

ICT Professional Profiles & Certifications in the Italian University System – The EUCIP Case

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Professional Profiles vs Formal Education

- Professional profile: competences
 - Experience
 - “skill do to comes from doing”

- Formal education: knowledge
 - Long term
 - Innovation

What Universities have to do with certifications ?

- Nothing (?)
- Knowledge vs Competence
- Curricula design vs Certifications' Syllabi

The EUCIP case

- CEPIS
- More a competence framework than a certification scheme
- Well structured (wide spectrum *core* level, narrow band *elective* profiles)

- AICA-CINI joint projects 2004-2007 and 2008-2009
- AICA-CRUI EUCIP4U 2005-2007

EUCIP overall scheme

- **21 professional profiles (ELECTIVE Level)**
 - IT professions broken down into competences
 - Roughly 2500 elementary “skills”
- **1 cross-disciplinary level (CORE Level)**
prerequisite to the Elective profiles
 - 3 wide-spectrum areas (PLAN, BUILD, OPERATE)
 - PLAN = IT in organizations and business
 - BUILD = the design of IT systems
 - OPERATE = the management/operation of IT systems

EUCIP structure: 21 profiles

- IS Manager
- IS Quality Auditor
- Enterprise Solutions Consultants
- Business Analyst
- Logistics & Automation Consultant
- Sales and Application Consultant
- Client Services Coordinator
- IS Project Manager

- IT Systems Architect
- IS Analyst
- Web & Multimedia Master
- Systems Integration & Testing Engineer
- Software Developer
- Database Manager

- X-Systems Engineer
- Telecommunications Engineer
- Network Architect
- Security Adviser
- Network Manager
- Configuration Manager
- Help Desk Engineer
- IT Trainer

PLAN

The use and management of information systems

BUILD

Aquisition, development and implementation of information systems

OPERATE

Operations and Support of Information systems

Profiles structure and competences

System of 21 profiles grouped into 7 areas of professionalism

- IT Business Mgr & Professionals**
- Solution Consultants**
- e-Business & Innovation Agents**
- Software Designers**
- Technical Advisers**
- Service Support Specialists**
- Operational Managers**

“Dictionary” of EUCIP competences

(**2.439** units of elementary *items* grouped into **155** categories; 6 classes endorsed by HR people)

- IT and ITC competences (both in proprietary and open source technology)
- Management competences
- Innovation competences
- Context competences (regulation, security, ..)
- Pedagogic competences
- Behavioural competences

Projects and actors

- **AICA**
- **CINI** a consortium of 29 Universities active in ICT
- **Fondazione CRUI**, operative branch of the Conference of University Chancellors

- **AICA-CINI** joint projects 2004-2007 and 2008-2009
- **AICA-CRUI EUCIP4U** 2005-2007

University Competence Centres

- CINI runs the EUCIP certification within Universities
- 28 Universities, each has a CCU
- 41 EUCIP Core level testing sites, 8 IT Administrator

- CINI has developed e-learning courseware (in Italian) and is partner of Leonardo framework EUCIP MAT project (Estonia, Latvia, Italy)

The EUCIP case

- Two **mapping projects**
- Core Level Mapping in L3 curricula **EUCIP4U**
 - Wide national effort (2005-2007)
- Elective Level Mapping in L3+LM curricula **EinU**
 - Experimental (winter 2008/2009)
 - 5 Universities

EUCIP CORE Level in ICT Curricula

- ***EUCIP4U***: Coverage of EUCIP Core Level Syllabus in ICT first level degrees (three-year tracks)
- 40 Universities
- 66 ICT tracks (both Engineering and Computer Science)
- 44 tracks assign University credits (ECTS) to the Core Level (3-9 out of 180 of the complete curriculum)

EUCIP CORE Level in ICT Curricula

- Coverage of EUCIP Core Level Syllabus in ICT first level degrees (three-year tracks)

Module code	Average coverage
<i>PLAN area</i>	
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%
<i>Total</i>	<i>46.2%</i>

EUCIP CORE Level in ICT Curricula

- Coverage of EUCIP Core Level Syllabus in ICT first level degrees (three-year tracks)

