical level. For this reason the EUCIP – IT Administrator modules can be used as certification for some vocational schemes, starting with EUCIP Professional Network Manager (see later in this paper).

### 1.2.6 New Developments

As with every technical project in ICT, including EUCIP, IT Administrator is at risk of obsolescence if the content cannot maintain a suitable level of currency, so around mid 2004 the decision was taken to develop a second release of all materials, starting with the Syllabus and continuing with the QTB.

The change was based on two main reasons: the first was the growing demand for IT Security and the broadening of this crucial sector; the second was the increasing number of different and updated technologies used for hardware. A third reason was the need for some knowledge about geographical networks to assess people working for multinational companies, ISP, broad Universities, or Public Administration.

The new syllabi and QTB were finalised in August 2005. This release will remain valid at least until end 2009.

During work to map and verify the overlap of IT Administrator with EUCIP and during the development of EUCIP Professional Network Manager profile (see later in this paper) the working group opened contact with CISCO to mainly to map their well known certifications to the mentioned vocational profile.

This led to an interesting possible synergy: CISCO holds IT Essential courses (and coursework), offering this teaching by means of "CISCO Academies", but without certifying its students on it. Discussions with the IT Administrator working group suggested that IT Essentials I and II could be assessed using modules 1, 2 and 3 of EUCIP – IT Administrator.

A pilot experience took place in Rome during December 2005: the results were largely positive so CISCO signed an agreement to continue this experience and many CISCO Academies have started to use the EUCIP – IT Administrator certification to meet student demand for certification.

### 1.2.7 Today

EUCIP IT Administrator is a certification operated by ECDL Foundation. The scientific maintenance and development is carried out by AICA, who also assist ECDL Foundation and other countries to launch and operate the certification.

Italy is fully operational with more than 200 certified certifiers and experiences ranging from State University of Milan, State Police, Secretariat of Prime Minister, Ministry of Justice and others. Romania, Norway and Spain are in the process of launching the certification, working on translation of syllabus, QTB and training materials.

### 1.3 EUCIP Professional Development

#### 1.3.1 First Steps

Since its inception, the EUCIP programme was designed to reach a professional level of certification; the initial idea was to develop EUCIP elective modules above the 3 Core level modules, so that a candidate could choose how to compose his/her progression to full professionalism by combining external certification modules (e.g. Cisco, Microsoft, ISEB,...) and some EUCIP elective modules.

In late 2001 this initial concept was partially revised, based on the fact that the external certification offering was already so broad that it could probably cover all requirements. In a workshop held in London in May 2002, the general structure of this higher level (at that time named "elective" or "vocational" or "practitioner" level) was first presented in a way which is fully compatible with the current definition of the EUCIP Professional level.

However, the main focus at that time was still on improving and piloting the Core level; therefore, during 2002 and 2003 only some initial work could be done, leading to the definition of the first profiles: the Business Analyst, the Software Developer and the Network Administrator (later renamed Network Manager). Apart from defining a method for specifying competences required from a single profile, the problem of defining a full range of profiles was not addressed for several months.

At the end of 2003, EUCIP was ready for a new step forward: EUCIP Core had started successfully and it was time to think about the vocational profiles.

Many certification schemes were examined to verify their strengths and weaknesses and to learn lessons from previous works: many schemes exist, but some are exclusively tied to ICT companies (as Career Space), while others are limited to existing job positions (as German AITTS), but the existing complexity in the market reflected the state of the existing job variety.

The job began defining a bouquet of 22 different vocational profiles: this quantity was not considered to be too high or too low, so each profile has an audience not too strict or too broad and the content was not too specialised nor too generic and weak.

In March 2004 the first four profiles were ready for pilot. During the development, the corresponding job role descriptions and a library of knowledge and competence items for each profile (similar to a syllabus but wider in scope and less defined in depth) were prepared.

To help the understanding of these vocational profiles, each of them was also mapped in terms of other existing specifications (SFIA, CIGREF, AITTS).

Another decision taken at this stage was not to develop proprietary certification exams but to use other available certifications to bridge the gap between Core and the vocational profile itself.

This was done using the library (see above) and working together with well known organisations that develop certifications like Cisco, Sun, HP, Oracle and Microsoft. In this work the library played a central role to define the impact of the various certifications.

In parallel with the profile specification activity, the accreditation process was initiated: a EUCIP elective profile,
in fact, would remain just a theoretical description of an ideal set of competences if no certification modules were available. As explained further in the article by Paolo Schgör, Frank Mockler and Neil Farren in this monograph, a candidate willing to achieve EUCIP Professional certification needs to collect some “elective modules” in his/her portfolio before gaining admittance to the final examination. Therefore, the accreditation of elective modules was started during the profile definition phase. The previously mentioned international ICT vendors were involved, and provided very useful input.

This accreditation process needs a continuous revision activity; for instance, in 2007 a new version of ITIL was released, and the related certifications are under revision: as a consequence, a EUCIP-ITSMF joint workgroup was activated to recalculate EUCIP points deriving from ITIL certifications.

1.3.2 More Profiles
In a EUCIP Product Development and Quality Management Board (PDQ) meeting on August, 31st. 2005 in Brussels, it was decided to develop other four elective profile specifications: the task force (12 people, 8 from EUCIP, 4 from companies involved in software products related to the profile, i.e. Oracle for DBA) started its work in September 2005 and the draft proposal of these modules was presented and briefly discussed in PDQ meeting on November 24th. 2005 in London. After some work the final version was approved by the PDQ in its Brussels meeting of February, 6th. 2006.

In April 2006, a dozen candidates applied to earn the first vocational certificates, in Rome, Italy. Nine of them were successful and the diplomas were awarded in a public ceremony on May, 5th.

As agreed at the PDQ meeting of June, 9th. 2006 in Barcelona, AICA asked some more experts to join the task force and develop the last elective profiles offering this work to EUCIP as a draft to explore the possibility to quickly complete the EUCIP professional level. The first three profiles were presented and agreed a PDQ meeting on October, 6th. 2006 in Brussels. The last eleven profiles were completed and accepted by the PDQ during the Rome meeting on March, 22nd. 2007. In the same PDQ meeting the revised final procedures for the vocational level certification were approved.

2 Expanding and Promoting EUCIP
EUCIP is promoted and its development managed by the ECDL Foundation. The certification programme is deployed through Licensees (Local Market Representatives) who run and administer EUCIP certification in their countries and strive to promote IT Professional development in their markets. In Europe most of the Licensees are directly associated with CEPIS Member Societies (National Computer Societies in Europe). The Licensees are responsible for establishing a network of Test Centres in their country and working with government, academia and industry to ensure the continual growth of the programme and widespread adoption of EUCIP as a national standard in their respective markets.

The EUCIP programme is also supported at Core level by approved Courseware and Learning Providers who make courseware and/or training available for students to prepare for the EUCIP qualification. Courseware, which must be approved by EUCIP, is available to support the teaching of the EUCIP Syllabus. Learning Providers may propose, either in taught courses or distance learning schemes. These training materials and teaching schemes must have EUCIP accreditation. Learning Providers can also operate as Test Centres. Test Centre accreditation by EUCIP ensures that the Learning Provider has the on-site capability and all the necessary equipment to conduct testing for the EUCIP programme.

Currently EUCIP has certification programmes running in Croatia, Estonia, Ireland, Italy, Norway, Poland, Romania and Spain. Approximately 6,000 candidates have engaged with the EUCIP programme since its inception.

3 Future EUCIP Developments
Due to the ever changing demands of technology and the IT Profession, EUCIP is constantly evolving and adapting to meet the needs of the market. As part of this evolution, plans are in place to carry out a revision of the EUCIP Core Syllabus during 2008, with a view to the new syllabus being available to candidates in the following year. Development work will also continue with EUCIP Professional, particularly relating to the accreditation of EUCIP elective modules.

Plans are also in place for a version of the eCCO diagnostic tool (See article “EUCIP Services for Organisation” in this monograph) to be hosted by CEPIS. This tool is used to map individuals’ IT Competencies to a comprehensive list of basic IT Professional Profiles. In doing so, the tool is able to define the competence gaps and training requirements for an individual and map them to the most relevant EUCIP Professional profile.

In addition, EUCIP will continue to collaborate with relevant certification vendors in the IT Professional certification market and explore further options to diffuse the EUCIP certification offering throughout Europe.
Exploring the EUCIP Certification Range and Progression Options

Paolo Schgör, Frank Mockler, and Neil Farren

This article provides an overview of the three main EUCIP certification offerings, namely, EUCIP Core, EUCIP IT Administrator and EUCIP Professional. The article also outlines the links between the certifications and the potential progression options available within the EUCIP certification model.

Keywords: Certification, EUCIP, EUCIP Core, EUCIP IT Administrator, EUCIP Professional, EUCIP Progression Options, Professional Certification.

1 Product Overview
EUCIP covers a broad range of ICT knowledge and skills on core topics relevant to ICT practitioners. There are three EUCIP certification options, which allow a candidate to progress from a solid grounding in the key areas of ICT all the way to specialised certification in a particular professional profile. The variety of options makes EUCIP an ideal qualification for a range of ICT jobs across all sectors.

There are three EUCIP certifications:
- EUCIP Core
- EUCIP Professional
- EUCIP IT Administrator

1.1 EUCIP Core
The Core level certification provides students with a solid foundation for all types of ICT related work. It gives a broad knowledge of the fundamental aspects of ICT. EUCIP Core is divided into three Knowledge Areas:

- Plan: The Use and Management of Information Systems. The Plan module is made up of seven categories, namely, Organisations and their Use of IT, Management of IT, Measuring the Value of IT, The Global Networked Economy, Project Management, Collaboration and Communication, and Legal and Ethical Issues.
- Build: Acquisition, development and implementation of Information Systems. The Build module is made up of four categories, namely, Systems Development Process and Methods, Data Management and Databases, Programming, and User Interface and Web Design.

Typically 300 - 400 hours of study time is required to complete the EUCIP Core certification. However, various models have been employed by EUCIP Partners to prepare a candidate for the final examination. Delivery of the course can vary, with some candidates (often experienced practitioners or current/recently graduated university students) opting to take a condensed "crash course" or sit the exams.
without having attending a formal EUCIP Course. Many others sign up to a more extensive course consisting of lectures, exercises and online learning material to help them to complete the certification.

Each of the three syllabus areas is examined in a one-hour exam. The tests consist of 45 questions. The pass mark for each exam is 60% and the Candidate will only receive their certificate on completion of all three syllabus areas.

The EUCIP Core level courses are supported with courseware. Some countries (e.g. Italy & Norway) have developed books and e-Learning content in their native languages to assist Candidates doing the course.

In addition, further materials are currently being developed as part of a project part-funded by the Leonardo da Vinci programme. The project entitled "EUCIP MAT" is led by the Estonian Information Technology Society and is explored within the article by Marco Ferreti and Jaan Oruaas in this monograph.

1.2 EUCIP Professional

EUCIP Professional allows candidates to specialise in a particular role through further certification. The EUCIP Professional certification involves a candidate compiling a portfolio based around gaining credits from other courses and certifications and documenting their relevant work experience.

The main goal of the EUCIP Professional level is to provide candidates with:

- A choice of different EUCIP job profiles within IT for Certification ("EUCIP Elective Profiles").
- A choice of accredited learning elements ("EUCIP Elective Modules").
- A professional qualification that recognises that the Candidate can act effectively and consistently in their role.
- An approach to building up to a recognised EUCIP elective job certification.

EUCIP Core is a prerequisite for EUCIP Professional. The EUCIP Professional "elective level" allows candidates to choose a specific profile that will qualify them as an ICT professional

The candidate can define a personal "portfolio" with a relative degree of freedom to document the range of individual competences acquired through university, recognised professional courses and/or experience on the job. The chosen combination must be consistent with the relevant professional profile for which the candidate intends to acquire the EUCIP Certification. There are 21 EUCIP Professional profiles which are publicly available via the EUCIP Website [1] (see Table 1).

Each of the 21 EUCIP Professional profiles stem from one of the three EUCIP Core Knowledge Areas (Plan, Build, Operate) via 7 "branches" of IT Professional profiles. For example, the Software Designer branch is made up of 3 EUCIP Professional Profiles (Software Developer, Web & Multimedia Master and Systems Integration & Testing Engineer) and builds on the knowledge acquired from the Build area of the EUCIP Core certification.

The diagram "EUCIP Professional Profiles Map" (see Figure 1) highlights these relationships. As a candidate moves from the EUCIP Core Level (broad, fundamental knowledge of ICT) to EUCIP Professional, they move to a higher level of specialisation, focusing on developing competences relevant to a particular profile specification.

The evaluation method for obtaining the EUCIP Professional certification is based on a credit system [2] which assigns varying amounts of points to the diverse elements (courses, certifications, etc.) composing an individual’s "portfolio". Among professional courses recognised by EUCIP, special attention is given to courses which allow candidates to achieve certifications from IT vendors, such as Microsoft, Oracle, SUN, Cisco, IBM, SAP, etc. The dia-

<table>
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<tr>
<th>EUCIP Professional (Elective) Profiles</th>
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<tr>
<td>Information Systems Manager</td>
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<td>Information Systems Auditor</td>
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<td>Enterprise Solutions Consultant</td>
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<td>Logistics &amp; Automation Consultant</td>
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<td>Client Manager</td>
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<td>Information Systems Project Manager</td>
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Table 1: EUCIP Professional Profiles.
gram in Figure 2 highlights a selection of the "building blocks" that can be used to obtain the necessary EUCIP points required for the EUCIP Network Manager profile. The EUCIP Network Manager Profile requires the candidate to build a variety of competences, which are primarily drawn from elements relating to the "Operate" and "Build" areas, with some overlap into the "Plan" area.

Following evaluation of a candidate's "portfolio" and the relevant compliance with the chosen EUCIP profile, an examining board consisting of two or more senior members appointed by the National EUCIP Operator, meets the candidate for a final discussion. During this oral examination the candidate will participate in a 20-30 minute discussion about his/her portfolio. This portion of the discussion also allows the examination board to evaluate the candidate’s presentation skills, as well as his/her behavioural skills. The oral examination continues with a 20-30 minute evaluation of the candidate’s knowledge and skills through questions on syllabus topics and on the general relationships between them.

Once this process has been successfully completed, the candidate will be awarded the relevant title, for example EUCIP Business Analyst, EUCIP Network Manager, etc. If the candidate meets all requirements apart from sufficient work experience, a reduced title can provisionally be awarded (e.g. Associate Network Manager): The candidate will be allowed to apply for a certification upgrade when they have accrued the required practical experience, and will then get the full EUCIP Professional title.

1.3 EUCIP IT Administrator

IT Administrator is a standalone certification programme that certifies practical and theoretical knowledge of computer technicians/specialists.

This certification programme covers several areas, ranging from Hardware and Operating Systems to Networks and IT Security.

Each of its five modules can be seen either as a single element of certification or as a step to achieve the complete title of EUCIP IT Administrator.

The programme is aimed at individuals working within small to medium-sized companies (including educational institutes and local branches of large organisations) that require in-house expertise in IT and also individuals who wish to broaden their IT knowledge and be able to administer systems and networks.

The candidate who has successfully completed the certification programme will be able to:
- Operate as an internal consultant for hardware, operating systems, networks and IT security.
- Follow technical developments in order to ensure effective utilisation of new technologies.
- Operate as market consultant for purchasing hardware and software for an organisation.
- Help and support network users with everyday problems.
- Ensure the safety of company data by protecting them from loss, virus attacks and hacking.
- Be able to communicate with specialised personnel from different hardware/software vendors in order to obtain proper solutions to the organisation’s needs.

The Syllabus consists of the following five modules:

**Module 1:** PC Hardware.

**Module 2:** Operating Systems.

**Module 3:** Local Area Network & Network Services.

**Module 4:** Expert Network Use.

**Module 5:** Security.

The tests are conducted using multiple choice theory questions and Modules 2 – 5 also contain practical exercises to be conducted on a live system, in a controlled test environment.

The pass mark in Module 1 is 60%, and in Modules 2 to 5 it is 70%. The candidate has 90 minutes to complete the Module 1 exam. In Modules 2 to 5 the candidate has 60 minutes to complete the theoretical questions and 60 minutes to complete the practical exercises.

CISCO IT Essentials I, a course aimed at preparing students for entry-level positions in IT, has been extensively mapped to the first 3 Modules of the EUCIP IT Administrator programme. This allows candidates who have completed the IT Essentials 1 course to sit EUCIP IT Administrator examinations to progress towards certification. An overview of co-operation taking place between CISCO and EUCIP is discussed in greater depth in a separate article in this issue of UPGRADE.

### 2 Progression Options through the Certification Range

There are several routes available to potential EUCIP candidates depending on their previous experience in the field of IT and their certification requirements. Each of the four routes is outlined below (see Figure 3).

**2.1 Route 1: EUCIP Core Only**

This route is particularly useful for a candidate who is interested in moving into the IT profession but does not yet have a relevant IT qualification. The candidate’s motivation is to gain the necessary skills and certification to enhance their employment prospects in the IT field.

**2.2 Route 2: EUCIP IT Administrator Only**

This route is suitable for individuals working within small to medium-sized companies (including educational institutes and local branches of large organisations) that require in-house expertise in IT and also individuals who wish to broaden their IT knowledge and be able to administer systems and networks.

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**Figure 2:** Acquiring EUCIP Points for the EUCIP Network Manager Profile.
2.3 Route 3: EUCIP Professional
This route is aimed at individuals working in the IT profession who wish to specialise in a particular role through further certification. The prospective Candidate will first complete the EUCIP Core certification. They will then select a suitable elective level profile to pursue.

2.4 Route 4: EUCIP Professional (acquiring credits from IT Administrator)
This route is similar to Route three above, however in this instance the Candidate will complete some or all modules of the EUCIP IT Administrator course to acquire some of their required elective credit "points".
For example, a Candidate who wishes to achieve the title of EUCIP Network Manager can acquire a large portion of their required credit "points" by completing modules from the IT Administrator course. The balance of the credit points can be gathered through successful completion of other university/certification studies as outlined in the profile document.

References
Advanced Experiences in Norway

Renny Bakke Amundsen

EUCIP, the European Certification of Informatics Professionals, is a professional certification and competence development scheme aimed at IT practitioners and undergraduates. Like ECDL, EUCIP was developed by CEPIS, the Council of European Professional Informatics Societies. This article gives an overview of the experiences of the EUCIP Operator in Norway, EUCIP Norge, in targeting the corporate market through the use of collaborative partners.

Keywords: Certification, Competence Development, Competence Gaps, EUCIP, EUCIP Core, EUCIP Examination Boards, EUCIP IT Administrator Professional, EUCIP Professional, Norwegian Computer Society, Partner Organisations, Professional Certification.

1 Introduction

With a population of nearly 5 million in Norway, an estimated 100,000 people are IT-professionals and approximately 3,000 are IT students. EUCIP Norge started with the corporate market as EUCIP would appeal to those who either lacked or had an out of date formal certification of IT-professional skills. The syllabus definition in colleges and universities is mainly driven by government which takes time to change. As a result, there has been good interest in EUCIP in the private sector, which is expected to increase following the release of the full range of EUCIP Professional Profiles in late 2007.

2 Launching the EUCIP Scheme in Norway

As an early adopter of EUCIP, the initial work involved promoting the certification concept. Based on DND’s (The Norwegian Computer Society) credibility as a vendor neutral IT-professional organisation, the society’s network was used to promote the concept. This was achieved through:

- Meetings with CIOs or HR managers in companies within the computer industry as well as the user industry (where the highest amount of IT-professionals are working) and also in public service.
- Establishing a separate website <http://www.eucip.no>, to promote and explain the concept. As one of the most important marketing channels for DND is through mails and newsletters, it was important to have websites to refer to, instead of using extensive mails with attachments. In addition, EUCIP was also well presented on DND’s own website.

3 Courseware to Fill the Competence Gap

Soon the demand for courseware appeared and EUCIP Norge found a courseware partner, TISIP; a foundation cooperating with the Faculty of Information Technology and E-Learning at Sor-Trondelag University College. They wrote text books (in Norwegian!) and e-Learning programs for each module of the EUCIP Core syllabus.

There are also ongoing discussions with universities and college universities about incorporating some of the 21 EUCIP Professional profiles into their bachelor and master programs. They will probably first be available for the corporate market.
4 Significant Norwegian IT-Organisations as Partners

The EUCIP concept is now fairly well known among IT professionals in Norway. However, EUCIP Norge hasn’t yet reached critical mass. EUCIP Norge is currently in a process of inviting the largest employers of IT-professionals to a partnership programme. To date three Norwegian IT organizations, DND (Norwegian Computer Society), IKT-Norge6 and Abelia5, have agreed to support EUCIP as a general industry standard for professional skills.

In a press release in September 2007 they said: "The majority of professions set standards which, when met, provide an indication of the skills and level of competence a worker possesses. You would probably be reluctant to let a person without a builder’s certificate be the building contractor for your house. Even so, Norwegian businesses purchase IT services worth billions of kroner without requiring formal documentation of the competencies of the persons hired in to do the work. The industry clearly wishes to address this problem."

"This is a big step forward, for both the industry and the industry’s customers” says IKT-Norge’s Secretary General, Per-Morten Hoff. "Certainly there are a number of certification programs which document competence within specific products, but a general competency standard has been sorely missed."

Paul Chaffey, Managing Director of Abelia, also welcomes the adoption of the EUCIP standard in Norway. “EUCIP is a common language for describing skills. We strongly recommend that our members start speaking this language”.

Geir Horn, former President of the Norwegian Computer Society, is pleased for the support from the other organizations. "The Norwegian Computer Society aims to be the leading certification body for IT professionals in Norway, and this co-operation is a breakthrough in achieving this heady goal”.

Adoption of EUCIP implies significant cost reductions for the IT industry. Many companies have found it necessary to develop their own internal standards, and have found that they are of little value outside their own four walls.

"In Software Innovation we used millions of kroner on internal systems for describing the competence of each of our co-workers, without this being worth anything to the co-worker on the day he or she left the company” says Per Kveim, former chief executive of Software Innovation7 and now Chairman of EUCIP Norge AS.

For those that employ IT workers or purchase IT services, EUCIP provides a more general view of competence than today’s confusion of certifications for skills within specific products. A certification from EUCIP says much about a candidate’s abilities, providing they fall in under one of the 21 job descriptions where EUCIP defines formal and practical competency requirements.

The Norwegian Computer Society has an exclusive license agreement for the programme in Norway and has established EUCIP Norge AS to administer the standard. IKT-Norge and Abelia acknowledge EUCIP as an industry standard and, through co-operation with the Norwegian Computer Society, are aiming to achieve the following goals:

- Recognise, document and protect industry standards for IT professionals.
- Further develop a process for mapping and measurement of IT professionals’ competencies.
- Develop goal-oriented training plans and stimulate professional development.
- Promote knowledge of the EUCIP standard within the media and public authorities.
- Create enthusiasm for EUCIP as a general competency standard within the membership of the co-operating organizations.
- Assist recognized educational institutions in developing EUCIP training programmes by identifying the industry’s needs for skills development.

EUCIP Norge is optimistic about the EUCIP initiative following the positive responses received from those visited so far. Essential to this success is the fact that the full range of EUCIP Professional Profiles is now available. This will open further opportunities as these organisations will have an industry standard to use for competence mapping, measuring and development for their IT-professionals.

5 Establishing EUCIP Examination Boards in Norway

Essential for providing EUCIP Professional certification is to establish Examination Boards for each of the 21 profiles. Assistant Professor, Ragnvald Sannes8 at BI’s Norwegian School of Management, and a member of the EUCIP Board of Directors, has taken a leading role in this.

Each of the Examination Boards has a minimum of three members: one from the academia, one in Norway with credibility for his or her skills relevant for the EUCIP Professional Profile (preferably one from The Norwegian Computer Society) and one with the same credibility from the user industry. So far, there has been no problem filling these positions as it is seen as an asset to be titled: A Member of EUCIP Examination Board.

EUCIP recognise formal education as well as working experience relevant for the applied profile and both behavioural and competence skills are measured. In this, candidates are also given credit for holding other (including vendors) certificates if they prove relevant competence. E.g. a candidate gets credit for a Cisco certificate if applying for EUCIP Network Administrator. Due to this, we have started mapping all other certificates for exact EUCIP points for each of the 21 profiles. Vendors now start to show interest in this and are of course eager to assure their certificates are properly mapped.

