

The EUCIP Scheme in the Italian University System

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Abstract: This paper reports on the approach of Italian universities to the Eucip ICT certification. The Italian academia has taken a proactive mode: it has decided to work with AICA to support the scheme in all its levels, and to contribute to the quality of the certification with some specific projects, among which the development of e-learning material for the Core level. The cooperation has lasted for four years now, and will continue. It is unique within the European scenario, and it can offer at least a worked-out example of the relationship between a professional ICT certification and the university world.

Keywords: Certification, curricula, degree, university credit, e-learning.

1. Introduction

This contribution describes the approach of the Italian university system to the Eucip certification scheme. The paper discusses the issue of certification vs university degree, the approach to the Eucip scheme in the Italian academia, the projects that have been carried out, the role of e-learning in supporting the certification, and possible future developments. The Eucip scheme will not be described here: the reader is assumed to know the Eucip framework, useful references are the Eucip web site [1] and a summary description [2] available on AICA website.

As will be described later, a few institutions played a major role: 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 [3], that operates the Eucip programme within universities [4]; Fondazione CRUI, the operative branch of the Conference of Italian Rectors, that worked with AICA and CINI in the Eucip4U project (2005-2007) [5]. AICA, CINI and Fondazione CRUI also run an "Observatory on ICT certification" (2000-2008) [6], that includes Eucip in its reports.

2. Certifications vs University degrees

In this section, we discuss the relationship between professional certifications and university degrees, and we report on the Italian approach.

2.1 *Why certifications in Universities?*

At the very beginning, a few questions stand out that must be given proper answer. Why should universities take care of, or even participate, in certification schemes? Is certification of ICT skills an alternative to the assessment of ICT knowledge that comes along with university degrees in informatics?

Certifications are important within the ICT community. The first certification schemes were devised by *vendors* to enhance the perceived quality of their products. Both hardware and software were covered. A large market developed during the 90's: vendors, companies offering ad-hoc training, publishers, all contributed to creating a very strong business. An insightful analysis of the history of certification [7] shows the shift from "product" certifications, to "competence" certifications. Currently, many efforts are being put into the attempt to create a shared scheme to classify competences in a broad sense. The E-skills Forum [8] is one such, long-standing effort promoted by the EU. If we agree that "the true value of a certification is its ability to verify that a person possesses skills that are important to an employer" [7], we must show that indeed a certification and a university degree differ with respect to this.

Broadly speaking, university degrees in ICT have a two-fold task: i) creating a deep ground knowledge that allows a student to enter the profession with skills for being creative and effective in the use of technologies; ii) preparing the individual to handle changes and shifts of paradigms, that are a distinctive feature of ICT. None of these is the purpose of a certification. Yet, the university must signal students the relevance of certification: after getting their degree, students enter a profession and often the employer or the market demand that the professional's competences be verified against a *syllabus* that details specific skills.

2.2 *The approach in Italy*

In the Italian university system, an ICT curriculum must allocate some effort to preparing students to enter the profession. This is usually obtained by setting up stages with companies, by offering short courses on the ethics of the profession, and by other similar offers. This is where certification can be effectively located within ICT curricula. It serves many purposes: it helps students perceive the role of the certification in the profession, it offers advantages when they apply for a

job, it exposes them to an independent, non-academic way of assessing competences.

Eucip was considered particularly attractive because it is a flexible scheme, with a vendor-independent approach. It combines a unified ground knowledge level (the Core) with a multi-face vocational scheme (the profiles of the Elective level). Even vendor specific certifications can be embedded in the Elective level scheme, thus opening up the way to striking 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 the Eucip Core; ii) to produce a set of e-learning courses to support candidates to the Core certifications, both within universities and in the general market; iii) to examine the whole certification scheme (including the Elective 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 goals to map the coverage of 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 got the 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 address mainly the Elective.

3. Implementing the Core Level within ICT curricula

According 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. In a university CINI establishes a single centre, though many test sites can be active, even in different locations within the same university. This structure is directed locally by a professor in informatics. A central coordinating structure manages all the project, and maintains a web site. Students sign-up to the certification programme at a special reduced fare, and have two years to complete the set of three exams that lead to the Core level certificate.