<i>BUILD area</i>	
B.1	71.9%
B.2	81.9%
B.3	95.4%
B.4	53.3%
<i>Total</i>	<i>75.6%</i>

EUCIP CORE Level in ICT Curricula

- Coverage of EUCIP Core Level Syllabus in ICT first level degrees (three-year tracks)

<i>OPERATE area</i>	
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%
<i>Total</i>	72.3%
<i>Total</i>	62.9%

The Elective level for the graduate student

- Mapping of “regular university courses” vs Elective Level profiles
- Eucip “points” as by-product of normal student effort

- **Profile name and short description**
- **Tasks Overview**
- **Essential behavioural skills**
- **Detailed skills required**
 - ✓ **List of detailed technical competences (*topics*) organized into coherent corpus (*categories*)**
 - ✓ **Degree of *relevance* (deep and incisive) of categories for each profile**
- **Sample learning modules**
 - ✓ **Course/exams in university curricula**
- **External references to SFIA skills and to profiles defined by AITTS and CIGREF**

An example: Network Manager

- **Profile Name and Short description**
 - ✓ “A EUCIP Network Manager is expected to be very effective in managing a networked information system of medium complexity, and improving its performances. Should also be proficient in interactions with network architects and possible external suppliers across all phases of a network’s lifecycle ”
 - ✓ **Esperienza minima 36 mesi (full certification)**
- **Tasks Overview**
 - ✓ “Working alone on moderately complex network systems, or with consultants on larger or more complex networks, defines network design policies, philosophies and criteria, specifies user/system interfaces, documenting all work using required standards, methods and tools and plays a leading role in scheduling installation work, ...”
- **Essential behavioural skills**
 - ✓ “The Network Manager role requires initiative, flexibility and a rational mental attitude capable of conceptual and analytical thinking, even under stressful conditions: a persistent goal-oriented approach in a strategic perspective has to be combined with strong attention...”
 - ✓ 2 Eucip “points”

An example: Network Manager

•Detailed skills required

✓ **Deep competence level [9]**

C3.02 Ethernet [1,5]

➤ Evaluate an Ethernet system:

- Data transmission rates
- Transmission media
- Maximum lengths and nodes
- Different types of Ethernet networks such as 10BASE-2, 10BASE-5, 10BASE-T
- Related standards (such as IEEE 802.3)

➤ Explain the CSMA/CD operations.

....

C3.04 IP communications [2,5]

✓ **Incisive competence level [21]**

C2.01 Operating Systems [2]

➤ Differentiate between the most widespread operating systems:

- Linux/Unix
- Windows
- MacOS

...

Elective Profiles: 155 categories

C.3 Communications and Networks

- C3.01 Network principles and standards
- C3.02 Ethernet
- C3.03 Apparatus and structured cabling
- C3.04 IP communications
- C3.05 Non-IP network protocols
- C3.06 Modem and modulations
- C3.07 Routing
- C3.08 Network segmenting and VLANs
- C3.09 Network essentials
- C3.10 Data representation and protocols



Elective Profiles: 2439 detailed skills

C3.02

Ethernet

Evaluate an Ethernet system:

Explain the CSMA/CD operations.

Explain level 2 operations, MAC address.

Explain Broadcasting and unicasting.

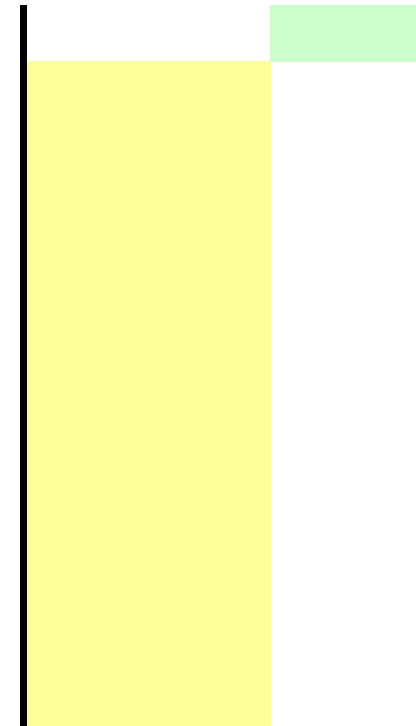
Connect a computer to a Ethernet segment.