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5 <http://www.ikt-norge.no/English-infopage>
6 <http://abelia.no/english>
8 <http://www.bi.no/Content/AcademicProfile__63388.aspx?ansattid=f788001>
9 <http://www.bi.no/Content/StartPageEnglish__56401.aspx>
6 Early Adopters for the EUCIP Scheme in Norway

The first EUCIP Professional Certified as Business Analyst in Norway was Senior Consultant David Thomstad in Ciber Norway. His substantial experience within ICT is highly recognised and he has a lot of other vendor and vendor neutral certificates. He also has significant education; however this was from some time ago, so he wanted an updated proof of his ICT professional skills. He says the rest of the Ciber’s consultant staff will follow during the next years to give the company a head start in offering consultancy with highly recognised advisers in the Norwegian market.

Next out is Devoteam daVinci, starting with four experienced consultants who will complete the EUCIP Certification programme in June. Two of which are applying for EUCIP Business Analyst, one for Security Adviser and one for Project Manager. daVinci wants a head start in the Norwegian market as well, but also like to see their colleagues in the rest of Scandinavia as well as Europe on board.

Another interesting case is Microsoft Norway as their Chief Security Advisor Ole Tom Seierstad wants to focus on security in Norway in 2008. As a part of his campaign, he is sponsoring four highly skilled consultants from some of Microsoft Norway’s partners for the EUCIP Security Adviser certification. He would like to make them leading figures within security and says the best way to prove their skills is for them to obtain a neutral accreditation, in addition to their Microsoft certificates.

Next in line is Aker Kværner, a leading global provider of services related to design, construction, maintenance, modification, and operation of both large and small industrial facilities. Stein Schjerve, Manager - Application Management, in Aker Kværner Business Partner wants to try the scheme with a handful of their staff on different EUCIP profiles during 2008. What drew Schjerve’s attention to EUCIP was a standard for categorizing ICT skills useful to define, measure and develop their staff worldwide. Aker Kværner is extremely project oriented and needs an efficient way to put together sufficient project teams with participants from their 35 branch offices all over the world.

These are examples of how candidates as well as their companies make use of EUCIP’s ability to be a neutral way of documenting IT-Professional skills. It is useful for candidates for proving competences and for their companies to have their staff categorised as a base for developing individual competence according to the markets need as well as being able to describe their competence when offering their services.

7 Prelaunch of EUCIP IT-Administrator Scheme in Norway

The IT Administrator programme is well matched to the company structure in a small country like Norway which means that it is a perfect solution for both industry and the public sector.

As a pilot, TISIP (see Section 3), will start a class for computer technicians and undergraduates in September this year enrolling about 50 students. The duration of the course will be one year and will cover all five modules from PC Hardware and Operating Systems, to LAN and Network Services, Expert Network Use as well as IT Security. Temporary employment services have shown great interest in this and The Norwegian Labour and Welfare Administration will be invited to enrol candidates as well.

8 Conclusions

This article describes in short how the Norwegian Computer Society has decided to approach the Norwegian market. The most important element was to achieve acceptance for the EUCIP way of categorising IT-Professional skills as well as the substantial way of measuring competence. In discussions with a lot of companies, even the biggest, it shows that they need and want a regime like this. They all admit it’s important as a base to develop IT-Professional competence for an innovating market approach. They have all tried on an individual basis to develop such a regime, and are interested in adopting this European standard as it is open and free with no risk to implement. The biggest and of course the multinational companies benefit the most as they work on a global market and need to describe, measure and develop their IT-skills on a worldwide basis.

By establishing EUCIP as a standard, we believe there will be a pull instead of a push for certifying candidates according to the vocational structure.

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10 <http://www.ciber-europe.com>
12 <http://www.microsoft.com/nb/no/default.aspx>
14 <http://www.akersolutions.com/internet/default.htm>
EUCIP: A Model for Definition and Measurement of ICT Skills

Advanced Experiences in Italy: The University Approach to EUCIP

Marco Ferretti and Nello Scarabottolo

This contribution reports on the approach of the Italian university system to the EUCIP certification scheme. The academic bodies, Universities, University consortia and central agencies have given a positive, proactive contribution to this effort. The cooperation has been active for some four years now, and will continue. This paper describes the organization that has been set up to support the certification scheme, the actions taken to diffuse its acceptance within the University curricula, and the different modalities for each part of the EUCIP scheme: EUCIP Core, EUCIP Professional (Electives), and EUCIP IT Administrator.

Keywords: Certification, Curricula, Degree, e-Learning, University Credit.

1 Introduction
This paper describes how and why the Italian university system has embedded the EUCIP certification scheme in its curricula. The paper discussess the issue of certification versus university degree, the approach to the different parts of the EUCIP scheme in the Italian academia, the projects that have been carried out and those that are on-going.

A few institutions have been active and some continue in the task: AICA, the Italian society affiliated to CEPIS, that holds the right to distribute and to promote the EUCIP concept in Italy; CINI, the consortium of Italian universities active in ICT [1], that runs the EUCIP programme within universities [2]; Fondazione CRUI, the operative branch of the Conference of Italian Rectors, that has worked with AICA and CINI in the EUCIP4U project (2005-2007) [3]. AICA, CINI and Fondazione CRUI also run an "Observatory on ICT certification" (2000-2008) [4] that includes EUCIP in its reports.

2 Certifications in the University Degree
In this section, we analyse the relationship between professional certifications and university degrees, and we report on the Italian approach.

2.1 Is there a Place for Certifications in Universities?
Certifications are becoming a relevant factor within the ICT community. The first certification schemes were devised by vendors to enhance the perceived quality of their products. Their market has become larger and larger: vendors, companies offering ad-hoc training, publishers, have all contributed to creating a very strong business. A nice paper on the history of certification [5] shows the shift from "product" certifications, to "competence" certifications. Capturing the basics of competence in the ICT sectors is a task that has received much effort: an example is the E-skills Forum [6] promoted by the EU.

Let us start with a tentative definition of what a certification is supposed to offer: "the true value of a certification..."
is its ability to verify that a person possesses skills that are important to an employer" [5]. So, by adopting this approach, what is the answer to the question: Is there a Place for Certifications in Universities?

University degrees in ICT have at least a two-fold task: i) building ground knowledge to prepare student to enter the profession with skills for being creative and effective in the use of technologies; ii) preparing them to handle changes and shifts of paradigms, that are the norm of ICT world. These goals are not typical of certification.

Yet, after considering the matter from another viewpoint, the question just raised can be answered with a yes.

The university system cannot ignore the relevance of certification and must warn students: in the end, students enter a profession and often competences are verified against a syllabus that details specific skills. Holding a certification on top of a university degree does not only offer a newly graduated student a competitive advantage, but shows the potential employer a person aligned to a tightly specified, verifiable ranking system.

2.2 The Approach in Italy

In the Italian university system, ICT curricula are offered in a two-level scheme: the first three-year degree ("Laurea") is designed to prepare students with the basics of the profession; the second two-year degree ("Laurea Magistrale") offers an advanced treatment of specific parts of ICT knowledge. By law, any curriculum within these degrees must allocate some effort to preparing students to enter the professional environment. Universities usually set up placements with companies, or offer short courses on the ethics of the profession. This is where certification can be hosted within a curriculum. Assigning a role to certification within the curriculum, possibly with explicit university credits, helps students perceive the relevance of the certification in the profession. Besides, if in the ICT market that certification is indeed valued, holding it offers advantages when students apply for a job. From another viewpoint, it shows them an independent, non-academic way of assessing competences.

EUCIP is well matched to the Italian university scheme: both have a two-level structure. EUCIP combines a unified ground knowledge level (EUCIP Core) with a multi-face vocational scheme (the profiles of the EUCIP Professional "Elective level"). The EUCIP Core level is by nature vendor independent; vendor specific certifications can be utilised within the EUCIP Professional scheme, thus opening up a way to strike a correct balance between long term skills and practical capabilities on specific software suites or hardware products.

For these reasons, a number of universities belonging to CINI joined AICA in 2003 in the task of assessing if and how the EUCIP scheme could be offered within the university system. After a preliminary assessment carried out within 5 universities, CINI and AICA agreed to launch a three-year project with a number of goals: i) to set up a network of university certification centres for EUCIP Core; ii) to produce a set of e-learning courses to support candidates of the Core certification, both within universities and in the general market; iii) to examine the whole certification scheme (including the EUCIP Professional level) and its relationship with ICT curricula. From 2005 to 2007, Fondazione CRUI, the operative branch of the Conference of the Rectors of Italian University joined with AICA and CINI in the EUCIP4U project, with the specific goal of mapping the coverage of the EUCIP Core syllabus in a significant number of the degrees of informatics in engineering and in computer science, and to favour the granting of university credits to students that were awarded the EUCIP Core level certification. Recently, AICA and CINI signed a new two-year agreement to continue the cooperation; while the first project was focused on the Core level, the new one will mainly address EUCIP Professional.

3 The Structures of University Competence Centres

According to the initial agreement, AICA granted CINI the exclusive right to operate the EUCIP certification scheme within universities. The certification scheme was supported by CINI by setting up a network of University Competence Centres (CCU in the following). In a university CINI establishes a single centre, though many test sites can be active, even in different locations within the same university.

The main reason for this structure is to simplify communication and data exchanges: AICA has a single, nationwide interface, CINI, which handles all administrative and legal chores. CINI itself has a single interface with a University, even if the Competence Centre of that University has many test sites. Accreditation of examiners and of test sites is done preliminarily by CINI on the basis of a special agreement with AICA, whilst the formal final accreditation remains with AICA.

The CCU is directed locally by a professor in informatics, and so is each test site within that CCU. Accreditation as examiners of professors and other personnel involved in ICT is formally granted, provided that the person signs a document whereby he/she declares to have read and understood all procedures established to run examination tests.

CINI has encouraged CCUs to leverage on existing accredited ECDL test sites, to set up the necessary computer room for examination. However, in many CCU the local facilities for usual teaching chores have been shared by the CCU and the university; actually, in most cases the university is one of the members of CINI.

A central coordinating structure manages the entire project, and maintains a web site. Students sign-up to the certification programme at a special reduced rate, and have two years to complete the set of three exams that lead to the EUCIP Core level certificate. Once registered on the web site, a student confirms his enrolment by exhibiting the receipt of payment at the local test sites he/she chooses. After this, he/she can register for one of the examination sessions. All data about the enrolled students, and the set-up of examination sessions, are downloaded from the CINI system.
EUCIP: A Model for Definition and Measurement of ICT Skills

and uploaded to the ATLAS system, used by AICA to run the EUCIP certification.

CINI’s system has a set of communication facilities to publish news and events both centrally and locally. There is a flexible search function on the database of registered users, coupled with a mailing system: both the central project staff and the people at the local sites can set up directed messages to properly selected groups of students.

The structure described above has been used so far to handle mainly the EUCIP Core certification, but has been designed to manage EUCIP IT Administrator as well, and, to a certain degree, the EUCIP Professional "Elective level".

Furthermore, while CINI has an exclusive role to handle the certification within the university, external requests for enrolment and certification by non-students are also accepted, with prior consent by AICA.

To support this effort, and to offer high quality material for a tailored approach to the Core examinations, CINI and AICA also decided to launch a project to develop e-learning material. CINI took up this part of the project which is described in another article by Marco Ferreti and Juan Oruaas in this issue.

4 The Core Level within ICT Curricula

As already stated, one of the major goals of the EUCIP4U project has been the introduction of the EUCIP Core Level into ICT degrees offered by Italian Universities (i.e., computer engineering as well as computer science) as a first step towards the adoption of the overall EUCIP certification scheme.

As the EUCIP Core Level certification provides a unified ground knowledge all ICT professionals are expected to possess (regardless of their specific field of specialisation) the EUCIP4U identified the last year of the first-level, three-years university curricula in computer engineering and computer science as the most suitable time for students to approach such a certification. In fact, it is reasonable to assume that first-level graduating students should possess the ground knowledge certified by EUCIP Core Level, to be considered as a common background for entering the ICT job market, and to be eventually specialised towards a particular ICT field in a second-level, two-year curriculum.

This hypothesis required a deeper analysis of the EUCIP Core Level syllabus (i.e., set of competences the candidate must have to obtain certification) in order to identify its actual coverage by the various ICT university curricula: it is in fact worth remembering that such a syllabus has been defined by a European team mainly focused on competences of professionals (i.e., people already employed in ICT jobs) while university curricula are designed to prepare future professionals, who will integrate techniques and methodologies learned at the University with practical skills ac-

<table>
<thead>
<tr>
<th>Module code</th>
<th>Module content</th>
<th># study hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1</td>
<td>Organisations and their use of IT</td>
<td>30 h</td>
</tr>
<tr>
<td>A.2</td>
<td>Management of IT</td>
<td>20 h</td>
</tr>
<tr>
<td>A.3</td>
<td>IT economics</td>
<td>15 h</td>
</tr>
<tr>
<td>A.4</td>
<td>Internet and the New Economy</td>
<td>15 h</td>
</tr>
<tr>
<td>A.5</td>
<td>Project Management (PM)</td>
<td>20 h</td>
</tr>
<tr>
<td>A.6</td>
<td>Presentation and communications techniques</td>
<td>15 h</td>
</tr>
<tr>
<td>A.7</td>
<td>Legal and ethical issues</td>
<td>15 h</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>130 h</strong></td>
</tr>
<tr>
<td>B.1</td>
<td>Systems Development processes and methods</td>
<td>30 h</td>
</tr>
<tr>
<td>B.2</td>
<td>Data Management and databases</td>
<td>30 h</td>
</tr>
<tr>
<td>B.3</td>
<td>Programming</td>
<td>60 h</td>
</tr>
<tr>
<td>B.4</td>
<td>User interface and web design</td>
<td>20 h</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>140 h</strong></td>
</tr>
<tr>
<td>C.1</td>
<td>Computing components and architecture</td>
<td>20 h</td>
</tr>
<tr>
<td>C.2</td>
<td>Operating Systems</td>
<td>20 h</td>
</tr>
<tr>
<td>C.3</td>
<td>Communications and networks</td>
<td>20 h</td>
</tr>
<tr>
<td>C.4</td>
<td>Internet and the New Economy</td>
<td>30 h</td>
</tr>
<tr>
<td>C.5</td>
<td>Network services</td>
<td>10 h</td>
</tr>
<tr>
<td>C.6</td>
<td>Wireless and mobile computing</td>
<td>10 h</td>
</tr>
<tr>
<td>C.7</td>
<td>Service delivery and support</td>
<td>20 h</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>130 h</strong></td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>400 h</strong></td>
</tr>
</tbody>
</table>

Table 1: Structure of the EUCIP Core Level Syllabus.
quired along their professional life.

This different perspective clearly emerges when considering the three knowledge areas addressed by EUCIP Core Level. In fact, competences grouped under the BUILD (i.e., implementation of an ICT system) and OPERATE (i.e., management of an ICT system) areas (considered the "core business" of any ICT expert) are expected to receive in university curricula a far deeper attention than required to obtain the certification (i.e., university courses should have prepared them well beyond the level of EUCIP Core). On the contrary, the PLAN area (i.e., feasibility study and specification of an ICT system) is frequently considered as someone else’s job, whose results are inputs for the ICT expert going to apply the suitable technologies to implement and manage the required ICT system.

These assumptions have been checked in the years 2004-2007 through two synergic actions:

1. EUCIP4U specific work on mapping actual coverage of the EUCIP Core syllabus in the ICT curricula;
2. CINI monitoring of the examination activities of the CCUs, to measure success ratios of candidates in the different knowledge areas.

Regarding action 1), it is worth reporting some quantitative information about the dimension of the EUCIP4U project.

The Italian Universities that joined the EUCIP4U project were 30 (out of 78). First-level courses introducing their students to EUCIP Core were 65: 39 in Computer Engineering (out of 141) 23 in Computer Science (out of 57) and 1 from the Economy area, plus a Masters course (one year after first-level degree).

Reference people for each course (i.e., presidents of their respective Didactical Councils) have been requested to compare the content offered by their own course with the detailed structure of the EUCIP Core Level (as reported in Table 1, where the three knowledge areas – PLAN, BUILD and OPERATE – are spread in 100 knowledge items grouped in 18 modules, characterized by different study times to reach the level of competence necessary for the certification) and to evaluate the percentage of EUCIP Core requirements actually satisfied by their own course.

A detailed analysis of the results of this collection of data is obviously out of the scope of the present paper: it is however worth presenting the summary reported in Table 2, showing for each EUCIP Core module the average coverage evaluated by the involved courses.

To correctly analyse the data in Table 2, it is important to remember the huge difference between the study time required to obtain the EUCIP Core certification (400 hours) with the one a university student is expected to spend during her/his three-years course (1,500 hours per year). If we measure study effort in ECTS credits (where 1 credit is equivalent to 25 hours study time) the EUCIP Core corresponds to 16 credits, while a first-level university degree requires 180 credits.

Keeping the above in mind, percentages reported in Table 2 mean that: only part of the knowledge items indicated in each EUCIP Core module are covered by the university courses but the covered items are exploited at a far deeper level than that required to obtain the EUCIP Core certification.

In other words, University courses dedicate far more time and attention to a large part of the EUCIP Core knowledge than required for the certification itself, but more than one third of this knowledge relates to topics not covered inside Universities.

Results in Table 2 clearly confirm the assumptions previously discussed. In particular:

- The PLAN area is by far the least covered by Italian ICT University courses. In fact, all its modules have been found to be totally or partially absent in several courses, ranging from a minimum of 36 courses (the A1 module on "Organizations and their use of ICT") to a maximum of 47 (the A7 module on "Legal and ethical issues");
- The 7th. module of the OPERATE area (C7, on "Service Delivery and Support") has also been found to be totally or partially absent in 42 courses (as for the PLAN area, topics in this module are frequently considered out of the "core business" of an ICT expert);
- The BUILD and OPERATE areas are obviously covered in a more complete way; however, some surprises arise

### Table 2: Coverage of the EUCIP Core Level Syllabus by Italian ICT Courses.

<table>
<thead>
<tr>
<th>Module code</th>
<th>Average coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLAN area</strong></td>
<td></td>
</tr>
<tr>
<td>A.1</td>
<td>56.9%</td>
</tr>
<tr>
<td>A.2</td>
<td>52.0%</td>
</tr>
<tr>
<td>A.3</td>
<td>43.9%</td>
</tr>
<tr>
<td>A.4</td>
<td>49.1%</td>
</tr>
<tr>
<td>A.5</td>
<td>47.8%</td>
</tr>
<tr>
<td>A.6</td>
<td>33.7%</td>
</tr>
<tr>
<td>A.7</td>
<td>40.0%</td>
</tr>
<tr>
<td>Total</td>
<td>46.2%</td>
</tr>
<tr>
<td><strong>BUILD area</strong></td>
<td></td>
</tr>
<tr>
<td>B.1</td>
<td>71.9%</td>
</tr>
<tr>
<td>B.2</td>
<td>81.9%</td>
</tr>
<tr>
<td>B.3</td>
<td>95.4%</td>
</tr>
<tr>
<td>B.4</td>
<td>53.3%</td>
</tr>
<tr>
<td>Total</td>
<td>75.6%</td>
</tr>
<tr>
<td><strong>OPERATE area</strong></td>
<td></td>
</tr>
<tr>
<td>C.1</td>
<td>91.8%</td>
</tr>
<tr>
<td>C.2</td>
<td>83.9%</td>
</tr>
<tr>
<td>C.3</td>
<td>96.2%</td>
</tr>
<tr>
<td>C.4</td>
<td>83.5%</td>
</tr>
<tr>
<td>C.5</td>
<td>63.2%</td>
</tr>
<tr>
<td>C.6</td>
<td>50.9%</td>
</tr>
<tr>
<td>C.7</td>
<td>34.4%</td>
</tr>
<tr>
<td>Total</td>
<td>72.3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>62.9%</td>
</tr>
</tbody>
</table>
from the unexpected low coverage declared by about 30 courses in the BUILD B4 module on "User Interface and Web Design" and in the OPERATE C5 and C6 modules on "Wireless and Mobile Computing" and "Network management", thus leading to carefully consider if and how to redesign University courses to take into account the message coming from the professionals environment.

Considerations emerging from the above analysis have been confirmed by action 2) recalled above (namely CINI monitoring of the examination activities of the CCUs, to measure success ratios of candidates in the different knowledge areas) which has been made particularly significant due to the fact that the network of examination centres rapidly grew from the 9 universities already active at the end of 2004, to the 26 of late 2007, with a total of more than 40 sites delivering the certification tests.

Students started to enrol in the certification programme in autumn 2004, with a special fare that packaged the skills card and the three exams. Table 3 shows the progress in time of enrolment, the number of certifications issued, and the success rates (percentages of passed exams) in the three EUCIP Core knowledge areas.

The numbers in Table 3 show some interesting facts. If one considers success rates, the EUCIP examinations proved to be more difficult than expected in the BUILD and OPERATE areas. This effect was larger than one could speculate on the basis of the coverage analysis carried out within the curricula.

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No surprise comes from the PLAN area. Among the reasons for this poor performance one must also take into proper consideration the language issue: the exams were (and still are) delivered in English and the English terminology typical for the PLAN area is quite unfamiliar to ICT technicians where English is only their second language.

Regarding people involved, it must be noted that the certification programme has attracted a good number of students up to 2006; in 2007 enrolment has declined strongly. This decline in enrolment is most probably due to some concurrent facts:

i) students perceive the EUCIP scheme as a whole as something potentially important to their future profession, but they have been offered so far only the least "professional" part of it, namely the EUCIP Core certification.

ii) the EUCIP Professional certification has only been completely specified in its full state of 21 profiles since mid 2007, and has not yet been deployed consistently neither in the Universities, nor in the market.

iii) only in 2008 has the EUCIP scheme been recognized in a few Italian institutions, either in the private area or in the public one.

It is likely that the trend will return to positive slopes when the diffusion of the EUCIP Professional 'Elective level' outside the universities will be effectively perceived.

5 IT Administrator for University Technicians

Some additional considerations are deserved by a particular certification present in the EUCIP scheme: EUCIP IT Administrator. It is clear that EUCIP Core and EUCIP Professional are two subsequent levels of knowledge for ICT professionals, while IT Administrator is put aside from the mainstream, since it addresses a particular subset of technical competences related to practical management of small-to-medium size offices or enterprises, provided with some tens of locally networked PCs.

The EUCIP IT Administrator certification is obtained by passing five tests on the following modules:

1. PC Hardware.
2. Operating Systems.
3. Local Area Network and Network Services.
5. IT Security.

Where competences required by the syllabus consist of the (typical) theoretical but also practical knowledge of computer technicians.

For these reasons, EUCIP IT Administrator is not comparable to the EUCIP Professional Elective profiles, that require a far deeper knowledge of techniques and methodologies (even if it is awarded some EUCIP points in the Network Manager profile), nor to the EUCIP Core (focused on the common background of ICT professionals). So, it is definitely less attractive for ICT University students.

On the contrary, it can be very attractive for University technicians, since on one side it guarantees to the institution that they have adequate operative competences, and on the other side it demonstrates the personal engagement of technicians themselves in certifying their own competences. This is why a few Italian Universities decided to organise specific courses to bring some technicians to obtain this certification.

Among them, the University of Milan, in 2005, selected

<table>
<thead>
<tr>
<th>Year</th>
<th>No of students enrolled</th>
<th>No of students certified</th>
<th>Passed exams (success rates) overall</th>
<th>Passed exams (success rates) PLAN</th>
<th>Passed exams (success rates) BUILD</th>
<th>Passed exams (success rates) OPERATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>226</td>
<td>71</td>
<td>62.0</td>
<td>52.4</td>
<td>70.7</td>
<td>65.4</td>
</tr>
<tr>
<td>2005</td>
<td>657</td>
<td>33</td>
<td>60.1</td>
<td>57.8</td>
<td>63.3</td>
<td>61.2</td>
</tr>
<tr>
<td>2006</td>
<td>444</td>
<td>52</td>
<td>62.5</td>
<td>56.4</td>
<td>66.8</td>
<td>64.9</td>
</tr>
<tr>
<td>2007</td>
<td>161</td>
<td>76</td>
<td>60.2</td>
<td>57.6</td>
<td>63.6</td>
<td>62.4</td>
</tr>
</tbody>
</table>

Table 3: The Diffusion of EUCIP Core Certification
15 technicians and trained them up to the IT Administrator level, in order to build a first pool of skilled people capable of guaranteeing proper operations of the most critical departments and of training younger or less experienced people to further increase technical support to its institutional, teaching and research activities.