The Eucip Core level certification addresses knowledge areas, such as the BUILD and the OPERATE, that are at the “core” of any degree in informatics. The PLAN area, instead, is largely ignored by curricula, both in engineering and in computer science. So, at the outset, the project was targeted to students enrolled in the ICT curricula, on the assumption that at the end of the three-year curriculum, just before getting their degree, or possibly one year later, at the

beginning of the subsequent two-year curriculum, they could successfully pass at least two of the Core level exams without any specific Eucip training. The university courses should have prepared them well beyond the level of the Core certification, as far as ICT is concerned. Instead, the PLAN area was expected to be mastered only to a very small degree.

These assumptions have been checked in the years 2004-2007 through the synergic actions of CINI centres of competence examination structure and the Eucip4U work on mapping actual coverage of syllabus in the curricula. 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 altogether more than 40 sites delivering the tests. The universities that joined in the Eucip4U project were 30, with 66 tracks (39 from engineering, 23 from computer science and even 3 from economy, plus a master).

The detailed analysis of the coverage of the Eucip Core syllabus confirmed the initial assumption. The PLAN area was found totally or partially disregarded in all its modules by a minimum of 36 tracks (in the A1 module on “Organizations and their use of ICT”) and by a maximum of 47 (in the A7 module on “Legal and ethical issues”). Furthermore, the OPERATE C7 module on “Service Delivery and Support” was found uncovered in 42 tracks; this was also expected. The true surprise comes from the unexpected low coverage declared by some 30 tracks 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”.

On another side, the groups of university professors active in informatics in engineering and computer science (GII and GRIN) recommended that the Core level certification be assigned university credits within ICT curricula. 41 of the tracks in the Eucip4U project complied, and granted an average of 5 credits (a three-year degree accounts for 180 credits).

Students started to enrol in the certification programme in autumn 2004, with a special fare that packaged the skills card and three exams. Table 1 shows the progress in time of enrolment, actual certifications issued, success percentages in the three knowledge areas.

Table 1. The diffusion of Eucip Core certification.

Year	Students		Exams			
	enrolled	certified	success	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

The numbers show a few 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 what 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 take into proper consideration the language issue: the exams were (and still are) delivered in English. The certification programme has attracted a good number of students up to 2006; in 2007 enrolment has declined strongly. Examination activity continues, since the programme allows for two years to complete the three tests, so a certain number of students are in process of completing the sequence. During 2006 CINI offered its e-learning courses for free to students (more on this sub-project in the following section); from 2007 the courses must be paid for, though at a price considerably lower than what the average Italian student spends for cell phones and the like!

Feedback was collected within the CINI network of university competence centres to assess the situation at the end of 2007. The 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 Core; ii) the Elective level certification has been completely specified in its 21 profiles in mid 2007, and has not been deployed consistently neither in the universities, nor in the market; iii) only in 2008 the Eucip scheme has 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 Elective level outside the universities will be effectively perceived. A possible contribution from the university system to the Elective level is described in a subsequent section.

4. The CINI e-learning courseware for EUCIP Core

As anticipated, one of the tasks CINI planned to support the Core level of the EUCIP certification scheme was the design, production and operation of set of e-learning courses. CINI held this part of the mutual cooperation with AICA so important and relevant for the world of the academia involved with informatics that it decided to share with AICA on equal basis the costs (known !) and benefits (speculative !). Among the motivations that lead CINI to this position were: i) the desire to support a certification that, at the Core level, is by nature “vendor independent” and that shares so much with all degrees of informatics in Italian university curricula; ii) the hope to contribute to set at a high level the perceived quality of the EUCIP scheme as a whole, mainly outside the university world; iii) the hope to offer the ICT community in its broad sense a set of high quality courses on introduction to informatics, that could *also* serve as a tool for preparing candidates to the certification; iv) the desire to experiment the e-learning techniques already used within some of the universities in a *nation-wide* framework, by running national virtual classrooms.

4.1 Design principles

Many Italian universities have produced e-learning material for official courses in various tracks, and there are a few degrees, especially in the ICT area, that offer on-line classes only. So there is widespread knowledge on setting up e-learning “university course”.