Connect in cascade hubs or switches using crossed ports, crossed cables or coax cables.

Recognise the different Network adapter connectors, Coax/BNC, DIX/AUI/DB15, RJ45 etc. Also know their use

Install network card driver on different platforms (Windows, Apple, Linux)

Know how to update NIC drivers.



EinU

EUCIP Elective Profiles to University Courses Mapping

Preliminary Results

- G. Visaggio/ Ardimento (Bari, Comp. Science)
- G. Aymerich (Cagliari, Comp. Science)
- M. Dominoni (Milano Bicocca, Comp. Science)

- G. Fumera (Cagliari, Comp. Engineering)
- C. Sansone (Napoli Fed. II, Comp. Engineering)
- **M. Ferretti** (CINI & Univ. Pavia, Comp. Engineering)

Winter 2008/2009

Eucip Elective Experimental Mapping

Analysis mode

- Two possible approaches
- **By profile**
 - Each profile is analysed and the coverage of its syllabus is estimated
 - Targeted mode, when very few courses are available
- **By competences**
 - All categories/detailed skills are considered, and their coverage in each course is assessed
 - Better suited to a large offer of courses (possibly overlapping)

Eucip Elective Experimental Mapping

Analysis mode – **by Competences**

- **2349 elementary skills**
 - Binary evaluation carried out by each teacher
- **155 categories**
 - Class *hours* on the category, as estimated by the teacher
 - *Coverage index* computed as weighted average of binary evaluations on related elementary skills ($0 \leq x \leq 1$)
- **21 profiles**
 - Profile composition in terms of categories
 - “deep/incisive” weight of categories within profiles
 - Global “EUCIP points” assessment per each mapped course

