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Advanced Experiences in Italy:
The University Approach to EUCIP

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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 discusses 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*

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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 view point, 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

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 *Jaan 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-

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

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

Module code	Average coverage
PLAN area	
A.1	56.9%
A.2	52.0%
A.3	43.9%
A.4	49.1%
A.5	47.8%
A.6	33.7%
A.7	40.0%
Total	*46.2%*
BUILD area	
B.1	71.9%
B.2	81.9%
B.3	95.4%
B.4	53.3%
Total	*75.6%*
OPERATE area	
C.1	91.8%
C.2	83.9%
C.3	98.2%
C.4	83.5%
C.5	63.2%
C.6	50.9%
C.7	34.4%
Total	*72.3%*
Total	***62.9%***

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

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

Table 3: The Diffusion of EUCIP Core Certification

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 re-design 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.

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.
4. Expert Network Use.
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

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

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