At the University of Bologna, a specific effort was made to develop an experimental e-learning activity based upon the IT Administrator certification. Using a little grant assistance from the University whose aim was to foster the production of high quality e-learning contents, in 2005 an e-learning course for about half the IT Administrator syllabus was developed. Specifically, the following modules have been addressed: 1: Hardware, 4: Network Expert User; 5: Security. These were chosen because they looked more interesting for the students. These contents were produced in the SCORM format and were uploaded on an open source e-learning platform. In a period of two years, about 50 students used these contents, in the scope of a special stage activity coordinated with the national EUCIP4U project. The students, all undergraduate, got (nine) credits if they passed the EUCIP Core Plan exam and then studied the available EUCIP IT Administrator material, producing a report on their experience. The material was also used with some technicians on an experimental basis. Neither the students nor the technicians were actually involved in any EUCIP IT Administrator certification exam.

Within the scope of CINI/AICA joint activities, an analysis will be carried out in the Universities to assess their interest in the EUCIP IT Administrator certification and programme, as a tool to actually improve the ICT skills of the technical personnel in charge of the computing facilities (those located in the departments, especially for teaching purposes). The e-learning material developed by University of Bologna will be updated and extended to cover the whole EUCIP IT Administrator certification.

6 The EUCIP Professional "Elective Level" for Young Professionals

EUCIP Professional is the real professional part of the complete EUCIP certification offering and represents the most valuable proposition in the market. Its 21 profiles detail competences that typically cover most of the "professions" in the ICT field. The candidate of the certification must produce a "portfolio" that lists competences along three dimensions: formal training/education, work experience, accredited specific EUCIP modules (beyond the Core, which is mandatory). If this "portfolio" is rich enough (there exist a very precise sets of rules to assess in objective way the dimensions), the candidate is admitted to a final examination.

By its nature, this level of the certification addresses skills and competences that are obtained after a significant period of actual work in the field. So, there is no question that this level of the certification is best located after university. Yet, the university system can help in many ways, within this scenario. However, there is a chance to involve students in the EUCIP Professional level. ICT students at the end of their degree, even if well trained in methods and technologies, are well below the competence level of a professional, in any profile. In some case, however, they are not completely void of a kernel of "professional competence". Indeed, if they have got their degree by preparing their final dissertation as a result of a placement within a company on subjects strongly related to a profile, they could be interested in being awarded an "associate" certificate, should their "portfolio" have the required characteristics.

These considerations, along with the analysis of the declining enrolment rates to EUCIP Core, have led AICA and CINI to prepare a new agreement, for the years 2008-2009. On one side, AICA is setting up a set of services for companies and the general market based on the 21 profiles of the EUCIP Professional level with the "Cantiere dei Mestieri" [7]. The approach of EUCIP as a service for organizations, detailed in an article by Roberto Bellini within this issue, is likely to generate more and more attention on the certification in the Italian ICT market.

Accordingly, the approach to EUCIP within universities will be more focused on the EUCIP Professional level, as well, in many directions.

One of the current difficulties of the EUCIP Professional scheme in Italy is the lack of accredited EUCIP modules. The university system can help in three ways: i) by setting up master degrees that are closely shaped around one of the profiles; ii) by analyzing current university courses in the two-year "Laurea Magistrale" curricula for coverage of profile sub-areas; iii) by designing new courses that are well matched to the profiles and appeal to the ICT market.

The two are quite different motivations: on one side, to encourage students to enrol in the EUCIP Professional certification, by showing them the advantages they can obtain by their formal training in the university; on the other side, to offer the general public a set of university courses that are accredited for certain EUCIP Professional profiles and that can be used without formal enrolment in a university degree.

As far as students are concerned, CINI is planning to map current courses offered within "Laurea Magistrale" degrees against EUCIP Professional profiles, in order to obtain correspondences. The final goal is to have a database of EUCIP points in university courses. Students enrolled in a university degree get not only university credits, but also EUCIP "points" to be utilised later towards the EUCIP Professional certification.

With reference to the general public, a database of university course with their accredited EUCIP points in the various profiles could help organizations and individual get the required number of points for the chosen EUCIP Professional profile. The analysis CINI is about to carry out will highlight to which extent an existing university course can effectively be used: it will be effective if the arguments that match the profiles are treated in a packaged number of lessons, rather than dispersed in lessons distributed along
the course. The higher the "useful" part of a course, the more likely it will be used by people interested in the EUCIP Professional profile.

The Italian university system is currently undergoing a reform. Among the guidelines of this reform, there is the requirement that a degree be designed with proper talks with "social partners", that is organizations that are the ultimate recipient of the university "product", the freshly graduated student. This is a nice opportunity to design university degrees that embed advanced skills, as is required by any university course, but that could also match one or two EUCIP Professional profiles.

Acknowledgements

Many people contributed to the EUCIP effort within the Italian university system. The first workgroup established by CINI in 2003 was composed of P. Ciancarini, P. Della Vigna, B. Fadini, M. Ferretti, A. Martelli, D. Nardi, P. Prinetto, F. Turini and G. Ventre. The 2004-2007 project was directed by a committee with M. Ferretti (project leader), P. Ciancarini, B. Fadini, P. Prinetto and S. Russo. The same group with the further contribution of A. Chianese led the e-learning subproject, with a specific role played by Chianese, Ciancarini and Ferretti in the editorial board. The central operative structure was run by P. Ferrari, and G. Meregaglia constantly took care of the financial management. The joint AICA-CINI-Fondazione CRUI EUCIP4U project was steered by a committee with C. Alfonsi, M. Calzarossa, P. Ciancarini, N. Cimitile (group leader), M. Ferretti, F. Patini, D. Pedreschi, N. Scarabottolo, with the constant support by M. Leo. These projects would not be possible without the voluntary effort of the university professors and personnel that actually run the network of CINI centres and that acted as reference persons during the EUCIP4U sub-project. A final special acknowledgement is due to the late B. Fadini, Director of CINI up to mid 2007, who strongly supported the EUCIP scheme and the collaboration of the university with AICA.

References

Advanced Experiences in Italy: EUCIP as a Shared Model in the ICT Community

Roberto Bellini, Franco Patini, and Antonio Teti

The following article describes some of the most interesting cases of the application of EUCIP-based services. All the case studies refer to the "EUCIP Services for Organizations" described in another article in this monograph.

Keywords: Case Studies, Competence Assessment, EUCIP, EUCIP Based Services, EUCIP Core, EUCIP Professional, International Certification, IT Certification, IT Standard, Ministry of Economy, Personalized Training Plans.

Case 1: Central public administration – Ministry of Economy
The Central State Account (CSA) is part of the Italian Ministry of Economy. In recent years, in order to meet the increasing demand for reliable and timely solutions for the monitoring of public finance, CSA became increasingly aware of the importance of having a leading edge ICT system. The responsibility for updating the ICT system was given to a specialized ICT Function (ICTF).

The ICTF Manager decided that ICT personnel needed to have an appropriate update in many areas of ICT and, in particular, in security and risk analysis, business analysis, systems and network architecture, and in evaluation techniques for ICT project investment management.

Those competencies (some of which were quite new) are now fundamental to guarantee the development of an Information System compatible with the need to manage expenditure while remaining coherent with the requirements of Public Administration.

There has been a demand to promote training paths which, while defined for various professional activities, could be aimed at a large number of human resources with the aim of strengthening ICT competencies within the ICT Function using an organic model.

The main reasons the EUCIP standard was chosen were:
- Firstly, the training paths are structured on two levels, of which the first (Core) level aims to strengthen core competencies and the second is specifically developed for the professional level. The Core level was considered appropriate to disseminate a shared ICT and similar culture for the fundamental elements of planning, building and operating Information Systems. The EUCIP Professional level was chosen because it was considered to be appropriate for creating and developing specialist profiles on the basis of organizational needs.
- The second reason for choosing the EUCIP model is

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its vendor independence. The training paths are not tied to specific technologies and do not impose the use of particular training providers.

The first project, "the development and certification of Core competencies", was in response to ICTF’s need to consolidate and standardize the ICT competencies of 21 internal professionals. After a test performed in order to check the starting competencies of the personnel, a training course (based on the three Core modules, Plan, Build and Operate) lasting a total of 24 hours for each module and combined with a final week of training at the end, led to the EUCIP Core Certification examination. 13 of the 21 candidates passed the exam within the 70% threshold and 8 passed the exam within the 60% threshold. All of them achieved EUCIP Core Certification.

Between the first and the second project the candidates were tested with an assessment of their EUCIP Professional "Elective" competencies. The results of the assessment were very useful as they gave candidates the opportunity of having a clear frame of reference on which to develop a training path to obtain EUCIP Professional certification for the profiles defined by management: Business Analyst, IS Analyst, and IS Project Manager.

Having obtained the EUCIP Core certification and, on the basis of the assessment results and of their curriculum vitae, all of the 15 professionals which started the training paths can expect to achieve the EUCIP Professional Level (Full or Associate) Certification specified by the general management. The differentiation between Associate and Full Level Certification is not determined by competencies (which could be identical) but by years of experience.

In addition, a third project is also underway, in which the consultant provides guidance to help ICTF’s staff deliver EUCIP Core training paths to colleagues.

**EUCIP Services used for the CSA Case:**
- EUCIP Core test.
- Validated assessment of current competencies.
- Design of needs-based training paths.
- Design of personalized certification paths.
- Training delivery and monitoring of results.
- Guidance for ICTF’s staff to teach their colleagues.

**Case 2: Insurance Company**
The Information Systems Management decided to plan the training paths of its ICT Specialists in the competencies required by the EUCIP standard, following the following criteria:
- Participation in the project will be funded in full by the company but the decision regarding whether or not to participate will be totally voluntary for employees. The company will give some “training vouchers” and the staff will be asked only to reach the end of the training paths, which are defined on the basis of the assessment of the gap between the competencies defined by the standard and the competencies of the employees themselves, and to achieve certification.
- For those employees lacking the necessary competencies for the EUCIP standard, training courses will be provided to enable them to acquire the competencies defined by the framework.

The company’s goals are:
- To give its staff an opportunity for personal development, which will allow them to obtain an international certification which is recognized in the ICT industry.
- To improve staff motivation and internal relations by the introduction of a competence scheme. The competencies obtained with EUCIP Core in this case are also considered useful for developing a "culture of excellence" in the company.
- The company may also ask their suppliers to adopt a similar scheme of human resources qualification in projects carried out together. In this way they will be sure to have well qualified external resources.

This particular project was a great success: 41 people (as opposed to the 15 that the company expected before starting the project) out of 45 decided to take the assessment.

The project has various phases: the first is to give the ICT specialists of the company the opportunity to use the ECCO EUCIP tool in order to check their competencies by self-assessment. The evaluation is carried out in multiple sessions in order to permit small groups to work together. Afterwards, every participant is given one week to re-think their evaluations and to change them on the tool.

On the basis of the first indications emerging from the assessment, each specialist participates in an hour long individual counselling session with the EUCIP consultant in order to analyse their evaluation and in some cases modify or confirm it. The EUCIP Consultant only confirms the evaluation after having verified that the candidate has a real understanding of the items. At the end of the session the Consultant shares the result of the assessment with the participant and it is decided which EUCIP Profile the participant is to acquire as a personal development target. This forms the basis for the input in the following stages of the personalized training paths and for recommendations given as to the degree of commitment.

In the third phase of the project, on the basis of all the information collected from the validated assessment and from the individual conversation, and also considering the operational context in which the specialists work (type of company, of business, of IT systems, of projects in which they are involved...), the EUCIP Consultant works to develop 2 different products for each specialist:
- To find the best personalized training path for covering the gaps, by considering the availability of EUCIP training offerings (the training path must be achievable).
- To formalize what emerged from the work by setting it out in a personal letter which will be given to the specialist in a sealed envelope.

Every personalized letter has the following content:
- Competency gaps with EUCIP Professional target profile and the list of the competencies to be acquired.
- Suggested EUCIP training modules/courses.
Suggested practical work experiences.
Suggested books for possible certification.
Indications of the path to certification.

For 75% of the specialists analysed, a complete training path has been defined, capable of covering all the competency gaps towards the EUCIP standard. The project activities by which each specialist could complete competencies they have already gained have also been defined. The EUCIP standard does in fact give credits for certification and work experiences compliant with the target EUCIP Professional Profile.

The project was closed with a Synthesis Report with the following indications:
- The list of the training modules/accredited EUCIP compliant courses, with their scores.
- The total number of training/development days per specialist and in total.
- The number of specialists per training module and in total.
- Possible other courses and examinations which will give each specialist the certification score necessary to be admitted to the certification examination. For this target the gaps on the Core level (Plan, Build, and Operate) have also been considered.

In conclusion, the project was closed with the following considerations:
- Highly active participation of all the specialists who wished to be involved.
- Personal/company level consulting through a complete screening of competencies and profiles.
- Development of the relationship between the company and the employees (Corporate Social Responsibility).
- Structured Report with final recommendation for the company.

**EUCIP Services used for the Insurance Company**
- Validated assessment of owned competencies.
- Design of personalized training paths for each employee.
- Personal and reserved recommendation for each employee.
- General Training Plan for the company, anonymous.

**Case 3: Work Intermediation Agency**
Among the thousands of workers which it places every year, the Work Intermediation Agency also places a large amount of ICT workers. The selectors’ problem is that they do not know much about ICT and even less about ICT professions. To support the work of the selectors, AICA suggested two kinds of actions:
- Some time spent on updating selectors on the differences of the ICT sector, based on the EUCIP standard.
- The use of the ICT assessment tool, populated with the EUCIP standard syllabus, which allows for the identification of the 21 EUCIP Professional Elective profiles, IT Administrator and EUCIP Core level competencies.

The Agency accepted the proposal for each of the three activities of selection and placement of specialized ICT personnel listed below:
- In its activities as a temporary work administration agency, working with thousands of low profile candidates, using an “industrial process” which allows them to obtain the greatest efficiency both for the agency and for the workers themselves.
- In its activities as a traditional selection agency, always based on a commitment from a client company, in order to search for and select a specialist for a steady position.
- In its activities of re-qualification of personnel to be out placed, again based on a commitment from a client company for the qualification and orientation of workers to be reinserted in the market with new competencies.

**EUCIP Services to be used for the Work Intermediation Agency Case**
- Self-assessment of current competencies by the candidate.
- Validation assessment for the candidates selected after the first screening.
- Training Plan and Delivery for the personnel responsible for selection.

**Case 4: Airport Services Company**
The Information Systems Department (ISD) of the society recently reached an agreement with the Trade Unions to develop and organize career steps for ICT sector employees.

That agreement now has to be reviewed and the ISD thinks that the time is right to consider the standard of EUCIP competencies.

The proposed project deals only with technical ICT competencies; the other behavioural competencies will be assumed by the company’s Human Resources Department.

The main company goals for the intervention based on the EUCIP standard are:
- To improve the employee motivation and internal relations by adopting a scheme based on competencies and responsibilities.
- To start a new kind of management in which competencies are a company asset, consisting of people’s “ability to do”.
- To have an organizational tool which could also be used in the future to meet the demand for change which characterizes the ICT sector.

**EUCIP Services to be used for the Airport Services Company Case**:
- Guidelines for the definition of contractual terms based on competencies.
- Validated assessment of current competencies and target competencies for each employee.
- Recommendations for the contractual terms of the employees based on competencies and target profiles.
Case 5: Software House

The Technical Director of the company usually hires dozens of graduates each year in order to meet the demand for software developers in the Java environment. Firstly they receive an internal training course and, at the end of the course, the Technical Director thinks it would be useful to compare the newly acquired competencies with those present in the EUCIP standard, starting from EUCIP Core, in order to plan other possible training interventions or change the training of the newly engaged graduates.

With the requested project, the company aims to raise the quality of its employees in order to improve the products/services it provides and also to improve the motivational factor of its human resources. The company wishes to have the opportunity to benchmark their competencies against an international framework and to select people to be eligible for EUCIP Professional Elective certifications.

EUCIP Services to be used for the Software House Case:

- Validated assessment of current competencies and of the target profile for each employee.
- Design of the company’s training paths for all the human resources involved.
- Design of certification paths for critical human resources.
- Training allocation and monitoring.
- Guidance for the certification of critical human resources.

Case 6: Service Company of a Large Insurance Group

The Service Company of the Insurance Group (SCIG) found out about AICA through the AICA web site and, after exploring the main features of the EUCIP standard themselves, decided to get in contact with AICA in order to solve the problem of "how to introduce a systematic qualification of its ICT Services suppliers". The aim of the project is to optimize the effectiveness of the ICT-based services deployed for the Insurance Group. The employees involved are 150 project managers and thousands of ICT specialists, some of them employed within the group and some employed by external suppliers. The project for SCIG is articulated in 3 sub-projects, all based on services referring to the EUCIP standard. These sub-projects are:

1) General Informative Workshop. The main goals of this sub-project are:

- To disseminate the EUCIP standard among the 150 project managers who manage the relationship with the professional resources provided by suppliers and with consulting services.
- To illustrate how the EUCIP Standard recognizes some professional profiles used by SCIG’s suppliers.

The most difficult part of this first sub-project is the analysis of ten professional profiles used by the suppliers in order to create a matrix showing the cross-reference to the EUCIP standard; this matrix needs to be approved by SCIG before it is presented to the Project Managers.

2) Guidelines to map and manage the consulting services. The main goals of this sub-project are:

- To develop an internal manual for the purchasing office and SCIG’s Project Managers with regard to suppliers, able to support the management of all the professional profiles offered by their suppliers. This matrix will complete the one used in the informative workshops of project number 1 above.
- To describe in detail how to manage the profiles mapped in the matrix in relation to each individual external supplier.

The most difficult part of this sub-project is the development of profile management guidelines in projects involving external resources: in particular it will be necessary to understand how to use the service "Competence Assessment and gap analysis towards the EUCIP Standard" by using the ECCO-EUCIP tool.

3) Supplier’s specialist assessment of the personnel and introduction of possible EUCIP Certifications. The goals of the sub-project are:

- To give SCIG’s Purchasing Office the opportunity to start agreements with each supplier on the basis of the guidelines developed in project number 2.
- To give SCIG’s Project Managers the tools to manage the resources to insert in the various projects in a structured way, helping them to monitor project turnover and the variation of the resource’s value.

The most difficult part of this sub-project is the introduction and management of the assessment service of the specialist resources provided by the suppliers, while taking into consideration the cost of professional resources and the changes which inevitably arise during long projects.

EUCIP Services to be used for the SCIG Case:

- Training Project Management on the main features of EUCIP. Guidelines on the mapping and management of the professional profiles provided by the suppliers.
- Validated assessment of the competencies held by the suppliers compared to the target profiles required by the purchasing company’s projects.

Case 7: ICT Central Competencies Body of Public Administration Case (CCBPA)

CCBPA1 is the Public Administration Organization

1 Although this case is based on reality, to safeguard confidentiality the organization’s name we have used is fictional.
which provides guidelines and controls the specific projects of the Central Organizations of the Italian Government; it gives binding advice on all ICT agreements of the Central Public administration.

EUCIP was presented to CCBPA by the ICT Industry Association, which was interested in having a European reference for the qualification and acquisition of ICT supplies for Public Administration projects. CCBPA asked AICA to define specific guidelines on the quality of ICT goods and services for the definition and governance of supply contracts in Public Administration, as well as update the 8 handbooks on ICT supplies lifecycle and the 37 supply clusters developed in collaboration with the main ICT companies and sector associations.

The projects required by CCBPA in reference to the EUCIP Standard are:
- To integrate EUCIP profiles into the guidelines (37 supply clusters).
- To define the specific professional profiles of the Public Administration based on the EUCIP framework.
- To translate EUCIP documents into Italian.
- To communicate and promote CCBPA project results.

In particular, in the operational handbook of each of the 37 supply clusters, AICA and EUCIP will contribute to the "description of the professional profiles involved" and will also develop the responsibility matrix activities/profiles.

With this project CCBPA and AICA think that the EUCIP framework will achieve widespread dissemination throughout the Public Administration as a reference for the development of internal resources and, also throughout Public Administration ICT suppliers, as a reference for the technical profiles and technical competencies offered.

EUCIP services to be used in the CCBPA case
- Guidelines on the mapping and the management of the professional profiles of PA suppliers.
- Design of an assessment process of current competencies by the resources of the ICT suppliers of the Public Administration towards the target profiles required by the various Organizations of the Central Public Administration.

Case 8: Borsa Lavoro Case
At the beginning of 2007 the Italian Ministry of Labour developed a new system for the online management of employment, called Borsa Lavoro².

Borsa Lavoro is a national system of online services which works on 2 levels: by direct access through the Web or through provincial employment agencies. It aims to put those in search of work in contact with those offering work: it is a system created for any type of job category and employment sector so it has to manage a large complexity when defining and matching the professional profiles of those searching for and offering work.

For this reason, after the implementation of an initial phase in which various ways of describing professions had been proposed, either by attempting to realign them on the basis of contractual declarations or, more successfully, by using less significant classifications (like ATECO codes or ISTAT codes), the Ministry decided to continue with a second phase which went into the descriptions of professions in greater depth. The ICT sector was chosen as a pilot professional sector in order to adopt descriptive models of competencies that would be more suitable for a successful match between work searches and offers of work.

After a detailed analysis of the definition models of ICT professions, the Ministry chose the EUCIP framework, promoted in Italy by AICA.

Borsa Lavoro provides a general framework for the ICT sector with specific information, tools and services able to give the 1.3 million Italian ICT professionals the opportunity to familiarize themselves with and to update themselves in the ICT sector scenario.

The Italian Ministry of Labour has signed an agreement with AICA who will contribute with Borsa Lavoro to draft content for the ICT Sector of the Borsa Lavoro and keep it up to date.

EUCIP services used in the Borsa Lavoro Case
- Information on the world of ICT competencies and professions, with reference to the EUCIP Standard.
- Simplified self-assessment offered to all visitors to the Borsa Lavoro website.

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² Borsa Nazionale del Lavoro <http://www.borsalavoro.it>.
Ireland Implementation Model

Mary Cleary

This article provides an overview of the developments which took place in the implementation of EUCIP in Ireland. ICS Skills has driven the deployment of EUCIP by promoting IT as a career through their ChooseIT campaign, resulting in securing part-funding for EUCIP in Ireland from the National Training and Employment Agency. The article also explores how EUCIP is being promoted by third-level educational institutions as a stepping stone to higher level degree and diploma course, and gives an overview of recent collaborations with the Associations of Northern Ireland Colleges and Momentum NI in bringing the EUCIP programme to Northern Ireland.

Keywords: Careers, Certification, Higher Education, Prior Experiential Learning.

EUCIP caught the attention and the imagination of several potential stakeholders in Ireland as early as 2002, when the programme was first mooted by CEPIS. The Irish Computer Society engaged in a market research campaign which indicated that the EUCIP Core programme could well fill a gap in the market for an entry level professional certification programme [1]. The comprehensive nature of the syllabus placed EUCIP in a unique position, as even degree level programmes failed to provide the broad sweep of IT knowledge which could potentially equip candidates with a very marketable qualification.

However, despite considerable optimism, the level of initial interest among potential learning provider partners was poor, and there was no immediate uptake of EUCIP. Further research revealed an array of factors responsible for this, relating the state of the marketplace, to the certification product itself, and to the identified target groups.

A trend was emerging in Ireland in the early 2000’s whereby the numbers of students opting to study Information Technology at Third Level declined, raising the prospect of a skills shortage at a critical period in Ireland’s economic development. Interestingly, this trend was being reflected across Europe also.

The Irish Computer Society responded to this decline by instigating a campaign to target students at second level to persuade them of the value and attractiveness of working in the IT industry. Negative perceptions of the sector were actively dispelled, and the focus repositioned on the variety of job roles available, and the opportunities to excel that they presented to students. A key part of this ChooseIT campaign was the promotional website [2].

