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# Toward an International Curricula Network for exchanges and LifeLong Learning

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**Abstract**— The ELLEIEC ERASMUS thematic network runs from October 2008 to September 2011. This project deals with several aspects linked to LifeLong Learning in Electrical and Information Engineering in Europe. One of the actions of the project is to set some ICN (International Curricula Networks) in some disciplines (specialities in EIE) and levels (Bachelor or Master) aiming at defining the necessary learning outcomes for some curricula. It is defined and agreed at the European level by the ICNs and can be used for AEL (Accreditation of Experience Learning) for European workers who want to validate some diploma, corresponding to their actual knowledge and skills. AEL could be partial, so it is crucial to have the possibility, for workers who need it, to validate some modules; these modules can be prepared either in a classical class or remotely. The modules (or pieces of modules) which are available remotely to students, and agreed by the partners of the ICN, are called IM (International Modules).

## I. INTRODUCTION

During the last years, an important work has been achieved within the framework of the European programmes in order to emphasise and allow the mobility of students, the exchange of teachers, the recognition of diploma (programmes ERASMUS, now in the LLP programme)...

These reflections have been done for classical programmes within HEIs throughout Europe and also within the programmes dedicated to vocational studies (LEONARDO, ValeurTech, EQF) to emphasise Life Long Learning and credit accumulation all around the life, with an approach based on competences [1].

The main purposes in these programmes can be summarized as follows:

- favouring the equality among citizens in Europe, giving them the possibility to obtain their diploma in any European country and also ideally to be able to work anywhere within the European Union,
- fostering Life-Long Learning in order to allow citizens to adapt themselves to the rapidly-evolving

needs of the society, all around their life, as far as jobs are concerned.

This paper presents the concept of ICN (International Curricula Network), which can act as a pedagogic committee at the European level for a particular discipline or sub-discipline.

## II. PROBLEMATIC

Three challenges are now facing the European Union concerning mobility or "equal mobility" (which means equality of mobility opportunities for each European citizen):

- Mobility of students, that is partially achieved by the ERASMUS exchange programme through the European Credit Transfert System (ECTS), and the Curriculum Development programme (+ ERASMUS Mundus), for the development of joint degrees.

- Mobility of workers (recognition of diploma) which is at the moment only partial, even if an important work is done in order to adopt or to converge to a European Qualifications Framework and maybe to a European Accreditation [2] System or Methodology (EUR-ACE (Accreditation of Engineering Programmes)) ...

- Mobility of LL citizens, which means the possibility for a citizen to accumulate credits and possibly to validate diploma during all her/his life, with a European recognition (credits, diploma) of the process she/he goes through. We can illustrate with an example, even if it is "theoretical":

- o to leave the university with a bachelor degree in a first country,
- o to work in a company of a second country, with the diploma from the 1<sup>st</sup> country,
- o to pass some credits in a professional speciality during this time at the company,
- o to go to a third country in order to prepare some theoretical credits,

- o to accumulate all these credits to get a master level, for instance, in another country,
- o finally, to go to a fifth country with this master obtained through accumulation of credits to work in a company or at educational institutions (colleges, universities...), or to do a Ph.D.

The main purpose of this work is to enhance the employability of people by allowing them to learn and validate their knowledge all life long and to recognise these lifelong-acquired competences in the various European countries and systems.

Our reflection concerns the field of Electrical and Information Engineering (it is our speciality) and in the ERASMUS programme (ERASMUS network) since it is targeted at the moment to Universities and HEIs, because there is a challenge in introducing these concepts to the universities and to provide them with some tools in order to develop and implement in the future a quality LL process, and we think our HEIs should be the main actors in that point, within the frame of the Bologna process [3].

### III. INTERNATIONAL CURRICULA NETWORKS (ICN)

An ICN is a cluster of partners who agree all together to a common or joint curriculum in a speciality. Ideally these shared curricula should be recognised at the accreditation level, but the process can be difficult in some cases. In order to initiate the ICN, we consider two pragmatic cases:

- Cross recognition of “curricula ” (learning outcomes, competences, Tuning approach), which is the fact when at least two institutions agree on common modules for an ERASMUS exchange either of students or of teachers.
- Shared recognition of modules, which is the case when a set of modules is developed and implemented within the frame of a programme; in particular distant modules can be used.
- Concerning this second point, we can consider the practical use of the module in various ways:
  - o Distant Course without any tutor,
  - o Distant course with a distant tutor,
  - o Distant course with a local tutor,
  - o Local course.