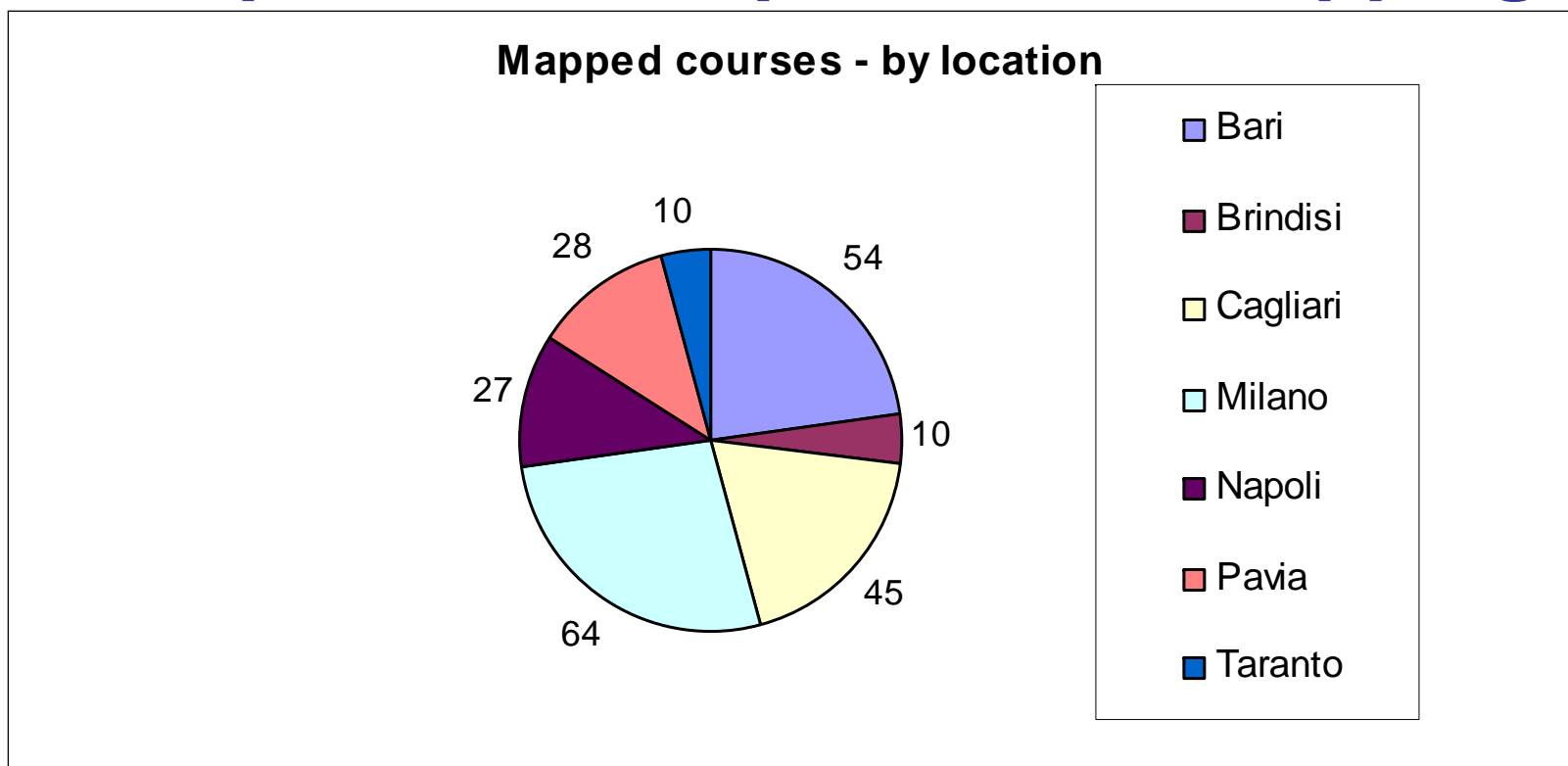
Eucip Elective Experimental Mapping

Courses database

Course Name	University	Degree	Degree type	ECTS	Hours	Eucip Hours	Eucip Points
Data Bases	Pavia	Computer Engineering	L3	5	54	45	6,74

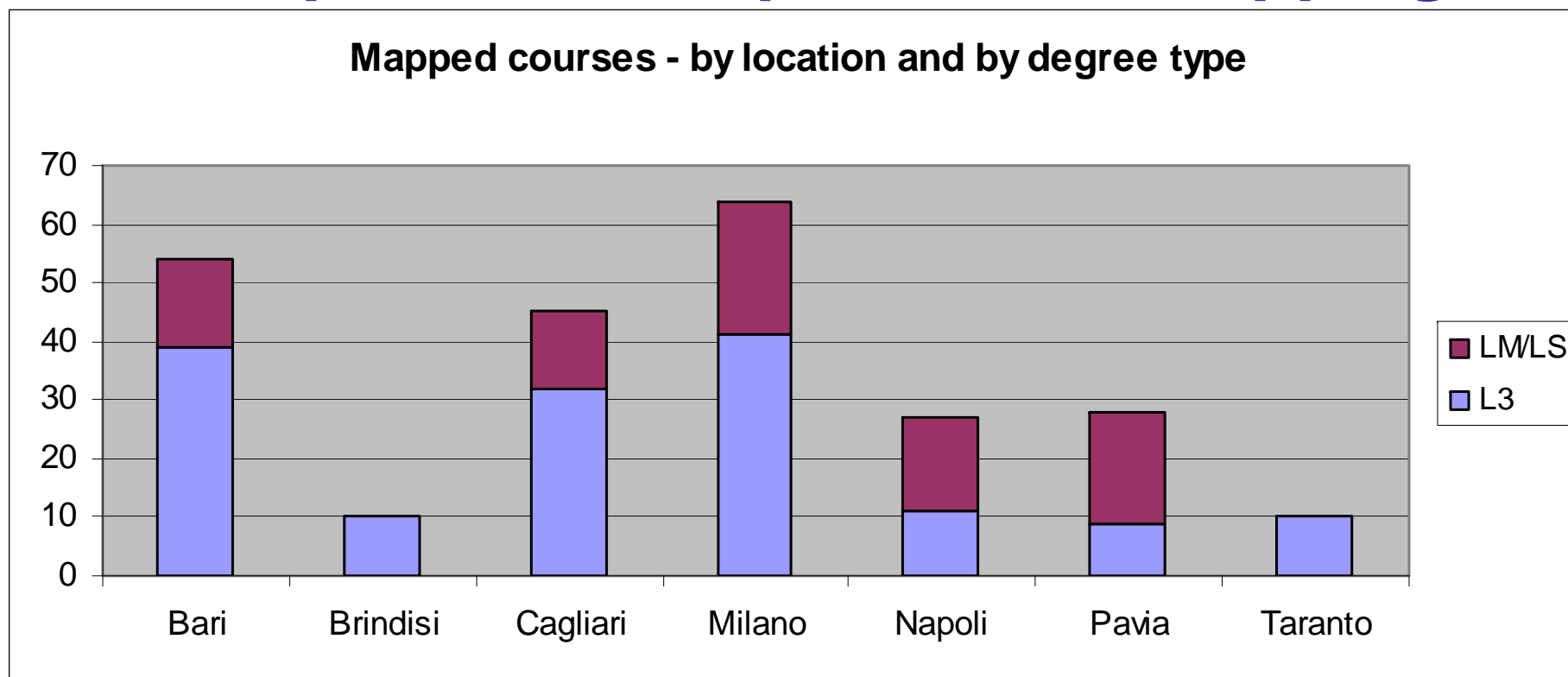
Information Systems Analyst	Software Developer	Network Manager	Enterprise Solutions Consultant	Information Systems Project Manager	Database Manager	Web & Multimedia Master	Help Desk Supervisor
0,45	1,33	0,00	0,20	0,00	2,43	0,07	0,00