Another factor which inhibited the initial uptake of EUCIP in Ireland was the timing of its presentation. It was simply brought to market too early. The implications of the decline in numbers of IT graduates were not clear, and the advantages of EUCIP over other IT courses and certifications were not communicated and it suffered the same dismissal by second level students as they did. The time had not come for graduates from other disciplines to see opportunities in the IT field, and take on EUCIP as a conversion programme.

Other difficulties were specific to EUCIP itself. On first reading, most interested parties applauded the breadth of content, but on closer examination they felt that the syllabus was too vague. Lecturers would not be able to assign a standard level for delivery. This was a technical difficulty which could be overcome in time. Alongside that, at the time of presenting EUCIP to the market initially, the Question and Test Base was not complete and finalised, and there was no courseware available to support delivery or to assist interpretation of the syllabus. A bank of diagnostic test questions was planned, but was not ready for distribution.

In 2005, the management of EUCIP was assigned by CEPIS to the ECDL Foundation, and within a short period of time, the outstanding issues were all addressed. A working group was established along the lines of the subject matter expert groups for other ECDL products, and the syllabus was refined. Arrangements were made to have courseware produced, and the first publication was delivered in Italy within a few months. The ECDL Foundation made arrangements for this to be translated into English, and a modified version was made available to EUCIP licensees.

With things looking more favourable, ICS Skills was determined to provide a complete EUCIP Core product to the market, and embarked on the creation of an automated test system. Three years on, the local market was also more
receptive to the new IT certification, due in no small part to the impact of the ChooseIT campaign. EUCIP was attracting school leavers, but more importantly, it was starting to appeal to a more mature audience, people working in IT already but without any formal IT qualifications. EUCIP was placed on the Irish National Framework of Qualifications at Level 6 (of a 10 Level National Qualifications Framework) which gave it the credibility to allow it to qualify for funding from Fás, the national training and employment agency. People working in the private sector, or the self-employed could have 60% of the cost of their EUCIP training paid by Fás. This was a great boost for the programme, and made it attractive to the Institutes of Technology to deliver to their corporate clients. These colleges also saw EUCIP as a stepping stone into their higher level degree courses, and offered credits, albeit on an ad hoc basis to students who had completed the EUCIP certification. Examples of this approach included the BSc in IT Management offered by IT Tallaght [3] and more recently a Graduate Diploma in Information Technology offered by Dublin City University [4].

For Tony Hopkins of the Department of Agriculture and Food, EUCIP provided a flexible, non-traditional pathway to formal professional qualification. Mr Hopkins commented that: “I have worked in the IT area of the Department of Agriculture and Food for about 6 years. I had no formal professional qualification but I have acquired a tremendous amount of knowledge while working in this area. I successfully completed the EUCIP course in December and therefore now hold a recognised IT qualification. I would recommend this course to anyone in a similar situation or to anybody who wishes to broaden their knowledge base. Several of my fellow students have gone on to a Degree Course and I hope to do so in September using the EUCIP as my foundation.”

Another positive development for EUCIP in Ireland was the attraction it held for students from abroad, with many Indian and Chinese students enrolling on courses. The international recognition of the certification was attractive to them, as was the professional reputation of the Irish Computer Society abroad. These factors allowed successful candidates of the programme to benefit from increased job mobility options across Europe.

In the last 12 months ICS Skills embarked on an advertising campaign to promote EUCIP as a gateway into exciting and lucrative careers. A series of advertisements aimed at young workers who might be tempted by a change of career, focussing on opportunity and advancement were run in daily “freesheet” newspapers, and yielded a good response in Dublin. In addition, ICS has begun to collaborate with Momentum Northern Ireland and the Association of Northern Ireland Colleges to certify candidates of their software professional course with EUCIP. Successful candidates of this particular programme have been highly successful in finding employment in the IT Sector [5]. “We’ve been using EUCIP on a course which takes non-IT graduates and converts them to software engineers. It gives those graduating from the course a European qualification which is recognised by employers and professional bodies and helps set them up for a career in the IT industry.” says Gary Burnett of the Association of Northern Ireland Colleges.

ICS Skills plan to offer a more stream-lined delivery option beginning in autumn 2008 to meet the needs of candidates with more experience in the IT field. This type of candidate has a desire to complete the certification, but would not require the suggested 330-400 study hours, due to their level of experience. This approach will involve the use of new courseware, web-delivered content and a series of one-day workshops.

By the end of 2007, 232 enrolments had taken place, and 152 certificates had been issued in Ireland.

References
Estonia Implementation Model

Jaan Oruaas

The following article provides an overview of the approach taken by the Estonian Information Technology Society (EITS) in the adoption and implementation of the EUCIP Programme. The article pays particular attention to the roll out of the EUCIP programme and how it is being integrated into the state curriculum in Estonia.

Keywords: EUCIP, EUCIP Core, EUCIP Professional, International Certification, IT Certification, IT Expert Shortages, IT Standard, Ministry of Education, Vocational Education.

In the mid nineties, just before the ICT boom or, to be more precise, enthusiasm over the “new economy”, the economy of Estonia and in particular its education system faced the challenges involved in choosing a way forward. The ultimate need for competitiveness in the process of integration into the European economy dictated the choices made. The government at that time was very ICT friendly (this friendliness did not stretch to the whole technological area due to limited resources) and supported IT infrastructure development and the introduction of IT training into schools. For this reason there was a widely accepted understanding of the need for IT skills.

Higher and vocational education was not receiving attention at the same time. There was a great lack of resources for the development of educational infrastructure and training quality. Vocational schools had to offer new courses to receive funding from the state budget. At this time it was easy to launch IT courses on the wave of the IT boom; unfortunately many of these courses were no more than extended ECDL (European Computer Driving Licence) courses.

The Estonian Information Technology Society (EITS) did not view this approach as a comprehensive way to maintain and develop an educated IT community. EITS felt that it had a responsibility for ensuring continuous recognition of ECDL, the development of proper qualification systems, and curricula for ICT education at the vocational education level. This philosophy was a key factor in the decision to promote the ECDL, and later, the EUCIP initiative. The first problem was very pragmatic – the joining fees for both of these programmes created some problems for our small society. Funding from governmental and EU projects was used to meet this requirement.

Changes in the education landscape started in the late nineties. There were two main initiatives (and some additional items) that enabled quick progress to be made in the chosen direction. The first was an initiative from the Chamber of Commerce to work out a professional certification system for the whole economy. It became clear at that time that all these developments should be regulated by law. The second helpful initiative was CEPIS’s efforts to create independent certification systems for IT professionals. Vocational schools were kept informed about these activities from the very early stages of the work. This involvement confirmed their exact needs, because the use of international experience was the best and quickest way to overcome unsatisfactory teaching quality levels. An established local legislative environment and associated practices were also very helpful. Due to the very strong position of EITS in the IT sector, there was a practice in the Ministry of Education that all ICT curricula had to be approved by this professional organization before a ministry decision. It meant that all new curricula for vocational education were checked against EUCIP Core Syllabus requirements.

The reputation of EITS was established through continuous work over several years in the IT education area. The first credit was obtained following implementation of ECDL certification in the country. Nowadays it is the de facto standard for all levels of IT user training. The latest direct evidence of this is that it is now common practice to define IT skills for computer users in all professional standards (over 700 standards in total) through ECDL require-
ments. Most market recognition of professionals was generated from the distribution of general knowledge collected from the Career-Space consortium project followed by the results of similar work in CEDEFOP (Centre Européen pour le Développement de la Formation Professionnelle, European Centre for the Development of Vocational Training). The distribution of the experience and knowledge gathered in the ECDL community was similarly influential. In short, extensive international experience was very useful in this field.

The qualification system is now up and running. The next step will be to make the required change from a five level qualifications structure to the European Qualification Framework that has eight levels for the description of knowledge, skills and competencies. Ten local professional standards for IT specialists created so far have to be changed accordingly. These are:

- Information technology specialist I & II levels.
- Information technology support specialist III level.
- Software developer III level.
- Information systems project manager III - V levels.
- Information systems analyst III - IV levels.
- CIO V level.

The first one is based on the EUCIP Core level syllabus. Candidates have to pass automated tests in accordance with all EUCIP rules to obtain certificates. Other standards are created on the basis of corresponding EUCIP profiles. The differences between the levels show the requirements of work experience in terms of time, money and people; i.e. how long a candidate has been involved in a particular business and in what kind of projects.

The implementation of new professional standards based on EUCIP Professional profiles and certificates is a problem in small markets where the shortage of IT specialists is very high and employers do not ask for very much in terms of certification. The main and the most effective headhunting method is still based on personal relations.

Even though the market is not expanding very quickly, much has been done to prepare for future developments and to raise the overall level of qualification in the country. EUCIP is the basis for all professional standards and, as a result of this approach, all vocational schools have to consider EUCIP requirements when creating their curricula. The latest development is that five state curricula for software developer, computer technician, database developer, multimedia specialist, and IT project coordinator have been created based on EUCIP. Some success factors played a significant role in this:

- The need for a unified, transparent and independent certification system for the whole economy and for the vocational education system during the economy transition period.
- Perfect timing of the emerging certification scheme for IT professionals in the CEPIS community.
- Legislative support.
- Good co-operation with key organizations - Estonian Qualification Authority, Ministry of Education and its departments, Chamber of Commerce, Confederation of Employers etc.

No system development can avoid weak areas, which may be objective and subjective.

The labour market does not require or, to be more precise, employers cannot be overly demanding regarding certificates of a general nature. Therefore most EUCIP candidates are from vocational schools. One of the key factors of success here is the decision of the Ministry of Education to oblige schools to carry out graduating exams with professional certification. It is important to note that in this case the professional exams are financed by the state.

The success rate of the candidates taking the tests is another problem. There are several reasons for failure, but there are two more important issues to note. The EUCIP Core knowledge area "Plan" has not been considered as a typical subject in IT studies and not many students choose to take this test. An additional important issue is the questionable qualification of teachers and, as a result, the quality of training. Massive training for teachers is planned in coming years to overcome this problem. European Social Fund income is already being dedicated to this work.

To sum up the work in figures, we can speak of nearly 400 certified specialists, 10 professional standards, 5 state level curricula, and 5 test centres throughout the country.
Spanish Implementation Model: Current Situation

José O. Montesa-Andrés, José-María Torralba-Martínez, and Manuel Rodenes-Adam

In this article we review the current state of EUCIP training and its implementation in Spain. In particular, we study the current situation of the "ConsITIO" Masters Degree taught in collaboration with five universities, and the EUCIP accreditation to which it leads. The article also looks towards the future prospects for EUCIP in Spain.

Keywords: e-Learning in ICT, Information Systems Competencies in Spain, Professional Certification in Spain.

1 Introduction

The situation regarding the issue of accreditation and legal competencies of ICT domain professionals in Spain is vague, so we shall begin by exploring the current context and then see how EUCIP fits within this context. Finally we will describe a specific case describing the training required for the Business Analyst profile of EUCIP Professional, within the ConsITIO Masters <www.itio.upv.es>, which consists of to two levels, Core and Professional. This Masters has been developed as a result of a joint project by the Valencia, Madrid, and Catalunya Polytechnic Universities, the Universities of Murcia and Cantabaria, and the Technical Institutes ai2 – (Instituto Universitario de Automática e Informática Industrial and ITT-Instituto Tecnológico de Informática), both from the UPV (Polytechnic University of Valencia), and AIrTiX (Asociación de Investigación de la Industria Textil).

2 The Context

In all societies, when professional services have a direct impact on people and their lives in a certain area, the Government requires a "licence" to practice this profession. This licence is obtained after a regulated training process and/or certification exams. Classical examples are medicine and architecture.

However, there are other professions that are not regulated. As examples we can cite novel writers, bakers, and shoemakers. Of course, there are also intermediate situations, especially when companies try to be accepted by consumers. In this case, companies seek professionals who provide certain levels of quality in their services. A good example is a football team.

If there is state regulation of professionals, companies are forced to abide by it, but even so, if companies want to progress they must select their staff carefully. An example could be a firm of architects, or a prestigious medical clinic.

2.1 Information System Professionals

Due to its youth and the diversity of job characteristics there is very little regulation in the field of information systems in Spain. Given this lack of clear references for the profession, many companies, especially those of a certain size, have been forced to select and train their staff.

Considering that the working life of a professional typically lasts about 40 years, and that colleges and faculties of ICT in Spain, such as the one in the Polytechnic University of Valencia, is celebrating its 25th anniversary (the first ICT schools and colleges in Spain started 31 years ago), then it is easy to understand that even today, despite the large number of graduates in ICT, the social demand for such professionals is only partly met; the remainder is covered by other graduates who have been recycled into ICT. Even today, the context is not clear, due to the lack of a widely accepted structure of professions, as well as the professional backgrounds of their professions. In Spain it is
difficult to know what profiles are associated with each training level.

Admittedly, there have been several efforts to address these issues; for example EISS (European Informatics Skills Structure) from CEPIS [1], or the work of the Career-Space consortium [2] which, although focused on the definition of profile, did help facilitate the selection processes. Career-space [3] provides a little more and created some guidelines for the development of curricula in ICT. In Spain EISS was the basis for the "Reference Model of Computer Functions for Recruitment" (MRFI-C) from the "Ministerio de Administraciones Públicas". Career-Space has had an impact on the white book on informatics (2004), a guide for the development of future university curriculum focused on the European space, for new Spanish careers in ICT.

The EUCIP approach, as discussed in other articles in this publication, goes further, because it not only structures professional profiles but also proposes a certificate structure that requires certain levels of knowledge and practical experience. This simplifies the staffing of companies, since they can focus on qualifications while assuming the knowledge, skills and attitudes that have been evaluated in the certification process.

In Spain the problem is complex and ambiguous because associations of informatics university graduates are pressing the Spanish government for similar treatment as other engineers (and architects), for whom a university degree is mandatory if they wish to pursue their profession in a legally recognized manner. For example, Telecommunications engineers, which are also considered as ICT professionals, have powers recognized by law.

In this context, EUCIP should be recognized as it is an independent professional certification of skills and expertise. In the case of non-regulated competencies, it will be an excellent reference for professional standards, and even in the case of regulated competencies it will provide a set of good practices for professional updating. Nowadays, it is quite normal to see professional certificates, as well as formal academic qualifications, in medical clinics, and we should not be surprised to see a similar situation in other professions. In fact, it is quite normal to hear of people talking about updating their knowledge and taking part in continuous education. Moreover, in other professions we regularly speak of accreditations such as the PMI (Project Management Institute), PMP (Project Management Professional) or similar accreditations from IPMA (International Project Management Institute). In the context of ICT in Spain, there are common recognized certificates from companies such as IBM, SAP, Oracle, Microsoft and CISCO.

3 EUCIP in Spain

In Spain, a foundation was created, the "Fundación EUCIP España", to operate in Spain and Andorra with the purpose of promoting and standardizing certification (in the same way as the ECDL Foundation), while licensing EUCIP courses and working with employers <http://www.eucip.es>. ATI (Asociación de Técnicos de Informática) is the Founder Patron of this association, and there are a number of other founding partners such as COMFIA CC.OO. and Élogos Conocimiento. To give an overview of the partners:

- ATI holds the honorary position of Founder Patron, since it is the Spanish member of CEPIS and EUCIP <http://www.ati.es>.
- COMFIA (acronym for COMisiones Financiero y Administrativo) is the Federation of Financial and Administrative Services Union (CCOO), born as a result of the merger of FEBA (State Federation of Banking and Savings) and FES (State Insurance Federation). It subsequently incorporated other associations such as administrative services, telemarketing, engineering offices, planning and computer services <http://www.comfia.net>.
- The company Élogos Conocimiento SL is oriented to the development and implementation of training solutions <http://www.elogos.es>.
- ATI focuses on clarifying the professional structure in the field of information technology in Spain. It is also involved in the provision of EUCIP certification in Spain, paying particular attention to its members, but also taking into account all other ICT professionals because, as a professional association, all professionals are candidates to join ATI. In fact, it has already offered free "Core" courses to its members and is currently organizing EUCIP IT Administrator courses.
- Élogos Conocimiento develops EUCIP course materials. The EUCIP Core courses offered by ATI were developed by Élogos Conocimiento.
- Given the job profile of many of its affiliates and its sphere of influence in ICT consulting companies, COMFIA CC.OO also intends to develop this type of training for its members and other stakeholders.
- In this context some ATI members, mainly professors from the UPV such as Julian Marcelo and others took the decision to create an "ICT Consulting Masters" following the guidelines of the EUCIP Professional Profile [4]. Since this is a university masters, we also need to address other requirements, such as a minimum amount of credits or a mandatory project.
- ATI welcomed this proposal and members such as Miquel Sarries provide their selfless support to this approach. At present the first edition of this masters started in September 2007 and will finish in February 2009.

4 Master ConsITIO (Consulting ITIO-Integration of Information Technologies in Organizations)

This masters is structured in three levels [5]. The first level, called the specialist ConsITIO, is equivalent to the "Core" and lasts one semester. This level seeks to standardize competencies, providing the students with a background in management, an introduction to the world of ICT, and for those who come from the technical area in ICT, an entry point into the world of management. The aim is for every student to understand the planning, construction and operation of information systems. The second and third levels are developed over two semesters and lead to the Masters degree. In both cases three objectives are pursued:
To train professionals with an attitude of service and competence in ICT, enable understanding of complex organizations, extract requirements, modelling processes, and identify the appropriate ICT solution [6].

- To provide a professional program that prepares for international accreditation by EUCIP. Knowledge and practices are evaluated in the masters and provide the university masters title, but students must be evaluated by EUCIP.
- The third objective is to provide phased and flexible modular training so that it can be tailored to each student, and allows for modular registration and flexibility in both time and place of study, using the collaborative blended learning style.

This masters requires the completion of 60 ECTS (European Credit Transfer System). As we adopted a blended learning method, these credits are divided into 6 presental credits and 54 non-presental (distance) credits, mainly using Internet technology. We opted for blended learning, as already indicated, because we work with professionals who have little time and who cannot all be available at the same time.

4.1 Masters Structure

The masters is broken down into six areas: the first three areas are equivalent to the areas in the EUCIP "Core", the other three areas - "Essential Behavioural Skills"; "Incisive Level Competence" and "Deep Level Competence" - comprise the "Business Analyst" elective unit.

Each of these areas is broken down into modules, which are equivalent to the categories listed in the Core and Elective units, with the exception of the "Essential Behavioural Skills" area which is not developed in the EUCIP profile but has also been broken down into modules for the purpose of this course.

The first semester is equivalent to "Core", and the first three areas represent 15 ECTS. In addition, to pass the assessments of the modules, candidates need to complete a tutored project.

The second semester develops Area 4 "Incisive Competence Level" and area 5 "Essential Behavioural Skills".

The third semester is dedicated to the Area 6 "Deep Competence Level" and the "Masters Project". The Masters Project tries to be as close to the business world as possible in order to provide a degree of specialized training and the set of skills associated with the "Major Competence Level1".

Each semester is broken down into modules (EUCIP categories), which are taught as we shall see below, and also some presential sessions, two sessions in the first semester, and one session in each of the other two semesters. The sessions are devoted to lectures by teachers and guests conducting tutored practice, and exhibitions by students.

The sessions also provide the means by which students meet each other personally, and include participatory training and shared experiences.

When each module starts, students can access the documentation, including the introduction, additional reading, and associated activities to be developed and used to evaluate the module, this includes:

- Tests.
- Questions.
- Individual and team cases.
- Problems.
- Discussions.

Within the module information an indication is given to which elements are mandatory and which are complementary. It should be noted that we work on a weekly basis and it is important that students are asked to contact the module teacher and/or the Masters coordinators if they have any queries.

5 Conclusions and the Future

Our experience with this model of training has been very positive. Participation in discussions is used in the evaluation of some modules and the teacher responsible for the module starts off the discussions by proposing a list of topics. Then students usually talk about their experience regarding the module topics and discuss related professional problems faced by them or their companies.

In the future we face two challenges: on the one hand, collaboration with other European Masters, and on the other, the development of other elective levels close to the present ones, in particular in terms of their orientation towards project management information systems (EUCIP IS Project Manager). We are also considering collaborating with other project management Masters, creating modules to complement EUCIP.

References

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EUCIP Certification Program in Poland was preceded by the research, which showed that all examinations processes, described by the ECDL Foundation, can be highly aided with the Internet Computer System. Polish Information Processing Society (PIPS) decided to implement EUCIP in Poland and base it on such a system, which was named EUCIP Examination System (EES). Now EES may support or automatically execute EUCIP proceedings. It consists of some modules, which are responsible for different activities like: payments, invoices, examination Core, examination Professional, and User (Candidate) account. The article also describes systems functionality designed for the Candidate, Competence Centre, PIPS accountancy and the Administrator.

Keywords: EUCIP, Internet System, IT Certification, Workflow.

1 Polish EUCIP market: the System Environment

The European Certification of Informatics Professionals (EUCIP) idea is aimed at people who are directly connected with IT, so they can be called IT Professionals. Such a target group gives wide possibilities to automate the certification processes using an Internet system. EUCIP certification procedures may be easily described using Business Process Management (BPM) methods and then used in a workflow, which is supported by the Internet system. As the advantages of workflow and electronic information flow are obvious and are well described in many articles, that issue will not be mentioned in this article.

The Polish Information Processing Society (PIPS), used the fact described above, to base the EUCIP Programme in Poland, on such an Internet system and named it the EUCIP Examination System (EES). The system was designed, taking into account all the rules described in EUCIP Standards and Procedures documentation, as well as Polish market demands. Considering the amount of paper documentation, produced by Polish ECDL proceedings, since it was implemented in 1997, PIPS decided to base all EUCIP activities, on electronic documentation. Now EES is available for candidates in Poland 24 hours a day, so they can register, pay and plan their examinations, at any time, from any computer connected to the Internet. EUCIP candidates may use two main parts of the system.

The first system element is a regular web page [1], which contains all the information about the programme, such as: EUCIP programme introduction, certification levels, Core modules, Professional specialisations, exams and certificate prices, procedures (available also as an animation show), actual competence centre (CC) data and a detailed EES user guide. Many of them are provided as PDF documents, which may be easily downloaded and printed, so it becomes typical paper documentation, like used i.e. at ECDL.

The second element is a dynamic EUCIP Examination System [2]. It is further divided into separate modules, responsible for specified activities like: payments, exams, user accounts and accountancy. The EES user is automatically switched between the relevant modules, so he/she won't feel any inconvenience. To use this element, candidate must become a certified user, which means he/she must register into the Polish EUCIP candidate's database. This is equal to purchasing the Record of Achievement (ROA) in other EUCIP running countries. After a registration, the user gets his/her individual account for the System. EES gives the candidate a possibility, to begin his/her EUCIP certification path, using his/her personal computer, connected to the Internet, at any place and any time.

2 Systems Architecture

The Polish Information Processing Society, decided to join the EUCIP Program at the second quarter of 2007. Official Polish EUCIP certification started on the first of February, 2008. The time between these two dates was spent on preparation, especially designing and implementing the
Due to the lack of time, the EUCIP Examination System takes advantage of some modules, which were developed earlier and already used in other educational and examination units. To meet EUCIP needs, such modules were adopted and partially rebuilt. The main problem was to set proper communication between the modules, because they were produced using different technologies.

All of these issues were successfully solved and now the system contains four general modules, which work together, as a single system. EES modularity is presented on Figure 1.

The most important and complex of the four modules is the Main module. This module acts as a gateway for the information processed in other systems components. The next two modules: Core and Professional examination modules, are used to process the exams on two different levels. The Core module was entirely adapted to the system, as a standalone application and uses other technology, than the rest of the system. It also separates the Question and Test Database (QTB) and taken exams history, from the rest of the system, what gives additional protection against unauthorized access. The last module is an outsourced payments service. This module operates all the money transfers between PIPS and the candidates or competence centres, resulted from the certification and authorization procedures. As mentioned above, the main module manages all the information flow, what means that the passed data must always run through this part of the system. Specified tasks are assigned and passed directly to the relevant module, which takes it into its proceedings and returns the result.

The main module is a kind of manager to assign tasks to the specified resource (module) and wait for the result, to activate the next step of the modelled process. Most of the processes in the system flow automatically, without any administrative activity, but there are also some breakpoints which needs to involve the Competence Centre or a system administrator decision. The whole system is a virtual partner for the candidate, which prepares him/her for the examination, then examines and announces the result. Additionally it helps the candidate, to go through the examination.
tion process on each part of it. That's why the candidate doesn't need to contact any EUCIP representative, to get or pass the information, needed to make the process go forward.