The last role of the ICN is to act as a “pedagogical committee” to identify good approaches in the setting of existing or new LLL curricula.

### IV. EXAMPLE OF AN ERASMUS-BASED ICN ON NETWORKING AT THE BACHELOR LEVEL

Within the frame of the “Final year of the Professional Bachelor’s Degree In Computer Networks and Telecommunications specialising in Wireless Networks and Security”(WiNS) [4] [5] programme, launched in Grenoble in September 2007 as an unexpected outcome of the previous Thematic network EIE-Surveyor ([www.eie-](http://www.eie-surveyor.org)

[surveyor.org](http://www.eie-surveyor.org)), the following experiments have been achieved in 2009-2010, as a first attempt to define the precepts of International Curricula Networks and International Modules.

The first experiment concerns both student and teacher international exchanges.

1. Within the frame of the student ERASMUS exchanges, 4 students attended the autumn semester of the WiNS class:

- Two students from University of Vigo / Universidade de Vigo (partner P35 of ELLEIEC) in “Technical Telecommunication Engineering, speciality in Telecommunication Systems / Enxeñaría Técnica de Telecomunicación Especialidade de Sistemas de Telecomunicación (ETTST)”

- Two students from Higher Education Institution of the Province of Liège / Haute-Ecole de la Province de Liège (P60) in “Bachelor in Industrial computing, option network and telecommunications / Bachelier en informatique et systèmes finalité réseaux et télécommunications”

This semester with courses was recognized by the students’ home institution. For the spring semester, the Belgian students went back in Liège and passed some courses and a Training project. Both of these were recognized in Grenoble and as a consequence the students obtained the two diplomas. The Spanish students stayed in Grenoble in order to get some courses and went in companies for their internship in France: these were recognized both by Grenoble and Vigo meaning that the students got also two diplomas.

Therefore, this first experiment of an ICN done in Grenoble obtained concrete results.

Another experiment concerns the case of a Slovak student, who attended the autumn semester in Grenoble, and then went in Germany (within an ERASMUS agreement between Grenoble and the German institution). So this student, registered in Kosice, spent one semester in Grenoble and one in Germany, and got both the Slovak and French bachelors.

The last scenario concerns a Finnish student, who attended only the autumn semester, and then went back to Finland for the spring semester. In his Finnish curriculum, the student followed courses but no internship. He naturally got his Finnish diploma. Concerning the French Professionnal Bachelor, an intership experience was missing, on the formal point of view, but this student got a previous professional experience, working previously in some companies in networking and security ; the final jury decided to give this student the “Licence Pro”, considering his professional experience as an AEL (Accreditation of Experiential Learning).

These are some examples of an ICN, composed of several universities in Europe, around an existing curriculum, based on ERASMUS exchanges.

## 2. Within the frame of staff ERASMUS exchanges

Vigo and Liège are so two partner universities of Grenoble in this experiment. Juan Carlos Burguillos from Vigo and Pierre de Fooz from Liège came in Grenoble within the staff ERASMUS programme in order to give a “bit-size” module :

- “Firewall configuration and WiFi security” within the frame of the module “Security of networks” for the Spanish colleague,

- “IPV6 protocol” within the “network” module for the Belgian colleague.

These “bit-size” modules were of course recognised by Grenoble, by the home institution of the students but also on an informal way by the other institutions collaborating with Grenoble within this WiNS programme: for example a student coming from AGH Krakow, following the WiNS course in Grenoble, validating the bit-size module of “Firewall configuration and WiFi security” from Vigo.

Various universities from the ELLEIEC project are partners of UJF Grenoble in this experiment:

- CTU Prague (partner P13)
- Technological Educational Institute of Crete (partner P32)
- University of Vigo (partner P35)
- Technical university of Kosice (partner P41)
- AGH University of science and Technology (partner P45)
- Technical University of Valencia (partner P55)
- Haute-Ecole de la Province de Liège (partner P60)
- Cracow University of Technology (new partner).