Eucip Elective Experimental Mapping



Total: 238 courses

Eucip Elective Experimental Mapping



L3 152 LM/LS 86

Eucip Elective Experimental Mapping

Quantized coverage level

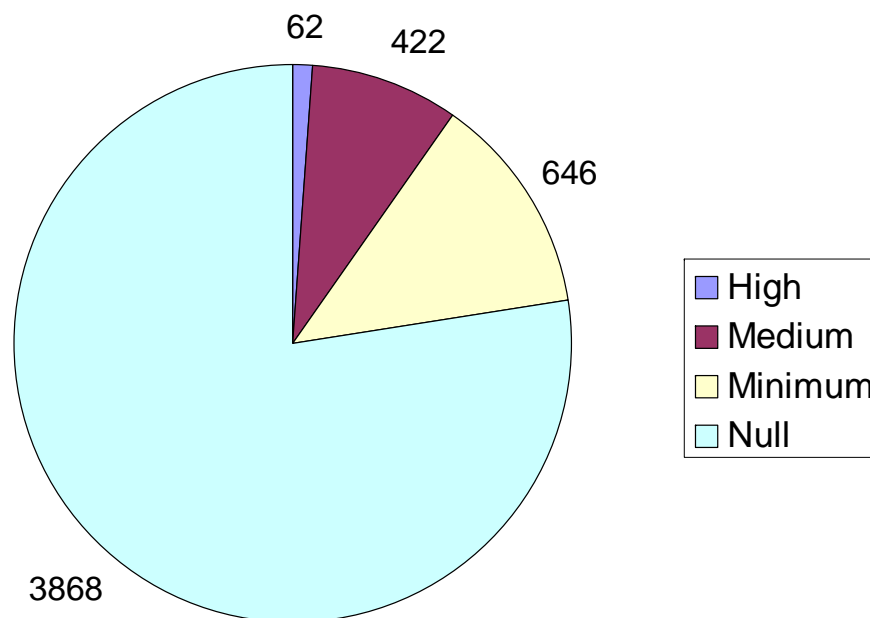
- **Coverage level** referred to categories measured in “Eucip points”
- Depends on the relative weight of the category for a given profile (incisive/deep)

Points < 1	Null
Points 1	Minimum
Points [2-4]	Medium
Points [5-]	High

- Eucip allowed range per accredited module [0-10]

Eucip Elective Experimental Mapping

Coverage level - general aggregate



21 profiles vs 238 courses = 4998 cases

The Elective level profiles as guidelines

- Designing ICT curricula that “match” requirements from the profession
- Designing master degrees on specific Eucip Professional Profiles

Other frameworks

- EUCIP is just an *instance* of qualification framework
- University system is open to any scheme, provided it is well structured and offers an analytic description
- Professional frameworks can be used by European University systems for “converging” curricula