Communication between the separate modules is hidden for the user so the switching between different systems is seamless. Candidates have a personal contact with the certification party, only while taking the exam (fulfilling the test in a EUCIP Core or Professional final exam). This is a requirement to prove the candidates identity, before the Core test or to estimate personality for the adequate points assigning in Professional. Candidate’s personal contact, with the board of examiners in professional level, as required by the ECDL Foundation.

The data gained in the specified processes are stored in separate databases, connected directly to the module which got it from the user or proceedings output. Only the Main module gets some information from the other systems components, because it is necessary as an input, for the further proceedings. Such partial data are additionally stored in the main system database. Detailed and complete data which are stored in other databases are accessible only through the specified module.

3 Systems Functionality

EES functionality is very wide and constantly developed to adjust the system for EUCIP certification in Poland. There are three main types of system users. Firstly, and the most important, is a systems administrator. That kind of user account has the widest access what means the biggest impact on the system. Managing the system provides not only the biggest access rights, but also many duties and acceptance of the huge responsibility for taken actions. The Administrator is able to use all the CRUD functions (create, read, update and delete) on the candidates database. He/she can also suspend candidates account if required. This may be used to block candidates which have broken the regulations they accepted in the account creation process. Through the administrators account, he/she can also add, edit, suspend or remove competence centres systems accounts.

On the professional level PIPS uses a board of examiners to prove the candidates skills as a concrete specialist. EES administrator creates the examiners database, which is further used in the Professional examination process. Every single examiner has assigned knowledge areas, on which he/she is able to evaluate someone’s achievements and knowledge. In addition, some of the examiners may fulfil a board chairman function and be assigned this right.

The Administrator is also authorised to browse the exams database and even cancel these which were taken and were not passed. That is a specific function which gives a possibility to annul the exam which was failed, owing to circumstances beyond anyone's control i.e. systems or connection failure. After such an operation, candidate gets a second chance to take the exam, without additional costs. The last of the administrator’s main functions is partial accountancy management. He/she is able to browse the invoices stored at the database and produced automatically by the system after getting the candidates payment.

The second user type is a competence centre account. It is created and accessible directly at the Core examination module. That kind of account has a right to plan and run exams on the specified (authorised) computers. Exams may be planned, after the user has paid (in Main module), from every computer connected to the Internet, after logging into the CC account. The test may be taken only on the authorized computer, located at the CC location and at the specified (planned earlier) time, with a 15 minutes time offset. The test is loaded and checked automatically, on the main EUCIP Core examination server. The only role of the competence centre in the examination process, is to plan the test time, prove candidates identity before the exam, provide a testing station, secure formal requirements during the exam and then print the exams result, mark it with the individual CC EUCIP stamp and pass it to the candidate. Each of the tasks, mentioned above, is supported by the SEE – competence centre user account. Moreover, the system provides a statement of the exams taken at the specified CC, which is generated at the end of each month. Such a statement is a key document for the CC, to get a reward from PIPS, for the examinations provided to the candidate. The described document is available for the PIPS and CC, using the System. The Examination history for each competence centre is kept in the database for one year and then moved to the offline backup.

The last account type used by the candidate provides him/her with plenty of functionality connected with his/her personal data management, payments and invoices, at last examinations of both levels: Core and Professional. Personal details may be freely changed by the user, with the exception on the personal identity number which is also an account login. Such a number is provided to each citizen in Poland by the government, just after birth and is generally unchangeable. It is used to identify each person which has a Polish nationality. EES also uses that numeration to identify people and to avoid re-registering the user account between two different people, i.e. after passing some of the exams. Using the candidates account type, 'credit' can be loaded which can later be used for exam activation. Candidates can 'top up' their account balance using outsourced payments system. The system provides many different payment methods such as: fast bank transfers, credit or debit cards or just a printed payment form, which can be processed in every bank or at the post office. Using the fastest of the mentioned methods, a candidate can get money on their account in a few minutes after the payment was made. After such an action, candidate gets an invoice which is available at the "invoices" tab on his/her account. The rest of the examination process is also supported by the system, but needs the personal feedback of the competence centre. After the exam is paid and activated, candidate may use the system, to set a time, date and the place, where the test will be taken. Such information is put into the system by the CC.
and then accepted (or not) by the candidate. After obtaining that stage of the process, test time and place can be changed only by the administrator and needs the atypical circumstances to do that.

On the professional level EES provides a tool, for uploading an electronic version of the portfolio, which is further evaluated by the board of examiners. The number of points which were given for each of the uploaded documents are also shown to the candidate, so he/she can constantly watch his/her points balance, given for the portfolio. After obtaining a minimum of 32 points he/she may proceed to the next level of the final Pro examination meeting. Using the candidates account he/she can also order a certificate, which will be sent to him/her by standard post. The certificate ordering option is available only when the candidate is licensed to get such a document, i.e. the required exams have been passed.

Depending on the account type, the system can create and provide wide statistical material of the tests which were taken (passed or failed), information on where tests were taken (in which CC) and what is the percentage of positive and negative results in a specified CC. The EUCIP Examination Systems functionality covers many different situations, which may appear in real life, but such detailed descriptions are beyond the scope of this article. All the functions described above represent only a portion of the system, but gives a possibility to imagine the whole EES concept.

4 Access and Security of the System

The whole system architecture has been designed to maximise protection of the data stored in the databases and processed in the modules. The system uses predefined processes, where most of the tasks are automatic. This ensures a minimum human risk factor, which may cause potential errors or a false data input. Additionally, systems protection is based on access control security. This means that every single user is given only the rights that he/she may need to use the system properly. For example, a candidate can't order a Core Certificate, until the system gets the information that he/she passed all of the three module exams.

The activation of the Professional level will also be unavailable in the user interface, until he/she gets a full Core certificate. Competence centres may not manipulate the Core test because they have no impact on the question configuration, in the specified test session. The test consisting of 45 different questions, taken from different subject areas, and is created automatically on the centrally located server (connected with the Core examination module) and sent to the candidates' station, located at the CC.

Moreover, the test is fulfilled by the candidate directly on the server, so the questions are not even for a minute, stored on the local computer's hard drive. After 60 minutes from the session start time, the system automatically closes the connection, sending only the percentage result of correctly checked answers. Such a confirmation is the only printed (or stored) document, which the CC and the candidate can get after the test submission. They don't have any access to the exam history to find out what were the questions and the correct answers. Such a possibility is assigned only for an administrator account, so he/she can use it in case of a complaint lodged by the candidate. The exam result confirmation, mentioned above, contains the total percentage result, and the percentage results of the specified subject areas used in the test.

The most important value is a testing station authorization, used for the Core examination. To get access into the EES, a competence centre must get through the authorization procedure to ensure the best quality for the EUCIP Core examination purposes. That procedure will be further described in the next section. After the CC becomes an authorised EUCIP Core test centre, they gain access to the system. At this level it may plan the examinations of the candidates using a given login and password. Inside the CC hardware infrastructure, there are only a few computers which may be used to process the exam. PIPS provide an authorization for the computers which are located in the examination friendly environment only. These computers are added into the trusted hardware list, what means that the system may set an examination connection, to such a unit.

To ensure the security for personal data in the EES, the whole communication between the server and the candidates or competence centres computer, is set through the Secure Sockets Layer (SSL) protocol. Each database of the system has an automatic backup procedure, which is activated every 24h and may be recovered in less than 1 hour after a potential database crash.

5 Other Activities in the Polish EUCIP Approach

As it was mentioned above, PIPS maintain a high quality for EUCIP examinations. For this reason it runs a quality assurance program responsible for competence centres selection and authorization. To become an authorized EUCIP test centre (TC) it must fulfil some requirements, from the appearance of the overall location, to the specified computers and Internet connection quality. Such an authorisation certificate is issued for two years and must be further reissued every 2 years. PIPS also limit the quantity of EUCIP TC at any one geographic area. It means that initially, there will be only one TC for each city or province, except main metropolitan areas such as a capital city and similar.

Every authorized TC gets a "welcome pack" which contains some materials used for EUCIP examination proceedings. Every trusted computer used for testing, must be equipped with the provided mouse pad, which was designed to prove computer systems access rights and promote the EUCIP Program. The Competence Centre also gets two framed certificates; one is a EUCIP Core Certificate model, second is a PIPS Authorized Test Centre Certificate. Both of them should be placed in a visible location for potential candidates. PIPS also provides printed documentation, where the procedures are well described and a individual stamp, used to prove the printed documents, which comes
out of the system. Polish Information Processing Society does not earn money from issuing the TC authorisation. The authorisation fee, which is paid by the competence centre, is used to defray the "welcome pack" content and audit cost.

In the Professional level, quality is assured with the board of examiners selection. People which are asked to take part in examination board activity, represent the highest level of knowledge in specified IT areas. Each board is automatically generated just after the candidate activates his/her Professional exam. The board composition is selected based on the elective profile chosen by the candidate and the cognizance of the examiners, stored in the database. Such a selection guarantees the highest quality of the candidates' portfolio evaluation.

To increase the certificate authority, it is issued as a full colour high quality print, proven with the ECDL Foundation hologram, PIPS numbered individual hologram, PIPS round stamp and a original signature. Such a diploma is framed in a wooden frame and provided to the recipient packed in the special carton. The package is delivered directly to the certificates owner, using the postal courier.

EUCIP in Poland try to distinguish itself from ECDL, not only by the different IT skills level, but also as a prestigious certificate. That's why most of the proceedings are covered by the EUCIP Examination System, which is accessible through the Internet. It provides the candidates not only with the best functionality and many facilities, but also a high maintenance level. All of these factors give a candidate the feeling that this program is well prepared and he/she can feel very comfortable using it. He/she is not taking just another exam, which looks like the others, but is taking part in a big certification project, where everything is well designed and works just as it should. Such a strategy was chosen to distinguish the EUCIP on the wide IT certification market and is expected to be successful.

References
Implementing EUCIP IT Administrator in Romania

Ana Dulu

This article provides an overview of the approach taken by ECDL Romania in the roll out of EUCIP. In particular, the Romanian EUCIP operations relate to the EUCIP IT Administrator programme and the relationships with suitable test centres with experiences of offering similar programmes for IT professionals.

Keywords: EUCIP, International Certification, IT Administrator, IT Certification, Networks, Security.

EUCIP is a pan-European qualification scheme for people entering the IT profession and for IT professionals wishing to continue their professional development. It has been developed as an independent, European recognized scheme for IT professionals and was created by CEPIS, the Council of European Professional Informatics Societies. The European Certification of Informatics Professionals (EUCIP) is a professional certification and competence development scheme aimed at IT practitioners and undergraduates.

The objective of the EUCIP programme is to offer a recognized certification of IT competence at a standard prescribed by CEPIS (The Council of European Professional Informatics Societies) for IT professionals, to meet the demands of the increasing market for IT professionals across Europe, to offer a vehicle for life-long learning and competency enhancement for the IT profession.

In Romania the qualification was aimed at practitioners working in industry, government and public organisations alike as well as students from high schools.

The advantages that we promote in Romania for EUCIP certification program are:

- A European qualification (EUCIP is a European qualification sponsored and guaranteed by CEPIS).
- Flexibility (candidates are offered a flexible delivery and examination approach).

In Romania, promotion of EUCIP is currently focused on the EUCIP IT Administrator certification. EUCIP IT Administrator is a standalone certification program that certifies practical and theoretical knowledge of computer technicians. ECDL Romania chose this certification because it covers a wide range of Hardware, Software and Networks knowledge areas.

In Romania we attempted to create a network of suitable Test Centres to offer the programme. This involved working with government, academies and CISCO Academies to ensure the growth of the programme and widespread adoption of EUCIP as a national standard. ECDL Romania began the implementation of EUCIP IT Administrator in December 2007 and to date the response from the market has been quite low.

The first EUCIP IT Administrator Testing Centre in Romania is CREDIS Academy, the largest Cisco Academy in Romania. CREDIS Academy decided to become a EUCIP testing centre after having heard about the success it had in other countries that already decided to get involved in the programme. Furthermore, the academy had to find another method to certify their high-school students that were mostly unable to pay the price of testing their knowledge by applying for the CompTIA A+ certification. The Cisco Networking Academy Programme promoted the first three exams of the EUCIP IT Administrator Certification by inserting a chapter that presented the benefits of the certification into the IT Essentials course and also gave a mapping about what the students should study from this course in order to prepare for the exam.

The first students that applied for the certification declared that they have chosen this certification mainly because of its high development in other European Countries. In order to find a good job in Romania it is highly impor-
tant that you acquire as many certifications as you can, be-
cause most employers are adopting the western methods of
evaluating the candidates when hiring somebody (ensuring
that they are certified). Also, the certification is expected to
become a standard in a similar fashion as was seen with the
ECDL certification in Romania. Therefore candidates could
take the advantage of passing the exams at the beginning of
the programme in the country.

The target audience for the EUCIP certification in
CREDIS Academy are principally youngsters, because they
are the main target for employers in the IT market and be-
cause the population in Romania is already demographi-
cally aged. For now CREDIS Academy are mainly promot-
ing the IT Administrator certification to the high school seg-
ment, but have also kept it available for other potential can-
didates.
An Overview of Recent Adoption in Croatia

Kristijan Zimmer and Enola Knežević

This article provides an overview of the EUCIP programme as organised in Croatia by the Croatian Information Technology Society (HIZ/CITS) through its network of seven newly established test and education centres. The article explores the first EUCIP Core education and certification pilot programme that took place in Zagreb between March 25th and June 13th, 2008, as a result of collaboration between HIZ/CITS and Algebra IT School. The article also outlines plans to roll out the EUCIP Professional level certification.

Keywords: EUCIP, EUCIP Core, EUCIP Professional, International Certification, IT Certification, IT Expert Shortages, Professionalism in IT, Test and Education Network.

1 EUCIP Core Roll Out

The EUCIP programme (European Certification of Informatics Professionals) was introduced in Croatia for the first time during a press conference on March 6, 2008, at the Faculty of Electrical Engineering and Computing, University of Zagreb. The programme is organised in Croatia by the Croatian Information Technology Society (HIZ/CITS) through its test and education centres, with Algebra IT School as the forerunner.

One of the problems EUCIP aims to solve is the existing demand for IT experts in Croatia. The lack of IT experts in the country is currently estimated at being between 3,500 and 9,000, while only around 900 students graduate annually from higher education programmes in the field of informatics and computing. Therefore, one of the main goals of the EUCIP programme is to define the standards for basic and specialist IT knowledge, in order to provide additional education for those who are migrating to the IT field from other fields and vocations, and help those who wish to "update" their knowledge with new technologies, practices and standards in the field.

Another important goal is to promote professionalism in informatics in Croatia and help create an efficient organizational model, such as the professional chamber, that would protect and help IT professionals by improving the IT legal framework, working conditions and their position in a better regulated market.

Following the launch of the EUCIP programme in Croatia, the president of the Croatian Information Technology Society, Mr. Mladen Glasenhardt said: "After having successfully initiated the ECDL programme, which has so far been completed by over 12,000 people of all vocations in Croatia, the Croatian Information Technology Society will focus on informatics professionals and offer this programme to those individuals, bodies of public administration, corporations and academic institutions which operate in the field of informatics".

The first EUCIP Core pilot education and certification programme started on March 25, 2008. The pilot consists of a 6-week education programme, spread over a 3-month period to enable sufficient self-study time and the possibility of consultation and learning support. The programme aims to provide an insight into the foundations of the IT profession as specified within the EUCIP Core curricula.

The pilot programme was organised in a partnership between the CITs and Algebra IT School, which at the time was most familiar with the EUCIP programme, since Alge-
Algebra IT School was founded in 1998 as a lifelong learning company and soon became one of best known IT education centres in Croatia offering various education programmes. In 2002, Algebra College was founded. Algebra became an ECDL training and testing centre in the end of year 2003.

The Financial Agency is the leading Croatian company in the sphere of financial outsourcing and IT support for government bodies. The national coverage, the information technology system tested in the most demanding operations of national importance, and high professional level of expert teams, are the major advantages of FINA. It currently offers ECDL training and testing service in major Croatian cities.

KING ICT has been present in the Croatian IT market since 1998 as a member of Croatian M SAN Grupa, providing its clients with integrated ICT and business solutions. The KING ICT educational centre started its work in the second half of 2004 and is currently the most successful ECDL educational and testing centre in Croatia.

The University Computing Centre (Srce) is the oldest infrastructural institution of the Croatian academic and research community in the field of application of ICT. It was founded in 1971 as an organizational unit of the University of Zagreb. Srce has been an authorized ECDL testing centre since February 2004.

FER - Faculty of Electrical Engineering and Computing, University of Zagreb, was founded in year 1956. In the 2005/2006 academic year a new syllabus was introduced in accordance with the Bologna processes. Many of the 3-year bachelor degree programmes and 2-year graduate degree programmes offer competitive knowledge in the fields of computing, electrical engineering, information technology and telecommunications.

FOI - The Faculty of Organization and Informatics, University of Zagreb (located in the city of Varaždin) was founded in 1974. It offers two 3-year undergraduate study programmes, one joint undergraduate study programme, four 2-year graduate study programmes, as well as one doctoral and three specialized postgraduate programmes, all in the field of information and organizational sciences.

TVZ - Technical Polytechnics School of Zagreb was founded in year 1998. It offers vocational studies in five fields including informatics, computing and electrical engineering, and also lifelong education through the NetAkademija. NetAkademija integrated Cisco, Network Security, Microsoft and Sun-Java programs into the Polytechnic of Zagreb, students have had the chance to upgrade their practical knowledge and experience taking advantage of the University's infrastructures.

Figure 1: Education Centres Integrated in the Croatian EUCIP Network in 2008.
bra integrated EUCIP into the curriculum of its new 3-year higher education IT bachelor programme.

The programme is taught by prominent Croatian experts for server platforms, application and database development, business intelligence, information security, project management and information infrastructure management. In addition to established Algebra trainers, a special contribution to the programme was given by Croatian IT industry experts in the fields of strategic planning of IT systems and the economic aspects of IT use.

A total of 19 participants took part in the pilot programme. The candidates came from industry and the higher education sector, as well as from IT training centres. To ensure a high quality of programme delivery and testing, CITS introduced a requirement for an accredited Croatian EUCIP centre to have at least two of its employees trained during the pilot programme. This step was taken to increase their familiarity with the programme and to enable them to better understand potential challenges candidates may face during the programme.

2 EUCIP Test and Education Centre Network

The EUCIP network is expected to consist of 7 centres in 2008 (see Figure 1).

EUCIP tests were conducted after each of the three modules – “Plan”, “Build” and “Operate”, and between 70% – 90% of candidates (depending of the module) passed the test at the first attempt. General feedback from the pilot group of participants shows satisfaction of the programme, with some constructive comments on the need for further improvements of the official EUCIP Core educational materials in the future.

The pilot project ended on June 13th., 2008 and the applications for the EUCIP Professional level certification for the first group began shortly afterwards.

From September 2008, most of new EUCIP Centres will start to promote the programme in their educational and business environments and, helped by the CITS, will start organising EUCIP Core educational and testing sessions.

3 EUCIP Professional: The Next Step

During 2008 and the first part of 2009, it is expected that 7 EUCIP Professional profile certifications will be organizationally supported by the CITS, including:

- Software Developer.
- Database Manager.
- Network Manager.
- X-Systems Engineer.
- Information Systems Manager.
- Information Systems Project Manager.
- Information Systems Analyst.

These particular profiles were chosen as a result of an analysis of the current market structure of Croatian IT professionals.

In all current EUCIP-related activities, CITS is continuously supported by the ECDL Foundation and AICA (the Italian EUCIP Operator, who are involved in sharing experiences and supporting new operators), and is thankful for this help, without which a programme of such importance and impact for the entire profession could not had been undertaken.
CISCO and EUCIP Co-operation in ICT Professional Competencies Development

Fabrizio Agnesi

This article gives an overview on initiatives jointly managed by Cisco and EUCIP to promote professional competencies development through high quality training curricula and certification programmes. In particular the Cisco Networking Academy’s curricula “IT Essentials” and the related “EUCIP IT Administrator” certification are presented, as is the role of the Cisco certification system as accredited “elective modules” in the EUCIP professional profiles framework.

Keywords: Cisco, Co-operation, IT Administrator, IT Essentials, Professional Profiles.

1 Introduction

The co-operation between Cisco and EUCIP in ICT professional competencies development has grown in recent years, driven by common objectives and synergies between the certification and training offerings of the two organizations.

The EUCIP vendor neutral definition of ICT technical competencies is open to instances of specific technology providers, and its certification system, based on working experience and educational credits, requires third party "elective modules", as the product certification and training courses provided by ICT vendors.

Cisco has a well known certification offering referring to networking technology and related products and since 1997 has developed a not-for-profit, high quality training initiative, the Cisco Networking Academy Program, to teach students how to design, build and maintain computer networks.

Co-operation between Cisco and EUCIP, which started in 2005, has capitalized on the above assets, focusing on two themes:

- The joint analysis of Cisco certification contents against EUCIP Professional profile specifications and their accreditation as learning modules in the pertinent EUCIP professional certifications.
- The proposal of EUCIP IT Administrator as a referred certification for students completing the Cisco Networking Academy IT Essentials curricula.

2 The IT Administrator - IT Essentials Initiative

The course "IT Essentials: PC Hardware and Software (ITEPC)", originally produced by Hewlett Packard and acquired and developed by Cisco, provides a comprehensive overview of computer fundamentals and an introduction to advanced concepts. It is intended for individuals who want to pursue careers in IT and gain practical knowledge of how a computer works.

Since its beginnings, the course was also proposed as an option to prepare for the CompTIA A+ examination, a certification for IT technicians with a good market presence in North America.

In 2005, the Cisco Networking Academy EMEA (Europe, Middle East, Africa) decided to strengthen the proposal of ITEPC curricula in Europe in order to extend the Academy’s portfolio and market presence from its historical networking segment to a more basic and extensive target audience.

Among other actions, Cisco was looking for a European Multilanguage certification to be proposed at the end of the course as a third-party, independent recognition of competencies acquired by ITEPC students.

EUCIP IT Administrator (ITA) was perceived as an opportunity and, based on a relationship between CEPIS and Cisco, a common feasibility study was launched to verify the technical and marketing coherence of ITEPC and ITA.

Under the initial relationship they agreed to work on three areas:

- To verify "theoretically" the convergence of the two programmes comparing the mutual coverage of ITA and ITEPC syllabi.
- To verify "empirically" the effectiveness of ITEPC courses in preparing candidates for the ITA certification.
- To design a common marketing approach in order to
The analysis of the syllabi demonstrated a large (77%) mutual coverage between ITEPC 1 and ITA modules 1 (PC Hardware) and 2 (Operating System, Windows flavour) as shown in Figure 1.

The major ITEPC topics not covered by ITA were in the introductory part (IT basics), which is beyond the scope of ITA as it is more related to a user certification like ECDL than a specialist one, and networking fundamentals, which is covered, in a broader and deeper way, by ITA module 4.

ITA topics not covered by ITEPC were mainly related to specific items of a narrower scope and some technologies such as laptops and portable devices that, as we will see later in this article, have been added in the new ITEPC release.

The empirical verification of the course to prepare for certification was tested with an ITEPC class of 21 students who - immediately after completing a standard ITEPC course in Rome, and without any additional preparation after having passed the curricula tests, took the ITA module 1 and 2 exams. All students passed the ITA exams, confirming not only the course coverage but also the didactic effectiveness of ITEPC.

From a marketing perspective it was agreed to focus on secondary technical school students and employees without a formal ICT education, working on IT infrastructure in SMEs or large organizations’ local branches. Special terms and conditions were established to facilitate both the students’ certification and the Academy’s accreditation as EUCIP Competence Centres.

This general approach, agreed at a European level, will be localized in each country by the local EUCIP licensee and Cisco Academy organization.

In the United States, in parallel with these pilot experiences, Cisco launched the development of a major new version (v4.0, released in 2007) of ITEPC curricula with the aim, among others, of providing exhaustive coverage of the first three syllabus modules of EUCIP IT Administrator.