Designing of Eucip Core is another matter. For one thing, the estimated effort for the various “modules” of the three knowledge areas is usually much smaller than the comparable effort for a university course. Furthermore, the target audience can be quite different: in a university environment, the profile of students of ICT degrees is known, while the prospect usage of Eucip courseware can call for attendees with good ICT practice, but no or little formal training, or for people in public administration that are involved with ICT processes but have no training in informatics at all, or even for students in business schools that want to complement their economics degree with training in informatics. Finally, one can conceive the material using the syllabus as a guideline, or one can adopt a more wide approach designing the courses without strictly adhering to the breakdown of the subjects suggested by the syllabus, meanwhile guaranteeing that all topics in the syllabus are indeed covered by the courses.

Since the profile of the would-be user of the courseware was so various, CINI decided to design the material with a “quality first” criterion and with the ultimate purpose to create a repository of elementary *learning objects* that could be re-used in more environments.

4.2 Courses structure and development

At the coarse level, the e-learning material developed is currently organized into 18 courses, each associated to one of the EUCIP “modules”. Within a course, the material is broken down into *learning objects*, that is self-contained units that can possibly be assembled to set up different learning paths. Each learning object contains many items: *units of content* (text with graphics and figures, each some 600÷800 characters), *self test questions* structured according to Eucip guidelines for examinations questions (multiple choice questions, with feedback for each choice); off-line *exercises* (short problems with an annotated solution), along with intended *learning outcomes*. The set of learning objects are accompanied by the *conceptual map*, a precedence graph that show the precedence among the concepts used within the learning objects themselves. The user of a module has a clear description of the sequence of learning paths that are available within each course. Coverage of the syllabus is guaranteed by proper references to the “topics” from within the learning objects.

The material has been produced in a year by a team of university professors and some professionals (the latter mainly for the PLAN Area). Authors were provided with proper guidelines and detailed instructions. A thorough reviewing process

was set-up, with reviewers chosen among PhD students in ICT, technicians with operative skills and even staff with little or no formal education in ICT. An editorial board collected the review forms filled each by each of the reviewers on each learning object and routed feedback to the authors when necessary. The process was indeed a fairly huge one, as well as the output.

The learning material produced consists of 193 learning objects, containing a total of 2000 units of content with 725 drawings and pictures, 2000 self-test questions and 400 exercises.

4.3 The technologies

The whole e-learning project was conceived to be an all in-house one, that is CINI wanted to leverage the capabilities and skills available within its member universities. So, an open software approach was followed consistently. The delivery platform was chosen among the open software based ones, and Dokeos turned out to be the most apt to the goals of the project. Among the key features, it supported fairly well SCORM 1.2 and allows for a fairly flexible setup of the virtual classes and for the tracing of the learning progress of the users.

The learning objects have been produced through software chain that has targeted re-use: the intermediate result of the developing project is a repository of XML documents embedding the various types of learning material. The final HTML pages (with proper javascript code for managing, among other things, self-test questions) also comply with accessibility requirements.

4.4 The e-learning model

One of the most important choices for this sub-project was the design of the e-learning model. The first use of the courses was within university students enrolled in computer engineering and computer science tracks. This audience was scattered throughout many universities and there was no practical possibility to create local classrooms obeying the blended mode e-learning paradigm. So the model adopted was based on virtual classrooms, assisted by a *tutor*, with the support of a domain *expert* and the overall assistance of a *controller*. Both the tutor and the student enrolled in the classroom were bound by an *agreement*. The tutor had to guarantee proper assistance to the classroom by regularly logging onto the platform, by answering questions with one of the asynchronous communications tools available (forums, FAQ, messages) or by forwarding them to the expert, by checking on the progress of each individual and by reporting on a weekly basis to the controller. The student accepted that he could access the courses for their whole duration provided that he actively participated in the experiment: he had to log on the platform within two weeks from the start,

meanwhile reading a number of units of contents from at least one learning object, and he should complete three of the seven courses within the first two months.