ITEPC v4.0 contents, which comprise almost all (96.4%) of the ITA topics, are organized in ten chapters covering all fundamentals and in six further chapters which increase the depth of coverage of key subjects. The sixteen chapters are:

**Part 1: Fundamentals**
1. Introduction to the Personal Computer.
2. Safe Lab Procedure and Tool Use.
5. Operating Systems.
7. Printers and Scanners.
8. Networks.

**Part 2: Advanced**
13. Laptops and Portable Devices.
15. Networks.

A wealth of teaching tools and materials are employed:
- A complete e-learning course available on the centralized Academy platform, usually blended with lessons and labs provided by each local Academy.
- Hands-on lab activities (with real systems and repair tools, but also supported by virtual laptop and virtual desktop stand-alone tools) in line with the practical orientation of both ITEPC and ITA.
Text-book, hands-on presentations and other teacher support materials.

As already mentioned, ITEPC v4.0 covers almost all IT Administrator competencies (including Module 3 LAN and Network Services; except minor items such as hardware trends and RAID systems), but also includes some additional skills either not present in ITA or dealt with in other modules (i.e. security and networks).

Skills not present in ITA include some practical abilities (technical as well as customer communication elements) related to PC maintenance activities, which are one of the key targets for ITEPC in North America.

Local agreements and activities are already set up in Italy and are set to be launched in other countries including Spain, Norway, Romania, and Poland.

In Italy, AICA (CEPIS Italian member society and EUCIP licensee) and ASSINT (the Italian association promoted by Cisco with Academies and other not-for-profit institutions) signed an agreement to promote jointly the EUCIP IT Administrator and CISCO IT Essentials programs.

Activities have already involved six Regional Academies, which have become EUCIP Competence Centres, and through them about 50 local Academies, mainly secondary technical schools joining the Cisco Networking Academy program for the first time in response to the IT Essentials-IT Administrator offer. A group of these Regional Academies has completely translated the ITEPC curricula into Italian and, with the support of AICA, is promoting the joint offering to schools and public education Authorities at both a regional and national ministry level.

3 EUCIP Elective Profiles and Cisco Certifications

EUCIP defines a framework of 21 EUCIP Professional profiles encompassing all major ICT professions.

Each EUCIP Professional profile is described in terms of competencies that can be attained through formal study, practical work experience, and professional development activities.

EUCIP Professional certification evaluates candidates’ experience portfolio in three dimensions (previous studies, work experience and professional development) in a structured and formalized way through documental review and an oral exam (peer review).

In order to become a recognized EUCIP Professional, the professional development activities and their associated "learning module credits" in the certification system must be qualified as pertinent to one or more professional competencies within the EUCIP framework.

Recognizing the potential value and synergies of their certification programs, CEPIS and Cisco decided to jointly map Cisco certifications (CCNA, CCNP, CCDP and others) onto EUCIP Professional competency categories in order to derive the learning module credits (EUCIP points) associated to each Cisco certification for each EUCIP Professional profile.

The two EUCIP Professional profiles most relevant in terms of Cisco certifications (i.e. with higher EUCIP points) were, as expected, the Network Manager and Telecommunication Architect profile. It is important to underline that EUCIP points cannot be used to compare different EUCIP Professional profiles because they do not measure the absolute value/importance of a certification, but only their relevance to a specific EUCIP Professional profile.

4 Conclusions

ECDL Foundation, CEPIS and CISCO believe that the mass dissemination of the informatics culture and ICT professional competency development represent key leverages to improve effectiveness in the use of informatics tools and consequently to promote economic growth and competitiveness.

ECDL Foundation, CEPIS and CISCO also believe that their systems of competence certification (reliable, synergic and widely recognized by the market) are useful tools in order to consolidate individual competences and to bring greater transparency and efficiency to the employment market.

Cooperation on IT Administrator-IT Essentials dissemination and EUCIP Professional learning modules accreditation is proof of the CEPIS and CISCO commitment in the field of ICT competence qualifications and of their willingness to operate within a multi-stakeholder approach, with other initiatives and additional partners, to achieve worldwide development and dissemination of the informatics culture.

References

For more information on CISCO IT Essentials, please contact Antonia Herrera (CISCO Systems) <antherre@cisco.com>.
EUCIP Services for Organizations

Roberto Bellini

This article gives an overview of the tools and methodologies being used to assess and tune ICT competencies. The article makes particular reference to the use of these tools in ICT demand side and ICT supply side companies, and explores how the EUCIP service model supports four main resource management functions.

Keywords: AICA, Competence Assessment, EUCIP, EUCIP Based Services, EUCIP Core, EUCIP Professional, ICT Demand Side Companies, ICT Supply Side Companies, Human Resource Management, International Certification, IT Certification.

1 Introduction

It is reasonable to think that stakeholders interested in an accreditation standard are more likely to choose and adopt the standard operationally as a reference scheme if it also provides a series of useful services.

In order to clarify the type of services which could be useful to apply for various objectives of the EUCIP Standard, AICA set out to analyse some problem areas which could be of interest for large and very large organizations in both the private and public sectors.

2 Problem Areas

In particular, the problems of the development and management of Human Resource specialists who work in two types of organizations were considered:
- ICT demand side organizations.
- ICT supply side companies.

In the first case, for non-ICT companies (and in particular manufacturing, services, finance, and trade companies) and Public Administration Organizations, specialist resources represent between approximately 1% and 8% of the total employees, and the most precious resources are those with a very technical specialization. Besides a request for even more specialized resources, ICT demand side organizations often apply more to resources provided by companies of the second type, with an important increase of the outsourcing phenomenon.

For these types of organizations the most important problems in the management of specialist resources are:
- The definition of strategic competence needs in relation to the development of company strategy, in particular if progression will involve digital services.
- Professional standards and the improvement of staff competencies, the career development of the most significant talents, the definition of salary policies related to real competencies, etc.
- The design and implementation of training and experience paths suitable for developing the competence level of the most critical resources.
- The selection and qualification of the personnel to be incorporated in the various highly professionalized project groups, using both internal and external resources.
- In the case of mergers and acquisitions, the optimization of specialist resources coming from acquired or merged business units.
- In particular, in public administration organizations, the need to reformulate the contract of internal specialists on the basis not only of their profile but also of their competencies.

In principle these types of organizations consider certifications as a critical factor only for the selection and incorporation of new resources, because certifications reduce the risk of incompetence.

In the second type of company, those on the supply side, including hardware, software and ICT services companies, specialist resources make up approximately 80% of the employees. They have similar management problems to those described for the demand side, but with the additional stress in regard to staff in direct contact with business
customers, both in the project acquisition phase and in the project delivery phase. In this case the certification of human resources offered on the market could be very important as a way to strengthen the value of staff offered to the most important customers, in particular those working at a multinational level.

3 Types of Services
Based on these considerations, AICA decided to develop and promote two types of EUCIP Services:

- Individual oriented services, aimed at professionals and managers who are already working, to develop and update their competencies throughout their working life.
- Company/organization oriented services, in which the subject of the analysis is still the individual worker (of the organization or of a third party) but the analysis itself and the results are configured to provide useful indications to solve problems at an organizational level (private or public) rather than at an individual level.

With regard to services for organizations, AICA has developed a service portfolio based on the following criteria:

- The service portfolio is structured and supported by tools.
- Services are structured following the indication of a model based on the EUCIP standard.
- Services are supported by the specific tools of the e-Competences and Certifications Observatory (ECCO) EUCIP family, that allow for every profile to deploy such online services as:
  - Competence assessment and gap analysis between existing competencies and competencies required by the framework.
  - Design of training and certification paths and monitoring of training results.
  - Support resource recruitment and project work structure.
- The service portfolio includes glossaries, dictionaries, handbooks, informative documents and everything that might help the customer organization use the services themselves.

4 The EUCIP Services Architecture
The EUCIP Service Model described below is a result of the aforementioned analysis and has been submitted for limited but important trials with some large organizations.

From an organizational point of view, four resource

![Figure 1: Flow of the EUCIP Service Model.](image-url)
management cycles have been identified:

- The first cycle is that of **strategic competencies management**, and describes the steps to design and plan internal and external digital services with suitable performance for business needs. The methodology helps ICT Managers check the competencies map of ICT specialized resources available for their organization and thus adopt the best action to achieve their objectives.

- The second cycle is that of **ICT project competency management** which is seen as the critical step in which projects based on innovative digital technologies will become operative. In this context the methodology can help organizations obtain a better definition of processes, by assigning roles on the basis of actual competencies.

- The third cycle is that of **specialized human resources management**, that starts by defining the new professional standards needed to develop the digitalization strategy at an organizational level and ends with a better definition of training paths for updating human resources.

- The fourth and final cycle is that of **ICT Supplier management**, to be considered only if the company decides to use external suppliers for the development of projects and/or for the acquisition of digital services. The share of certified professional profiles between the customer and the supplier is already considered an important element for the enhancement of cooperation in the supply value chain.

The EUCIP Service Model has been designed to support the four management cycles described above and will allow the organization to:

1. Analyse and understand the structure of the available competencies
2. Evaluate to what extent the target competencies for each profile of the EUCIP Standard are uncovered
3. Recognize, on the basis of the competence gap analysis, the type of interventions to carry out in order to fill the gap, by using one or more of the following options:
   a) Internal and/or external turnover management.
   b) Design of training paths focused on the reference standard and the sector benchmark.
   c) Correctly assign roles to the personnel by using their pattern of competencies.
4. Select and encourage specialists and managers critical for the evolution of the IT infrastructure and application development plans and for the management of new digital based services to work towards European certification.
5. Evaluate and optimize the salary level of professionals by using the sector benchmark.
6. In some cases, and in particular for Public Administration Information Systems, redefine the supply contracts of IT specialists by using as a reference not only roles but also competencies.

Therefore, the main scope of the services model is to promote the use of the EUCIP Standard along with the specific rules to be respected.

Clearly the main service component is **competency assessment**, which is a fundamental knowledge function for all the other types of interventions for the improvement of a company’s functions because it gives an objective vision of the competencies present in the organization.

The flow of the EUCIP Service Model is presented in Figure 1 and provides useful indications for the definition of the roles present in the processes to be activated for the performance of ICT projects. The diagram shows the functional dependencies between the various components for a more effective application. Nevertheless, each component is characterized by its own autonomy and may be applied independently of the others.

The subjects involved in the deployment of the Service Model are as follows:

- ECDL Foundation / CEPIS through updates of the EUCIP Standard Syllabus;
- In each country, i.e. in Italy, AICA promotes the dissemination and application of the Services Model to business clients and in particular:
  - Supports the Service Model through its own competence centres.
  - Manages the examinations and provides the certification of the professional profiles.
  - Guarantees the quality monitoring of the services delivered to customers.

The target of the services are always IT Specialists who work in the various business units in supply side companies or in the information systems units of demand side organizations.
E-Learning Tools and Projects on EUCIP Core

Marco Ferretti and Jaan Oruaas (with contributions by P. Prinetto, A. Chianese, P. Salomoni and Lily Loidap)

This article covers two projects whose goal is to produce e-learning material to help EUCIP enter the market with a complete scheme: syllabus, question database (both the responsibility of ECDL Foundation) and learning material (books, and on-line course). E-learning tools are widely recognised as a valid means to help the vocational market address the learning phase of a certification.

Keywords: Certification, e-Learning, EUCIP, European Projects.

1 Introduction

This contribution reports on two large projects devised to produce learning material for the EUCIP Core certification. The first project was carried out by CINI, a consortium of Italian universities active in EUCIP certification since 2004 [1]. The second is a European endeavour within the Leonardo framework, called EUCIP-MAT [2], led by a consortium of six partners from Estonia, Latvia, Sweden and Italy (namely, The Estonian Information Technology Society EITS, BCS Koolitus, an Estonian training and consulting company, the Estonian IT college, CINI, that replaced AICA, the Italian Association of ICT Professionals, the Latvian Information and Communication Technologies Association LITKA, and Amfora Training AB, a Swedish company active in science based education). While the CINI effort completed the production of a set of e-learning courses in 2006, the EUCIP-MAT project is expected to complete its products by September 2008. The main purpose of this article is to report on possible approaches when designing courseware to support candidates of the EUCIP Core level certification. The Italian model strongly reflects the university background in which it was conceived, while the European project has been designed along different guidelines. Some feedback is already available from the CINI project, and it will be interesting to compare the outcomes of the two projects once the second one is completed.

The questions that any approach to developing courseware has to answer are: i) the relationship between the EUCIP syllabus and the body of ICT knowledge to embed in the courseware, with special regard to the depth of the subject matter to be treated; ii) the level of granularity software development and hardware business was a normal step in the light of the development of the society at large. His current position is Chairman of the Estonian Information Technology Society - an organization of IT professionals, whose target is the formation of good communications and information exchange practices between IT companies and users. The work in non-governmental organizations requires a good knowledge of IT policies and best practices as implementing instruments of knowledge in the information society. The deepest knowledge is to be found in the educational sector. Close cooperation with EU institutions (CEDEFOP, ENISA), international organizations (CEPIS), governmental institutions, and participation in several international projects makes it possible to implement existing knowledge and ideas in real life. <jaan@eits.ee>.

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Other contributors to this article were Paolo Prinetto (Politecnic of Turin), Angelo Chianese (University of Naples "Federico II") and Paola Salomoni (University of Bologna).
of the objects that make up the courses; iii) the teaching model (e-learning vs. classical face-to-face learning), and iv) the intended audience.

2 The Italian e-Learning University Approach to EUCIP Core

2.1 Motivation

In 2004 AICA and CINI signed a three-year agreement to support the diffusion of the EUCIP certification model within the Italian academic system. The agreement listed many activities, along with the development of e-learning courseware targeting the Core level certification. This effort was jointly supported by both institutions: AICA was interested in offering a high quality set of courses the market of prospective EUCIP adopters and learning providers, while CINI was eager to help the process of diffusion of an independent, professional ICT certification by deploying the teaching skills available among university professors. The ultimate goal was to set the level of certification so that the ICT community would perceive the new scheme as a truly qualifying one.

The first question at the outset of this effort was the definition of the target audience. At the very beginning of the EUCIP project in Italy a few options were available: one could address primarily the fairly large number of professionals active in ICT, whose formal training seldom comes from computer science or from computer engineering degrees; one could consider the set of people active in public administration, involved with ICT processes and tools at various levels of expertise; finally, students enrolled in university courses could be considered, on the assumption that the degree of ICT coverage in many technological tracks is scarcely uniform and that business schools often cover just a minimum of the principles of informatics and prefer to offer a short-term, practical approach to ICT.

With so many and such diverse possible profiles for the audience, no clear guideline could be drawn, and CINI decided on a simple criterion: quality first. At first glance this seems a very naive way to decide, but if one considers the task at hand carefully, it is not.

Indeed, the Italian university system has a long established tradition in developing courseware, and ICT university tracks are rich in textbooks and even in e-learning modules covering the wide spectrum of knowledge of this field. Nevertheless, this learning material is usually conceived without reference to any specific body of knowledge organized in a syllabus, broken down into categories and topics, like the EUCIP syllabus. It is worth noting that from 2005 to 2006 G.I.I., the community of ICT professors of computer engineering tracks, designed and released the so called BOK (Body Of Knowledge) [3], in an effort to help the community design the content and structure of new ICT tracks. A similar effort has been made within the computer science community G.R.I.N. [4]. These attempts to structure the "minimum knowledge" to be embedded in the com-

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<tr>
<td>3.2</td>
<td>OPERATING SYSTEMS</td>
<td>20</td>
</tr>
<tr>
<td>3.3</td>
<td>COMMUNICATIONS AND NETWORKS</td>
<td>20</td>
</tr>
<tr>
<td>3.4</td>
<td>NETWORK SERVICES</td>
<td>30</td>
</tr>
<tr>
<td>3.5</td>
<td>WIRELESS AND MOBILE COMPUTING</td>
<td>10</td>
</tr>
<tr>
<td>3.6</td>
<td>NETWORK MANAGEMENT</td>
<td>10</td>
</tr>
<tr>
<td>3.7</td>
<td>SERVICE DELIVERY AND SUPPORT</td>
<td>20</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>400</td>
</tr>
</tbody>
</table>

Table 1: Core Level Study Time Breakdown. EUCIP Core Syllabus Version 2.4, 21 May 2002.
puter and informatics tracks share a much wider scope than the EUCIP syllabus in that they detail not only ICT skills, but also basic engineering, mathematics, physics and similar ones. However, they are narrower in their coverage of economics, organisation structures, business models and processes which are a relevant section of the EUCIP Core specification, particularly in the PLAN "knowledge area".

The task of designing courseware that would support candidates of the EUCIP Core certification was therefore a difficult one, since no precise reference existed. The depth of university courses, even introductory ones, and their approach to the subject, seemed a good starting point, but the structure of the syllabus, its type of categorisations, and the expected "study hours" for the various topics are not very compatible with the average "university course". We quote below the definition of study hours and the breakdown of the effort measured accordingly in the "modules" (see Table 1) as specified in version 2.4 of the EUCIP Syllabus (the initial specification for the CINI courseware developing effort): The typical study time for the entire core syllabus is set to 400 hours. Study time is defined as the time spent by the student in acquiring the competence, regardless of how this is acquired, through self-study, lectures or e-learning services. The hours are however meant to reflect an average spent on well-proven and efficient learning/teaching principles, such as employed by e.g. universities and colleges. Thus a candidate who wants to document real and non-formally acquired competence may have spent substantially more time e.g. learning by experience. The table below gives an overview of how study time might typically be distributed among syllabus modules and categories.

A quick inspection of Table 1 clarifies the distance between the EUCIP presumed effort and the average time spent in university courses on these subject areas. Just to give an example, the "Data management and database" module weight is 30 "study hours", if we compare its corresponding area in the G.I.I. BoK [3], we find a recommended 52 "hours" of lectures and hands-on activities.

With a very practical attitude, the design process of the courseware for preparing a candidate for the certification exam could have been based on a completely "utilitarian" approach. Since the certification is awarded on the basis of the record of achievement in an exam consisting of a set of multiple-choice questions drawn from the Question and Test Base (EUCIP QTB), the courseware could have been tailored to these questions, presumed known and stable enough to be a reference for the design. This method has the advantage of steering all learning effort towards a set of concepts that are in fact the only ones used in the exams; any "study time" is indeed well spent, since it goes to the point in every item covered by the courseware. But it has some important drawbacks: on the one hand, the QTB may change over time, thus undermining the presumed 100% coverage of the initial release of the courses; and on the other, this approach swaps the roles, because it sets the level of the "concepts" at the level of the "verification of the concept" and it prevents building a "ground knowledge" of any length of time.

In accordance with the above arguments, CINI decided to take a "quality first" approach, by asking authors to develop learning material with the same scientific approach they use when working for their university courses. However, to help them choose a proper level of depth in the treatment of the concepts, CINI distributed the QTB to them, with permission from AICA and the chief of the Product Development Board and under a Non Disclosure Agreement. Analysis of the questions can help the author verify whether the approach taken to the subject matter is appropriate. Obviously, it also serves the very important question of coverage: the user of the courseware must be guaranteed that any question that he will face during an examination can be answered either using the material directly from the courses or by proper inference from it.

CINI expected more outcomes from this development:
- To offer the ICT community a set of high quality, short courses on the most relevant areas of ICT, independently of EUCIP.
- To produce e-learning material that serves the immediate learning needs of an individual enrolled in EUCIP Core.
- To show that e-learning technology can be effectively exploited in a nationwide teaching experiment.

Two more questions were also open at the beginning of this project: i) which teaching model to adopt and ii) which language to use, English or Italian. As to the former, very soon the e-learning scheme was agreed upon. The e-learning model section will go into the details of the actual implementation chosen. At this point suffice to say that the broad objective of preparing courseware to be used in many diverse learning environments (formal training in institutions, whether public or private; personal, ad–hoc schemes for professionals looking for an upgrading path; corporate training) called for a very versatile scheme, and e-learning was the only choice. The language issue was more controversial: according to implementation guidelines for the local societies involved in the EUCIP programme, each country can deploy the certification scheme either in English or in a localized version. At the time of the set up of the CINI AICA cooperation, the EUCIP QTB was not available in Italian, so that the exams were delivered in their officially released English version. Nevertheless, the courseware was designed in Italian, under the assumption that it would be used in the university environment as a test bed, but that its primary target would be the general public, and the public administration as well (where the use of the Italian language is still mandatory in almost all cases). The command of the English language is not widespread in Italy, so courseware in English could pose a further barrier to the acceptance of the EUCIP scheme. We will come back to this issue when we report on the experiments carried out both within universities and in some small companies.

2.2 The CINI Courseware

In this section, we describe the overall structure of the
courseware developed, and we also touch on the developing process itself. More than 50 people were involved in various roles, for a period of time that spanned over a year.

2.2.1 Structure

The EUCIP syllabus is broken down into three "knowledge areas", each split into more "modules". Within a module, "categories" are "conceptually homogeneous subject matters", and "topics" cover the main aspects of a category (definitions are drawn from EUCIP Syllabus 2.4). This is an appropriate structure for developing learning material, and such an approach has been followed within the EUCIP-MAT project described later.

The CINI approach to structuring the EUCIP courseware was different. The learning material is organized into 18 "courses", one for each of the "modules" of the syllabus. Otherwise, no effort has been made to map the syllabus "module" structure into that of the "course". Rather, authors were asked to organise the material freely according to their teaching experience, using the notion of "learning object" (to be discussed shortly) as a guideline to obtain self-contained learning units. The rationale for this choice stems directly from the "quality first" approach described above. The EUCIP courseware should be a short, consistent and good introduction to computer science and informatics.

When dealing with the concepts categorised in the syllabus, it was by no means intended to adopt the same type of organisation, nor to infer any privileged sequence of concepts. Loosely speaking, the CINI courseware "learning object" can be compared to the EUCIP syllabus notion of "category", but this only clarifies the granularity of the notion, not its actual implementation. Of course, authors have been given appropriate instructions to show syllabus coverage by referencing the "learning objects" they set up for a "course" to syllabus "topics".

Each of the 18 courses consists of a number of elements: an introduction page describing the learning outcomes; a bibliography of pertinent material to be used for in-depth reading on the subject matter; a glossary of terms; a set of learning objects; a "conceptual map" that shows precedences among learning objects and which is described briefly in its set of learning objects. At the outset of the project, each module was also to have included a short video with a speaker (possibly the author) giving a short introduction and guidance to the reader, with the help of the conceptual map. This element was later dropped from actual production. Each module also contains the CVs of the authors that contributed it.

Another specification for the development process was compliance to accessibility requirements as specified by Italian law [5]. On the author side, this amounts to producing a short and a long textual annotation for each graphic object; on the designer side, the actual layout of the web pages embedding the courses must obey some more rules, one of which bans the use of animations.

2.2.2 The Notion of Learning Object

The learning object (hereinafter LO) is the key element of the courseware. It is a unit of learning material that is self-contained in that it addresses a concept distinct enough from others to be treated separately. Ultimately, a long standing outcome of CINI development effort was the production of a library of such objects, to be stored in a repository and available to create courseware in a modular fashion.

![Figure 1: A Snapshot of one Page from Course B2 Data Management and Database: a unit of content (UC) in the central frame, within its learning object (LO) in the left frame.](image-url)
This long-term goal has conditioned the way the LOs have been actually implemented in the software delivery platform, as we discuss later on.

Each learning object contains learning material organised in the following structure:
- Title.
- Learning outcomes.
- Units of content (UC), each a text of 800 - 2000 characters, with figures and drawings, key words, and optional in-depth sections where deemed appropriate.
- Self tests questions (STQ) structured according to EUCIP guidelines (multiple choice questions, with proper feedback).
- Exercises (EX); short problems that do not fit into the pattern of a single question and that require off-line elaboration from the reader. Each exercise has a problem statement and, separately, an annotated solution.

To guarantee a degree of homogeneity in the treatment of concepts, each LO must have a minimum of 3 UC, at least one STQ for each UC and a single EX. Aside from these minimum constraints, no other guidance was given; for example, while the total number of STQ must equal the number of UCs, the author was left free to allocate questions to UCs as he deemed necessary.

The length of each UC was chosen so as to fit comfortably into a web page so as to be readable without massive scrolling. This usability constraint was somewhat questioned by authors, but it was enforced throughout the courseware.

Figure 1 shows a snapshot of a web page from course B2 on "Data Management and Databases". The central frame contains a UC (named "Basi di Dati"), which is a text-only instance of content. The left frame contains the tree-like structure of the LO. Note the learning outcomes page ("Obiettivi"), the contents laid out in a sequence of UCs that make up the LO, with UCs already read marked off, the exercise ("Esercizio svolto 1" and its solution "Risposta esercizio 1"), a sequel of 8 STQ ("Test1-Test8"), bibliography, and glossary. Below is a progress bar with navigation buttons.

Figure 2 shows the "conceptual map" for course B2. The map is a directed graph: each node represents a learning object, each link the precedences implied by the node that it exits from. For example, the LO labelled B2.03 "Il modello relazionale" ("relational model") is considered a pre-requisite for both LO B2.06 on SQL and for LO B2.04 on relational algebra.

**2.2.3 The Developing Process**

The actual production of courseware required a careful design of the process in all its phases. First of all, CINI set up an editorial board responsible for the general scheme of courseware and for all decisions regarding its production. The main phases and activities were:
- Choice of in-house development and subsequent operation of courses delivery vs. a hosting approach.
- Selection of the software model and standards for the final e-learning "product".
- Selection of the software chain to produce the e-learning modules.
- Detailed specification of the courseware structure and associated instructions to authors.
- Selection of authors.

---

**Figure 2:** The "Conceptual Map" for Course B2.
Design of the reviewing process and recruitment of reviewers.
Production by authors.
Reviewing process.
Post-production to generate LOs for deployment on delivery platform.

The activities began in September 2004 with preliminary meetings of the editorial board, and the first on-line course was offered to a class of university students in November 2005. The last of the 18 courses was completed in spring 2006.

CINI decided to run the whole process using the resources of member universities and of its national laboratory. In a first nationwide attempt to launch a huge e-learning experiment, the consortium decided to test its ability to collect resources from different universities, professors, ICT technicians. This was definitely a somewhat bold step, in that the consortium had never managed such a huge effort on its own.

The software model and environment was readily identified within the open software family. Since the long term goal was to prepare a repository of reusable learning objects, adherence to an industry standard was mandatory, and SCORM 1.2 was the simplest choice [6]. Choosing the software chain for producing the final object, however, was by no means that simple. While there were many alternatives that appeared to be fairly comparable, the choice went to a software tool-chain [6] developed by one of the members of the consortium, the University of Bologna. We made use of the experience gained within that university in developing e-learning ICT courseware for internal use in technical, non-informatics curricula. That tool chain was adapted to suit the specifications, notably with regard to accessibility requirements. Authors were instructed to use a specific set of styles when composing the material with MS Word; the documents were later checked against a set of edit rules and, once formally correct, they were transformed, according to a suitable XML schema, into XML documents and subsequently converted into html web pages.

Along with detailed instructions on the use of style for preparing the material, authors were provided with a "Guideline" document highlighting the purpose of the effort, describing the structure of the courseware (the notion of course, learning object, multiple-choice question, etc.). It goes without saying that a great many discussions helped to clarify the task at hand.

Selecting the authors was a major effort in itself. For each of the 18 courses, a single, principal author was identified; eventually 16 people were involved in this role. Most of them are university professors and some are professionals (mainly for the PLAN area). The real difficulty in their involvement was "selling the idea"; it proved to be quite a task to convince a few of them to cooperate in a task that usually required them to reshape learning material in their field of expertise and to adapt it to the EUCIP spirit and syllabus. However, all of them were very cooperative and passed on some comments on the syllabus structure that could be taken into account within the EUCIP Expert Working Group. The actual list of people involved is large, because many of the principal authors shared the effort with one or two "secondary authors".

The reviewing process was a very important part of this effort. The editorial board decided on a two-level scheme: a detailed review of each module to be carried out by three people with different profiles and skills, and a final, synthetic review by the editorial board itself. It is worth describing the "low level" review process. Since the intended audience of this courseware includes university students in technical curricula, professionals already active in ICT for many years, and people from public administration with scarce prior knowledge in informatics, the editorial board decided to enrol as reviewers both skilled personnel (PhD students from computer science and computer engineering) and other people with moderate to low informatics skills (technicians responsible for the day-to-day operation of computer labs): some even had a degree in humanities! This group of reviewers (6 people all together) read all the LOs and compiled: i) a review report form for each module consisting of a general assessment of the module; ii) a detailed analysis of each LO: in respect of the constraints in terms of length of each UC, readability, correct number of STQs and adherence to MCQ guidelines, etc. The review form for each LO has 10 categories, the form for the course as a whole only 4. The analysis of these reports has been carried out within the editorial board. After the reconciliation of very few conflicting reports, appropriate feedback was forwarded to the authors and the edited material was acquired for further processing.

It was quite a job to coordinate some 60 people, with delivery milestones, files to be uploaded into a central repository, checks to be executed through the software chain, and reviewing comments to be fed back them.

### Table 2: Overview of the Numbers of the CINI EUCIP Core e-Learning Material

<table>
<thead>
<tr>
<th>Words</th>
<th>Lines</th>
<th>Pages</th>
<th>Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>770265</td>
<td>103569</td>
<td>3422</td>
<td>725</td>
</tr>
</tbody>
</table>

### 2.3 The e-Learning Model

Developing the learning objects was only the required, preliminary step in order to set up a learning offer. As anticipated, CINI decided to operate the courses from some central facility. To do so CINI had to set up the technical platform for delivery and maintenance and, after inquiring into public institutions and private companies offering a
hosting service, decided to locate the technical infrastructure within its national laboratory "ITEM Carlo Savy" [8] located on the premises of the University of Naples "Federico II".

2.3.1 Choosing a Platform

The next step was to choose a delivery platform that matched the two main requirements: being an open software solution and effectively supporting SCORM 1.2. A taskforce was appointed to assess the available solutions, and a preliminary analysis restricted the choice to A-Tutor, Dokeos or Moodle. An analytic approach was then carried out according to GQM methodology [9]. The main characteristics for which metrics were specified and assessed were: modular break down of learning material into didactic units, lessons and course; possibility to set up a learning path in a tailored fashion; type and features of content management tools; SCORM support; communication tools; other didactic tools; test and surveys. The result of the assessment [10] showed that DOKEOS was the solution which offered the broadest average support to all criteria and notably to SCORM compliance. We ultimately wanted an environment that would provide an easy and flexible way to trace the learning progress of each individual.

2.3.2 Setting up the Courses

The didactic model for offering a EUCIP learning path was also given proper attention. The various "objects" available in the CINI repository could be assembled according to various learning models: a completely free model, with no prerequisite, barriers or other compulsory tests for the learning path or, conversely, a tightly controlled mode, with a pre-designed linear pathway without choices or exits. This design spectrum existed at various levels: within each LO with reference to its sub-parts (learning outcome section, units of content, self-test questions and exercises); among the LOs themselves within a module; and finally, even between modules.

The notion of a learning object and its presumed self-contained structure led quite naturally to choose a strict path within the LO. It was therefore decided that the UC should be read in the order in which the author had specified them, and that self-test questions and exercises could only be used after completion of the UCs. The software setup of the SCORM LO embeds this constraint. With reference to Figure 2, the tree structure of the LO must be traversed in a linear order, from top to bottom, with progress through the units made available by the marks for each unit read. One unit cannot be accessed unless the previous ones have been read.

As to the LOs and their dependencies described in the "conceptual map", a more flexible approach was preferred. The platform shows the LOs making up a course in a linear order; this order was specified by the author as one of the possible visits of the graph embedded in the conceptual map. No constraint however is enforced in the platform, and the user is free to open the LO in any order. The conceptual maps clearly identify dependencies among the LOs.

The further level of granularity, that of the courses, seems to offer no option. Yet, the modularity of the LO approach opens up the way to experiment with the construction of individually tailored courses that assemble LOs from different EUCIP courses and even areas. No such experiment has been carried out by CINI at this level, with reference to single individuals. But the offer prepared for the university community, to be described shortly, did assemble modules from different areas to suit the needs of specific sections of students.

2.3.3 Setting up Nationwide Virtual Classes

The production process of the e-learning material was controlled in such a way to deliver first the modules for the PLAN knowledge area and part of the Operate one, namely the C.7 module on "Service delivery and support".

The rationale for this schedule was to have a set of courses ready for experimentation within university tracks in computer engineering and computer science. CINI in fact decided to test both the material developed and the delivery model in universities, and chose to do so with students that were well acquainted with ICT and presumably needed no special training in the Build and Operate syllabus knowledge areas. It was widely expected that these students would lack proper training in the PLAN area and in the subsection of the Operate specific to managing contracts and customer relationship. So, the first e-learning offer was called PLAN+C7.

The next step was to set up virtual classes and to design the supporting scheme. The teaching model for any e-learning experiment must take into account the communication capabilities offered by the delivery platform and the need to control the progress of students both on-line and with periodic face-to-face meetings. The first experiment in the EUCIP effort did not have enough resources to schedule a proper blended model because the intended audience consisted of students from any computer engineering and computer science tracks of CINI member universities. So a nationwide classroom model was chosen: individuals subscribe to the learning offering, are put in a virtual classroom with a dedicated tutor, and are given free access to the instance of courses for which the classroom is set up.

2.3.4 Tutor, Expert and Controller

As required by any learning scheme, the e-learning model has its specific requirement. A virtual classroom is an effective means of carrying out a teaching experience if a number of conditions are met: a good service is provided with the help of supporting figures (such as the tutor/facilitator); good communication capabilities are available through the software platform for sharing the learning experience (forums, messaging, e-mail among asynchronous tools); proper tracing of the enrolled student is actually carried out by the tutor with the tools provided by the platform; proper feedback is collected at the end of the experiment from the students in order to review the process.

The support figures chosen were the tutor of the class-
The expert in the subject matter is an unusual figure in e-learning experiments, that came about because we expected students to raise questions that the tutor could not answer directly. The reason for this was that the courseware would be offered first in the PLAN area, a very specific knowledge domain for which the people that we could enrol as tutors were unlikely to be experts. So, we agreed with the authors of the course that they would step in as subject matter experts for those questions that the tutors could not handle themselves.

The controller is a third figure that helped guarantee overall quality. As we shall see in the upcoming sections, at a certain point during the delivery process, up to four virtual classrooms were active concurrently, with some three hundred students active on the e-learning platform. The service agreement signed by the tutors needed proper control, and a fairly tight one. So a person was chosen and contracted to check on the activity of the tutors and to report on a regular basis to the project management.

2.3.5 Student Agreement
At the outset of this project some experience had already been collected within CINI member universities in running e-learning virtual classrooms. One of the lessons learnt was that e-learning requires a mutual agreement between the two partners: the "teacher" and the "student".

The organisation that is active as the "teacher" specifies its offer with an open declaration of services: platform availability, tutoring system, course content and scopes, etc. But the user must sign an agreement: he must subscribe to the teaching model offered and must obey the rules stated in this model.

Indeed, experience shows that a completely free approach to the virtual classroom leads to consistent dropouts or misuse of the services. Unless driven by compulsory requirement, users of e-learning courseware tend to defer the effort: they usually show some interest at the very beginning, then delay the activity and finally try to catch up when their allocated learning time is close to expiration.

So, we decided that, upon enrolling in a virtual classroom for the PLAN+C7 offer, the student should sign a "learning agreement" with the following main points: The first access to the virtual classroom has to be within the first two weeks and the student must also read through a single UC within any of the LOs available within the same time interval. The student must complete three of the seven courses within two months. Failure to comply with either rule leads to expulsion from the virtual classroom. The agreement also specifies that the student has a right to support from the tutor for three months, and that he can access the platform for one more month. So, each classroom has duration in time of 4 months.

2.4 The e-Learning Experiments
The e-learning facility and courses prepared by CINI for EUCIP Core have been used in two different environments: in a large university experience, led by CINI itself, with the support of the EUCIP4U project launched by "Fondazione CRUI" [11] (FCRUI in the following), and in a small test bed within the Rome branch of the ICT section of "Ordine degli Ingegneri", the Council of Engineers. Here we shall mainly describe the university experiment.

The motivation for the experiment within the university tracks was twofold: CINI and AICA were eager to expose students to the concept of certification performed by EUCIP Core. The overall effort is described in an accompanying article in this issue. FCRUI joined in the task by urging computer engineering and computer science tracks to grant

<table>
<thead>
<tr>
<th>Students</th>
<th>Edition instance</th>
<th>Course</th>
<th>Starting month</th>
</tr>
</thead>
<tbody>
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<td>PLAN1, PLAN3a,</td>
<td>PLAN+C7</td>
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</tr>
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<td>PLAN3b</td>
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<td>January 2006</td>
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<td>69</td>
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<td>June 2006</td>
</tr>
<tr>
<td>864</td>
<td>Total number of participants</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: The Editions of CINI Courses Delivered to University Students.
were a total of 42 questions. As an example, in the first

CINI agreed to offer free access to the courseware, for a
limited period of time, spanning from November 2005 to
September 2006 to students enrolled in the EUCIP pro-
gramme (that had therefore bought the record of achieve-
ment and the minimum of three tokens for EUCIP tests)
and attending university tracks that joined in the FCRUI
project. This period was also chosen to fit in with the sched-
uling of courseware releases. As already anticipated, the
PLAN+C7 courses were completed by September 2005,
while the BUILD and OPERATE were completed by May
2006.

The editions of courses planned until September 2006
consisted of 7 instances of the PLAN+C7 offer, and a sin-
gle instance of the BUILD and of the OPERATE offer. The
actual editions and the number of students enrolled are listed
in Table 3.

Running these editions required close coordination be-
tween the technical staff responsible for the platform and
the associated IT infrastructure, located in CINI premises
in Naples, the tutors, one for each instance of the course,
the controller and the management of the project.

The choice of an open software solution for the e-learn-
ing delivery platform paid off almost immediately. In its
official release Dokeos did offer some reporting capability,
but the requirement specified by the service agreement be-
tween "student" and "teacher" and the desire to have a more
advanced control on the progress of the students enrolled
in the virtual classroom called for enhanced, tailored re-
porting facilities, not available in the platform. These were
developed by the technical staff as add-ons. The tutor and
the controller were able to collect, say, averages on UC read
and STQs visited and passed, computed on the traces stored
in the database supporting the platform.

The overall process went fairly smooth, notwithstanding
some initial problems regarding the DBMS (MySQL)
configuration which were quickly identified and resolved.

2.5 Lessons Learned

The experiment and the overall process have given some
insights into the EUCIP Core development carried out by
CINI.

Part of the agreement with the students was the comple-
tion of a questionnaire at the end of the course. The data
was collected and analysed for a subset of the edition in-
stances, not for all of them. The reason is simple: since the
questionnaire was not compulsory, many students skipped
this phase. Also the first feedback on the process suggested
that the structure of the questionnaire was too detailed: there
were a total of 42 questions. As an example, in the first
other two, and this also comes as no surprise. Most of the students that joined in the experimentation are enrolled on ICT tracks. For them, English is more familiar in these knowledge areas where it is being used consistently in technical documentation of software products, operative systems of laptops and desktops, and the like. Some university courses even adopt English textbooks. The pattern is completely different in the PLAN area. Here, the technical jargon of ICT offers little support, and the user of an Italian courseware faces obvious difficulties when required to answer EUCIP core questions. This is one of the reasons why CINI agreed to join the EUCIP MAT project, to be described in the remainder of this article.

3 EUCIP-MAT, a European Project for the Vocational and Professional Market

EUCIP-Mat [2] is a Leonardo da Vinci programme supported project which aims to create e-learning materials for the EUCIP Core programme. The users of the project results are IT students of the vocational school and the students of the first courses of colleges and universities in the technology area as well as IT practitioners who do not yet have vocational certificates. The project target group contains everyone who is responsible for IT job market planning and regulation: policy makers, employers, employees, training providers, and career consultants.

The professional exams, managed by independent certifying bodies, should on every qualification level characterise any examinee fully, and be transparent and independent in accordance with general principles of certification. An ultimate need for the success in exams is the need for training materials. It is recognized that the production of learning materials is difficult because the IT field is developing extremely fast. Therefore students need the possibility to study using materials that are in line with examination questions and current subject content. Another reason for developing the learning materials is to help learning providers implement EUCIP based learning in a professional manner.

EUCIP certification started some years ago and it became clear that training institutions such as vocational schools and the like are not able to produce these course materials by themselves, due to either a lack of knowledge or time. Feedback from teachers and students ultimately shows that there is a demand for learning material in these vocational schools. Through these learning materials it is possible to create overall basic knowledge and skills standards for IT specialists. These standards will be vendor independent as is the entire EUCIP system. These learning materials will help schools start training courses quickly or integrate certification requirements into existing courses.

The Leonardo da Vinci programme has three general objectives:
- To improve the skills and competencies of people, especially young people, in initial vocational training at all levels. This may be achieved, inter alia, through work-linked vocational training and apprenticeship with a view to promoting employability and facilitating vocational integration and reintegration.
- To improve the quality of, and access to, continuing vocational training and the lifelong acquisition of skills and competencies with a view to increasing and developing adaptability, particularly in order to consolidate technological and organisational change.
- To promote and reinforce the contribution of vocational training to the process of innovation, with a view to improving competitiveness and entrepreneurship, also in view of new employment possibilities. Special attention will be paid in this respect to fostering co-operation between vocational training institutions, including universities and undertakings, and particularly SMEs.

In respect of the first two objectives, innovative counselling and guidance approaches are of particular importance.

In implementing the three objectives, special attention is given to proposals addressing:
- The development of practices to facilitate access to training for the less advantaged people in the labour market, including the disabled
- Equal opportunities for women and men, with a view to combating discrimination in training provision.

In order to achieve the programme’s objectives, calls for proposals are published which set out specific priorities. <http://ec.europa.eu/education/programmes/leonardo/leonardo_en.html>.

3.2 The EUCIP-Mat Project Consortium

The EUCIP-Mat project consortium was created to develop the necessary training materials and consists of six partners from various countries with different backgrounds. Each brings its own knowledge and experience to the project.

- The Estonian Information Technology Society - EITS was established in 1989.
- EITS objective is to establish information exchange environment for its members to:
  - Improve their professional level.
  - Improve their business activities.
  - Find solutions through co-operation.
- EITS is an organisation of persons interested in IT issues on a professional level or who represent organisations with interests in the IT field. EITS coordinates ECDL and EUCIP certification in Estonia, as a certifying organisation in the Information Technology and Telecommunication area. There are 45 ECDL test centres and 3 EUCIP test centres around the country.
- BCS Koolitus AS is the oldest training and consulting company in Estonia, which offers its services for ICT users, specialists and managers. The selection of services is...
English version.

EUCIP: A Model for Definition and Measurement of ICT Skills

The CINI e-learning project is the result of the efforts of many people. But first we should acknowledge the contribution of the late Prof. B. Fadini, former Director of CINI, who strongly supported the idea of producing an e-learning offering for certification from within the consortium. The editorial board that steered the project was composed of M. Ferretti, EUCIP CINI project leader, A. Chianese of the University of Naples “Federico II”, P. Ciancarini of the University of Bologna. But many more effectively contributed in various capacities: the list runs to more than 30 people, not including the authors and their colleagues who themselves amount to some 40 people. We thank all of them.

Acknowledgements

The proposed interactive form of materials will help students use e-learning environments and thus ensure that learning methods and possibilities are flexible for every beneficiary and target group member from Estonia, Latvia, Sweden and Italy (namely, The Estonian Information Technology Society EITS, BCS Koolitus, an Estonian training and consulting company, the Estonian IT college, CINI, that has replaced AICA, the Italian Association of ICT Professionals, the Latvian Information and Communication Technologies Association LITKA and Amfora Training AB, a Swedish company active in science based education).

References

[1] CINI EUCIP. <http://eucip.consorzio-cini.it> (as of varied: various training courses, consultations, certifications, ICT managing projects, and the staging of development events in ICT. The company offers a full training process, from ascertaining training needs to measuring training results. BCS has several competencies, such as adult training, the methodical delivery of training courses, training material production. BCS Koolitus also has experience in managing ICT projects.

- Estonian IT College (ITC) - ITC is a private but not-for-profit professional higher education institution, established and financed by the Estonian Information Technology Foundation (EITF) in 2000. ITC is working very closely with both universities and the ICT industry. ITC provides three-year professional higher education. There are four curricula: IT System Administration, IT System Development, Information System Analysis and Technical Communication. Education in ITC is combined with International IT certification programs (Cisco, Microsoft, etc.) and has a strong applied focus. ITC teaching staff is highly skilled highly educated, and experienced. Teaching staff are sourced from partner Universities, and the ICT industry, and there are also full time teachers. IT College is a Regional Academy ofCisco CCNA, the Cisco Wireless program, and a local academy ofCisco CCNP program. ITC is a member of the Microsoft Academic Program, Oracle Academic initiative. ITC is a member of the Estonian e-University and college teachers have elaborated dozens of e-training/distance education courses.

- CINI is a consortium of 30 Italian Universities active in ICT. As already described in the first part of this article, CINI and AICA agreed to launch the EUCIP scheme within the academic system in Italy. CINI has set up a network of competence centres to deliver EUCIP Core certifications in universities and to cooperate with AICA in all EUCIP development. After having produced Italian courseware, CINI agreed to step into the EUCIP-MAT project, substituting AICA in the effort to develop a new, English version.

- Latvian Information and Communications Technologies Association - LIKTA is a professional association founded in 1998. It brings together over 60 important ICT product and service providers and educational institutions, as well as over 150 individual professional members of the ICT industry sector in Latvia, LIKTA is a non-governmental organisation. LIKTA members have all the necessary skills, knowledge, expertise and experience.

- Amfora Training AB has a 20 year history of presenting science-based education. Today Amfora mainly creates e-learning materials that consist of streaming video, visualisations, and educational quiz-games, all presented on Amfora’s own-developed e-learning platform. The high quality video content is produced by its parent company Panthera Film & TV. Amfora Training has in-house competence in project management, information processing, instructional design, 2D- and 3D-visualisation, streaming video production, system development, and programming. Amfora Training has the skills to process and present information in a comprehensible manner.

The roles and the tasks of each partner involved are described in the project plan. The main tasks to which each partner will contribute are: creation of the learning materials and tests, pilot training of the teachers and students, translation of the materials into five languages, preparation of e-learning environment, and bringing the project results to the target groups.

The training materials for IT professionals will be presented in the interactive electronic form of an online textbook. It will thus be easy to make updates and print or make CDs. These materials will be in the five languages of the project partners - English, Estonian, Latvian, Italian, and Swedish.

The learning materials content will cover the EUCIP Core level modules:

A – "Plan" knowledge area: Use and management of information systems.

B – "Build" knowledge area: Development and integration of information systems.

C – "Operate" knowledge area: Operation and support of information systems.

The learning materials proposed are new products in response to existing demand. It is recognised that the production of learning materials is difficult because of the speed at which the IT field develops. Therefore students need to be able to study using materials which are in line with examination questions and current syllabus content. Another reason for developing learning materials quickly is to help learning providers implement EUCIP based learning in a professional manner.

The proposed interactive form of materials will help students use e-learning environments and thus ensure that learning methods and possibilities are flexible for every beneficiary and target group member from Estonia, Latvia, Sweden and Italy (namely, The Estonian Information Technology Society EITS, BCS Koolitus, an Estonian training and consulting company, the Estonian IT college, CINI, that has replaced AICA, the Italian Association of ICT Professionals, the Latvian Information and Communication Technologies Association LITKA and Amfora Training AB, a Swedish company active in science based education).
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ICING: Building the Cities of the Future

Joan Batlle-Montserrat, Irma Merino-Zapirain, and Carlos Paternain-Soler

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The ICING Project explores new uses of mobile technologies to increase citizens' quality of life in urban areas by means of improving their communication and interaction with the urban environment, communities, and public administration. This paper presents the project and describes the main goals, technological contributions, and benefits.

Keywords: Cities, e-Services, ICING, Innovation, Mobile Technologies, Social Networks, Strategic Planning, Web 2.0.

1 Introduction

Nowadays more than half the world’s population already lives in cities and this tendency is increasing [1]. This makes it difficult to manage cities and provide a good quality of life to their citizens. Large urban areas require public administration to react efficiently while being aware of the reality of the city. If we are to make city management possible it is necessary to involve the citizens themselves in some way. Fluent lines of communication are needed between citizens and their city council. Citizens should know and be able to communicate easily with their city council. Only then will it be possible to manage cities efficiently.