The classroom was scheduled to last for three months: the tutor was active for the first two months, and the student could continue on his own for one more month. At the end of the period, the student was asked to fill in an assessment form.

The *expert* was the author of the module. His services were considered necessary only occasionally, should a tutor be unable to answer directly the questions raised by course attendees. The subjects covered by the courses are indeed very wide; while the BUILD and OPERATE area are somehow homogeneous and insist strictly on ICT, the PLAN area requires a different expertise. So, in a virtual classroom that is associated to all the Eucip Core courses, the tutor is unlikely to be in command of all subject matters.

The *controller* was given the task to control the work of the tutors. This function has proven very important for the experimentation phase, and can be used profitably when an e-learning process involves many virtual classrooms that are active at the same time. Basically, the controller checks that the tutor complies with the duties of his agreement.

Of course, the actual work of tutors and of the controller and the quality of the service offered to the student depends on the features of the delivery platform. This is where the combination of technologies (standard SCORM 1.2) and open software played its role at the most: the type of data collected by the platform and the modes of analyzing these data were not suited to the intended scopes but have been properly tailored and extended.

4.5 The experimentation

The first use of the e-learning course was within universities. We chose to offer students of informatics degrees learning material for the PLAN area of the syllabus (and of module C7 on Service Delivery and Support) because these knowledge areas are not covered or treated only shortly in the official course of their curricula. Also, the BUILD and OPERATE course were offered to students in electronics and telecommunications: their curriculum indeed covers only introductory informatics.

From November 2005 to June 2006 CINI ran 9 nation-wide virtual classrooms. Some 800 students were involved in the experiment. They were offered free access to the classrooms, provided that they had enrolled in the Eucip certification scheme, and that they belonged to one of the tracks that supported the Eucip4U project. The experiment worked fairly well; the management of the process was smooth, some initial technical deficiencies in the platform were identified and corrected (slowness due to improper DBMS usage by Dokeos, unreliable collection of tracing data).

The student perspective has been analyzed on the basis of the questionnaires filled in and with the help of the tutors. It turned out that the courses have been perceived useful and suited to the certification. The one thing that disappointed most students is the use of the Italian language: since the certification exams are delivered in English, the user of the courses receives proper cultural assistance, but experiences true difficulties with the sometimes puzzling terminology of the English questions issued during the exams, mostly in the PLAN area.

A small experimentation was also carried out in a classroom of ICT professionals, mostly engineers or public servants in ICT agencies. Their feedback was altogether different: they considered the material very useful to rehearse and update “ground knowledge” in ICT; yet, the sheer volume of the 2000 web pages (for the whole Core) was perceived as a major hurdle. Actually, a proper profiling of the candidate can help extract from the large repository of learning objects those really necessary to an individual learning path. Work is in progress!

5. Perspectives on the future

The cooperation between AICA and CINI continues and a new agreement for the year 2008-2009 has been signed. On his side, AICA is setting up a set of services for companies and the general market based on the 21 profiles of the Elective level with the “Cantieri dei Mestieri” [9]. Accordingly, the approach to Eucip within universities will be more focused on the Elective level, in many directions.

The Elective level is the real professional part of the certification. Its 21 profiles detail competences that typically can be attained only after proper work in the field. The candidate to the certification must produce a “portfolio” that lists competences along three dimensions: formal training/education, work experience, accredited specific Eucip modules (beyond the Core, that 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.

The university system can help in many ways, within this scenario. Clearly, students at the end of their degree are well below the competence level of a professional, in any profile. Yet, if they have got their degree by preparing their final dissertation as a result of a stage within a company on subjects strongly related to a profile, they could be interested in being awarded an “assistant” certificate, should their “portfolio” have the required characteristics.

The dimension on accredited Eucip module is currently the most weak one in Italy. The university system can help in three ways: i) by setting up master degrees that are closely shaped after 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 well matched to the profiles that are most appealing in the ICT market. Two are the criteria: on one side, students enrolled in a university degree get not only university credits, but also Eucip “points” to be

later spent for the certification; on another one, specific new didactic proposals can be modelled after the requirements of the ICT market, clearly specified by a set of professional profiles widely accepted and recognized.

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