Meanwhile, mobile phone use in Spain has already reached a penetration higher than 100% [2], meaning there is more than one mobile phone per person. This technology offers a number of easy communications channels, some of which are already accepted by their users. However, mobile devices have many embedded technologies which either have not yet been used or did not prove to be a real solution for users. This context provides public administrations with the opportunity to use the mobile channel to offer new services, thereby improving communication with their citizens.

2 How ICING was born

During 2005, the City Councils of Barcelona, Dublin and Helsinki decided to work together on an R&D project with the purpose of finding a
way to deploy citizen-oriented services through mobile phones and Web 2.0 technologies. These services aim to make it easy for urban society to merge, and to improve urban space management and council services by means of promoting citizens’ active participation.

The Innovative Cities for the Next Generation project (ICING) [3] has eleven partners, a budget of 5 million euros, and a scheduled length of 30 months. The project is partially financed through the European Commission as a part of the sixth framework program of the Information Society and Technology. Project co-ordination is provided by the Dublin Institute of Technology. Also from Dublin, eSpatial is in charge of geospatial applications development. The Art and Design University of Helsinki contributes with its knowledge in the field of citizen participation and social software development. From Barcelona, 22@Barcelona and the Pompeu Fabra University are taking part through Barcelona Media, while the Barcelona Agency of Urban Ecology (BCN Ecologia) and the companies T-Systems and Telefónica I+D are also participating in the project.

ICING is exploring a new city model in which a city, by means of ambient intelligence and information provided by citizens, is able to react and adapt to the changing needs of urban society (see Figure 1).

There are a number of other projects around the world working in the same direction. Emerging information and communication technologies make it possible to redefine the way in which users relate to their immediate environment. In the case of cities, we are talking about the way citizens interact with their urban environment. Can we imagine a city in which inhabitants have access to the information everywhere, and at any time, by means of various devices; in other words, a ubiquitous city? A good example is to be found under construction at Songdo [4] (Korea). The MIT SENSEable City Lab, is working on various projects [5] aiming to create ambient intelligence and use it to study urban dynamics to improve city management. The OXIGEN Project of the Laboratory for Computer Science in the MIT [6] is also worth mentioning. Large IT companies [7] and important universities such as the University of Washington [8] or the Carnegie Mellon University [9] are also working on similar projects focusing on user interfaces, distributed services, and city ICT-enabled infrastructures to allow a richer and more efficient interaction of users with their immediate environment.

The ICING city model requires us first to address the problem of how to install new infrastructure in the city to provide lines of communication between citizens and the city (such as Wi-Fi networks or Bluetooth access points in addition to existing GSM and 3G networks). We also need to deploy a sensor network to transmit information about the city (CCTV for traffic, sound meters, pollution meters…).

Secondly, the project studies the applicability of technologies already used for the identification of logistics products (Semacodes [10], RFID labels, etc.) to identify and even “connect” urban elements.

Finally, return channels must be qualified. Citizens who use innovative services to communicate with the public administration must receive feedback; they have to know that their contribution has been considered and they should be able to see the result of their contributions and even of the contributions from other citizens. And although services may have been especially designed to be used through mobile phones, the return channel could be of a different nature going from an SMS to, say, a written letter, email or phone call.

Due to the varied nature of the services of the type described so far, for the purposes of the project the possible services were divided into three main categories:

1. Services for citizens and communities, which are services intended to facilitate contact between members of a defined community;
2. City services or e-Government services, especially designed to be used through mobile phones despite their multichannel inception and construction.
3. Services based on ambient intelligence and an ICT-enabled city infrastructure. Services enabled by deploying city sensors and through citizen involvement will help councils be more aware of the reality of their city

![Figure 1: ICING City Model.](image)
and allow them to respond more efficiently to its needs.

3 ICING Architecture

From a technical point of view, the Project's main aim is to develop a platform capable of integrating all the types of services mentioned above, adaptable to any city requirements and easy to maintain. The platform is based on a Service Oriented Architecture (SOA) built in multiple layers: infrastructure, user interface, integration layer, and ICING services provision layer. See Figure 2.

Firstly there is an "infrastructure layer" also called Multi-Access Gateway (MAG) which provides service access to citizens. Thanks to this gateway, citizens and digital sensors communicate with ICING services using interface based web services, which follow the Parlay X 2.0 standard defined for this purpose, independently from protocols and network functionality (hence the term Multi-Access).

This layer acts as a protocol translator to connect several networks with different technologies in just one system. In this way, MAG is a node which acts as a single entry point to the ICING platform from the several access technologies available.

As well as detecting the state and presence of terminals, messaging is one of the main functionalities provided by this layer. This functionality allows citizens to send and receive messages, (SMS or MMS messages for mobile networks and emails for Wi-Fi or DSL using SMTP protocol). Also an immediate message service has been included, which uses the XMPP protocol (Extensible Messaging and Presence Protocol) to allow any device to communicate with any other.

The location functionality is another of the most important functionalities provided by this layer. Thanks to this layer service, applications can resolve a user's location or a group’s location.

The next layer is also called the "user interface" layer and is implemented as a Multi-Modal Gateway (MMG) providing multi-modal functionality to ICING services. This layer uses the MAG interface to send or receive all kinds of messages from/through the users. It is responsible for providing format to higher layers. To achieve this, it fits the information data to the active device in real-time, and to the return channel chosen by the user in its ICING profiling registry.

The method used to carry out this functionality is based on the idea of "content adaptation", which is a neutral representation of the interface produced by the service to make the final interface representation (user interface) based on device capabilities and user preferences. The kind of research which provides this technology is the "Single Virtual Terminal" paradigm (Helver, 2002), which is nowadays used to join a number of physical devices to a virtual terminal to access specific services with improved capabilities.

The MMG also manages user profiles, and so preference requests and device features are provided in this layer.

The integration layer is provided by
ICING (Integration System for Integrated Computing of Services) is a software architecture that follows the principle of providing services that can be easily integrated and reused. The architecture is designed to eliminate code dependencies and allow for efficient reuse of services.

SOA (Service-Oriented Architecture) is a method of building applications that involve services and providers. It requires services and provider systems to interact and communicate with each other. The IISYS (Integration System for Integrated Services) acts like an operating system and is responsible for the integration of various services and the management of data storage. It provides a platform for the provisioning of services and data, enabling efficient data management and access.

Another component of the ICING architecture is the Urban Mediator, which acts as a mediator of the request between service requesters and providers. It facilitates the creation and sharing of location-based information among users and allows for easy communication between service providers and users.

In a SOA, services are treated like first-class entities, allowing for easy integration and reuse. However, it is important to note that despite the benefits of SOA, there are challenges in implementing it, such as the need for careful planning and design.

ICING Pilots

To validate the architecture mentioned above and the proper operation of the existing platform, three prototypes will be implemented, one for each city involved. Helsinki is where the Urban Mediator service is being tested. The Urban Mediator is a software application that allows citizens to create and share location-based information about their neighborhood, set up their own topics of interest, and process the available information through various online tools. Urban Mediator can also be used by cities as a channel to relay location-based information to citizens and ask them to report issues. Citizens can report any issue that may be of interest to the council. This is a public administration tool which, through citizen collaboration, provides information to the public administration about which issues are interesting for, of concern to, or disliked by citizens. City-point comments added by citizens are displayed on a map. This information is publicly accessible by any citizen and as a result of this a forum discussion may be initiated about any issue. Helsinki will make a general test of this service for any issue suggested by citizens.

Dublin is also testing Urban Mediator, but in this case lack of accessibility is the discussion issue. Thus, anyone finding an architectural barrier in Dublin could create a discussion point linked to that geographic point and would be able to add a comment on and a picture of the reported issue.

In the Barcelona 22@ district, three different pilot schemes are being implemented. Testing is being conducted using an application developed within the project to help members of a community open lines of communications between one another. The service is based on a real-time messaging software for mobile phones, the ICING Messenger, developed by one of the project partners. This software allows fast communication between two people and it displays their proximity to one another as well as their proximity to the rest of the connected group. This powerful tool helps create social networks while facilitating communication between members of existing networks despite the fact that the pilot scheme is so far only demonstrating its functionalities and not exploring all the applications of this tool.

The second prototype is based on city traffic data reception and processing to provide citizens and city managers with real-time traffic information. This pilot project involves modifying city infrastructure. It is based on an advanced network of Bluetooth sensors deployed along the streets of a city area located in the 22@ district of Barcelona. At the same time, a second network of video cameras to monitor traffic on streets has also been deployed in a nearby area. These two networks of "sensors" are acting as a complement to the existing network of "magnetic loops" to count traffic on the streets. All the information provided by the three sensor networks is processed and adjusted to create "from-to" arrays of city mobility. These arrays indicate how pedestrians and cars are moving around the city, and they constitute an essential tool for urban planners. As a by-product, citizens obtain real-time information about traffic on the streets.

The third pilot is based on an issues-reporting service that directly involves citizens with the aim of enhancing city quality of life. The reporting service uses semacodes to "tag" items of urban furniture while, at the same time, providing an easy way to report any issue related to the tagged furniture. An overflowing rubbish bin, a broken streetlight, a damaged container - anything a citizen might report could be an issue. The actual prototype a citizen will be able to report an overflowing rubbish bin to the City Council by just one click on his or her mobile phone. This new facility will reinforce the already existing IRIS service provided by Barcelona City Council by adding a new channel to the existing service that up to now has allowed citizens to report any issue by phone (voice) or Internet.

A Useful Sample Case

To register a new issue it is necessary to have some information: firstly
the object related to the issue; secondly, the issue to be reported; thirdly, where the object is located; and finally, the personal details of the person reporting the issue. As well as adding a mobile channel to this kind of communication, the purpose of the project is to enable most if not all of the parameters required to set up an issue to be inputted automatically. This opens up city management to citizen participation.

City components are labelled with a Semacode (for MMS or browser communication) and an alphanumeric code (for SMS) so that every component will be related to the proper issue, as shown in Figure 3.

Not all components can be reported with the same issues: a street light may be blown, but a rubbish bin cannot be blown. We code each issue in relation to its associated element, therefore a 1 referring to a rubbish bin indicates that the rubbish bin is overflowing, while a 1 referring to street light means that it is blown. The reason for this type of coding is to use a unified "language". For example: an English speaking person will choose 1, meaning the rubbish bin is "full", and the same code would be chosen by a Catalan speaking person, meaning the bin is "plena".

The third parameter we need to know is the element’s location, and this is the most difficult parameter in terms of making automatic input available to everyone. It will be much easier with the embedded GPS technology that most mobile phones will have in the near future.

Finally, it is essential to identify the person who reports an issue. Until now, whenever a citizen made use of this service he had to provide his personal and contact information. In the pilot scheme, citizens will have to register their personal information just once, when they will provide this information and their favourite incoming channel (SMS or email). The system will use this information whenever they report an issue.

Let’s imagine the following situation. Imagine a citizen (we will assume a male citizen, for grammatical simplicity) who owns a GPS mobile phone with the bi-dimensional code or Semacode reader application installed and who has already registered with the council. This citizen comes across an overflowing rubbish bin and he wants to report it to the council, so the rubbish can be emptied. The citizen will open the application in order to read the rubbish bin code. Automatically the reader will recognize the Semacode and send a request to the City Council IRIS [11] service, including the user’s ID, the ID of the offending element, its location, and the issue. With this simple action, the issue has been reported to the city cleaning company and a tracking code has been sent to the citizen through his preferred return channel. The issue reported is attended by the cleaning brigade according to the established SLA and the citizen is notified when the problem is solved. All this happens with just one "click", as if by magic!

6 Conclusions

This ICING project explores the opportunities provided by the new mobile technologies and Web 2.0 technologies implementation for improving urban quality of life. This project offers the citizens a platform which allows cities to deploy advanced services to encourage social integration making use of social networks and citizen participation in the management of the city. Services which provide new information about the state of the city, allowing public managers to act faster and better while providing the citizen with qualitatively and quantitatively better information. The cities of Barcelona, Dublin and Helsinki will be the first to implement the pilot services provided by this platform.

References

Thinking Ahead on e-Skills in Europe: Matching Supply to Demand

Consortium Team led by CEPIS

This report offers a framework for long-term thinking on the development of Information and Communication Technology (ICT) as the engine of Europe’s knowledge economy. Core information is drawn from the findings of "Thinking Ahead of e-Skills for the ICT Industry in Europe", a report published for the European Commission by a consortium led by the Council of European Professionals Informatics Societies (CEPIS).

Keywords: e-Skills, European Policies, Future Scenarios, ICT Industry, ICT Workforce, Knowledge Economy.

1 Findings

The rate of ICT innovation, the economic climate and off-shoring are likely to have the greatest impact on future demand for IT practitioner skills by the ICT industry in Europe. A consortium composed of CEPIS, Manchester Institute of Innovation Research (formerly PREST) and Eurochambres estimated supply and demand levels for IT practitioners in 2010 and 2015, having created six foresight scenarios based on quantitative evidence. They believe that the ICT industry could be facing shortages of up to 70,000 IT practitioners per year in Europe, as supply falls short of demand. A fall-off in ICT activity is seen as very unlikely, but should this occur the EU could be facing an oversupply of 1,000 IT practitioners per year.

2 ICT as Infrastructure

We live in an ongoing technological revolution in both hardware and software, one where our lives are more and more dominated by the pervasiveness of ICT, where sophisticated software has fused with telecommunications to conquer the limitations of geography, where we can deliver unique and imaginative solutions to our customers and access business-critical information when we need it and where we need it.

Behind the progress of this hardware and software is an ICT industry whose innovations are led by speculative curiosity, by market demand forces and by anticipation of our wider needs and desires; and behind this industry are people: the creative professionals who make it possible, the customers who use its applications and the enterprises who conduct business across the marketplace of the Internet.

ICT has become the cornerstone of the modern European economy. It is vital to homes and indigenous businesses across the EU — and is a requisite for attracting foreign direct investment. ICT systems are the "bridges, roads and railways" of the highly evolved economy, and the means by which modern states compete to put themselves on the global map. And just as previous innovative infrastructures have required people with the vision to design and build tunnels and skyscrapers, ICT is nothing without a supply of creative and excellent people to design and build new hardware, to write and continually extend and enhance software, and to dream up the imaginative interfaces that can link previously disconnected technologies.

Europe is evolving away from heavy industry and gearing its resources more towards becoming a matrix of knowledge economies. To ensure its own continued success, our ICT industry must be equipped with professionals who have both the knowledge and the experience to produce the services and products we need. In Europe, we must plan and
monitor our policies to ensure that our supply of ICT professionals will meet our future demand: we need the right number of people with the right levels and mix of skills. Anything less and Europe’s member states will lag behind the rest of the world technologically and therefore slip economically. To avoid being relegated to playing a smaller international role, Europe must ensure that it has a supply of appropriately skilled ICT practitioners (see Figure 1).

3 e-Skills Pool: Supply and Demand

The ICT workforce needs are supplied in a variety of ways. Primarily, people enter the sector having studied courses at certificate, diploma or degree level. These employees choose to study computing for various reasons – including personal interest, desired career path and, crucially, response to national educational strategies. Typically, computing (informatics) students follow third-level courses with the goal of taking up lifelong employment in the ICT sector. Their decision to follow such syllabuses is influenced by the availability of courses, perceived job satisfaction and security, likely levels of remuneration and their response to the overall image of the ICT industry.

In times of boom, people will be enthusiastic to commence and complete computing qualifications. A recent example was the dot-com boom, when the Internet appeared to offer endless potential in terms of creativity, mobility and financial reward. Preparation for the "Y2K bug" and the computer implications of adopting the euro all captured the imagination of people and drew them into ICT. In less certain times, people are more reluctant to embark on specific courses of study – we only have to look at what happened when the dot-com bubble burst in 2000 to see how a workforce can move away from what was once so attractive.

The danger is that such extreme (and unforeseen) swings of interest in ICT can leave the skills market short of qualified people – this is most likely to happen when the market has recovered, is growing fast and is in most need of a specialist workforce. Central to this problem is the time lag between study and qualification. Academia generally moves slowly; national educational policy is cautious in responding to estimates of future workforce needs; and serious attempts to study the possible shape of the future take time. It is of limited use to respond to a take-off in an industrial sector after it has started – it requires years for policies to be developed and implemented, and years again for educational courses to be devised and filled. By the time the much-needed graduates eventually come on stream, the industry may have stopped growing, be less buoyant or have gone into decline – in each case starved of the skilled people it needed to prosper and reach the next level. One thing is clear: demand for IT practitioners must be professionally forecast and policies must be developed and implemented to ensure their timely supply. This report by CEPIS meets those requirements by modelling potential supply and demand scenarios for IT practitioners using a mix of quantitative and qualitative analysis (see Figure 2).

In modelling the future supply of and demand for IT practitioners, CEPIS took into account demographic decline and the expected fading interest by students in IT and technology courses, estimating for its scenarios a fall-off in graduations of 30 per cent between now and 2015. Across the EU, there must be compensation for this drop. Otherwise, we will suffer more serious adverse impact of competition from outside the EU, as we falter within the global economy made possible by ICT technology and skills.

4 Study

To shed light on the future personnel needs of the ICT industry, a model of the overall environment was devised. Ninety stimulants or "change

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Innovation Rate</th>
<th>Economic Growth</th>
<th>Off-shoring Pace</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Renaissance</td>
<td>Rapid</td>
<td>Positive</td>
<td>Moderate</td>
</tr>
<tr>
<td>B: Steady Climb</td>
<td>Moderate</td>
<td>Positive</td>
<td>Moderate</td>
</tr>
<tr>
<td>C: Global</td>
<td>Rapid</td>
<td>Positive</td>
<td>High</td>
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<tr>
<td>D: Fight Back</td>
<td>Rapid</td>
<td>Turbulent</td>
<td>Moderate</td>
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<tr>
<td>E: Dark Days</td>
<td>Moderate</td>
<td>Turbulent</td>
<td>Moderate</td>
</tr>
<tr>
<td>F: Decline</td>
<td>Moderate</td>
<td>Turbulent</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 1: Future Scenarios for the ICT Industry in Europe.
Figure 3: IT Practitioner Supply and Demand, ICT industry 2010.

Figure 4: IT Practitioner Supply and Demand, ICT industry 2015.

**Figure 5:** News on European Commission Policies on e-Skills.

Drivers" likely to impact on the development of the industry in the years up to 2015 were identified. These included social, technological, economic, environmental, political and other forces that together could shape the demand for IT practitioners. Overall, they yielded three dominant influences or "core drivers":  
- ICT innovation rate;  
- Economic growth; and  
- Off-shoring pace.

A number of permutations of the positive and negative roles played by each of these three core drivers are possible – the results give rise to various future scenarios (see Table 1). Six of these scenarios were isolated to help clarify thinking about the level and type of e-skills needed in the years to 2015. These scenarios were labelled as follows: Renaissance, Steady Climb, Global, Fight Back, Dark Days, and Decline.

Arising from detailed workshop discussions held in November 2006 with expert EU member state representatives and feedback from leading ICT industry players, expected values of the core drivers (innovation, economics and off-shoring) were deemed most likely to produce the first three scenarios: Renaissance, Steady Climb and Global. This is based on a detailed consideration of all six scenarios and of detailed figures for the years 2010 and 2015.

Important to the CEPIS analysis is the strong evidence of close correlation between investment in software and the level of employment in the ICT industry. The availability of figures for software investment in EU member states facilitates modelling of the ICT future in each of the scenarios.

For the purposes of modelling the future, overall economic conditions of 2.5 per cent GDP growth per annum are described as "positive"; and conditions of 1.5 per cent GDP growth per annum are described as "turbulent".

Figures 3 and 4 summarise ICT practitioner labour market imbalance estimates for 2010 and 2015.

**5 Positive Scenarios (deemed "more likely")**

The first set of scenarios (Renaissance, Steady Climb and Global) is based on a future where the economic climate is positive. In the context of high levels of growth, ICT becomes an increasing element of many educational courses. While there is an increased interest in IT careers by women, and people will generally tend to remain longer in the workforce, shortages of staff lead to a surge in off-shoring to lower-cost regions outside the EU.

These scenarios reveal that, in 2010, annual supply will reach only 180,000 in a market requiring 250,000 IT practitioners. By 2015, overall demand is seen as falling to a potential low of 129,800 with a shortfall of as many as 51,000 IT practitioners.

**6 Negative Scenarios (deemed "less likely")**

The second set of scenarios (Fight Back, Dark Days and Decline) is based on contexts where economies grow turbulent, where geopolitical instability increases and where business cycles become erratic. There would be a tail-off in investment confidence and reluctance to adopt new technologies. Off-shoring would initially decrease due to volatility and poor international relations. Eventually, the situation within the EU would be as unstable as the rest of the world and off-shoring would become more attractive on the grounds of cost and a pragmatic acceptance of political instability overseas.

By 2010, the net result of such negative scenarios would be a marginal oversupply of IT practitioners. By 2015, demand could fall to as low as 38,000 with continuing shortages; or, in a Fight Back scenario, there could be a shortfall of as many as 30,000 IT practitioners.

**7 A Call for Action**

Having created various future scenarios based on quantitative evidence, and having estimated supply and demand levels in 2010 and 2015, CEPIS believes Europe could be facing shortages of up to 70,000 IT practitioners per year, as supply limitations fail to satisfy high demand.

The figures suggested by these future scenarios make it clear that the ICT industry must not be allowed to develop "organically" – as this could lead to a situation where the industry had an inadequate workforce, with too few people, and not the right depth of skills. Challenges would also arise if there were too many people – this could lead to unemployment and start a cycle where IT careers would appear unattractive, leading ultimately to a shortfall of skills in the industry as students avoid IT courses.

To get the balance of supply and demand right, policymakers in education, in regional and national governments and at EU level must be very attentive to likely workforce needs (see Figure 5). At a policy level, this extends to research and development and to immigration policy; and it requires professional bodies and trade unions to work with policymakers to ensure a greater supply of IT professionals. The ICT industry itself has a key role to play in coordinating these efforts.

**8 What Must We Do to Avoid a Future e-Skills Shortage?**

To reduce the risk of running short of IT practitioners with the right degree of excellence in a range of e-skills, all relevant ICT stakeholders must work to:

- Create better awareness of the threats and opportunities in the growth of globalisation of ICT activity.
- Promote improved understanding for both the industry and public

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bodies of the current quantitative and qualitative levels of e-skills in Europe.

- Foster public-private initiatives to develop understanding of likely estimates of e-skills needs at the European level. This would need investment by ICT industry players and the European Commission, and cooperation in estimating future levels of demand. Such collaboration between industry and policymakers would lead to better understanding of the impacts of cyclical market effects on the supply of and demand for practitioners.

- Train more consistently and steadily over time. E-skills must be imparted more evenly throughout all phases of the business cycle. The pressures of business often make it difficult to allocate enough time to training, while in slack phases, industry is cautious about investing in training.

- Collect comprehensive and reliable data on e-skills at EU level. We also need to improve the quality of cross-coding of national labour force survey data for submission to Eurostat.

- Benchmark EU e-skills against competitor economies.

- Focus on the quality aspects of skill shortages, not just the quantity. The ICT industry needs skills elites and a growing pool of capable people with the right level and mix of technical competence.

- Minimise mismatches between university and industry. More collaborative work between the two is required, along with the introduction of competence frameworks as goals within higher education. Bridges should be built between ICT industry-based certifications and formal education and vocational training courses. At the same time, students should not be moulded just for the immediate needs of the workplace.

- Cultivate a positive public image of the ICT industry. State and industry must work to attract people to study computing courses and pursue ICT careers. Positive coverage of ICT activity and active recruitment drives must do more than counteract “bad news” such as redundancies in specific companies. The industry must be portrayed as dynamic and rewarding, exciting and desirable. Students contemplating the study of ICT must be helped understand that it is the market environment when they graduate that counts.

- Clarify employment levels as they evolve and use them to continuously gauge the future requirements. Common indicators and measurement criteria must be agreed on and actively sought as part of a process of constant monitoring.

It is hoped that the work and conclusions presented in this report will be found of value by interested parties; CEPIS looks forward to continuing to engage with the European Commission and stakeholders to further advance the understanding of e-skills in Europe and to supporting measures that will help improve the position of e-skills throughout the EU.