Another interesting experiment, not further developed in this paper, concerns the setting of 6 LLL modules, developed by a set of partners within the CD project ESPANT (<http://www.advancednetworking.eu/>), in the field of networking. A cross-fertilisation experiment is on the way between ELLEIEC and ESPANT.

## V. EXAMPLE OF AN ERASMUS MUNDUS-BASED ICN ON VISION AND ROBOTICS AT THE MASTER LEVEL

Erasmus Mundus Programs (Erasmus Mundus Master Course EMMC and Erasmus Mundus Joint Doctorate EMJD) are very good examples of ICN. Since the launch of the Program (2003) and the first round of EMMCs (2004), the number of ICN in the field of computer Vision and/or Robotics has increased and they have gained visibility for non European Countries and for non European students through actions developed within the Action 3 (former Action 4) of the Erasmus Mundus Programme. The list of all EMMC and EMJD can be found at [http://eacea.ec.europa.eu/erasmus\\_mundus/results\\_compe](http://eacea.ec.europa.eu/erasmus_mundus/results_compendia/selected_projects_action_1_master_courses_en.php)

[ndia/selected\\_projects\\_action\\_1\\_master\\_courses\\_en.php](http://eacea.ec.europa.eu/erasmus_mundus/results_compendia/selected_projects_action_1_master_courses_en.php) and [at](http://eacea.ec.europa.eu/erasmus_mundus/results_compendia/selected_projects_action_1_joint_doctorates_en.php) :

Among the list of EMMCs, 3 are in the fields of Vision and Robotics (EMARO : European Master on Advanced Robotics, VIBOT ([www.vibot.org](http://www.vibot.org)) : Erasmus Mundus Master in Vision and roBOTics, CIMET: Master Erasmus Mundus “Color in Informatics and Media Technology) and no EMJDs selected yet.

Considering these three masters, one can see the diversity of an ICN:

At the mobility level: VIBOT is based on a rotation basis of all students at the same time (every semester) within 3 European Universities, one in France, one in Spain and one in Scotland; CIMET includes 4 European Partners (Norway, Finland, Spain and France) with students being split between the European Universities depending on their chosen specialty; EMARO relies on a consortium of 3 European Universities (Italy, Poland, France) as well as 3 non European Universities (Thailand, Japan, China). For the first year, students are split into two groups and stay in one University (France or Poland), afterwards they can go in any of the three European Universities for the third semester and in any of the 3 non European University for their research Internship.

Regarding the course structure, the three masters offer also a different approach: VIBOT has decided to have their course contents commonly defined and held every semester in each university in common with local students who follow a national degree in their university. The contents are discussed and adapted every year, based on research progress, during the Academic Board. Regarding CIMET, students may attend different courses depending on the university, and the specialty; but they can also have similar courses delivered on different campuses, taught by the same lecturer either through Intensive Modules or through Vision Conference teaching Methods. EMARO is closer to CIMET than VIBOT but the course content being highly technologically based, some modules have a slightly different content. All consortia welcome numerous guest professors from different countries sponsored by the Erasmus Mundus Program as scholars, who are teaching in some of the modules. Their lectures are fully recognized by all institutions of the consortia, leading to degrees which contents might vary from year to year but with similar acquired competencies.

Regarding, the degree awarded, all consortia recognized the modules gained at the partner institutions. They are moving to a Joint Degree but at the present time they are only delivering multiple degrees or double degrees. VIBOT is delivering a triple Degrees, EMARO is giving a double degree whereas students enrolled in CIMET can either get a double or triple degree depending on their mobility. Nonetheless, all consortia deliver a Diploma Supplement which describes the mobility of the

students, explains the difference between the grading systems, and gives some details about the research topics tackled during the fourth semester.

Regarding the administrative aspects, the three consortia are following the same route: a centralized system at the Coordinating Institution, a set of quality procedures to monitor all the aspects of the EMMCs (administrative support, course content and competencies delivered, transferable skills, housing support, ....), a set of meetings for recruiting the students and discussing about course content adaptation, quality assessment and reporting.

Employability and sustainability are also of main concern for these three consortia which are developing various actions for these: conferences with industrial partners, Job fairs, interview for job and summer placements...

Extension on the same basis (double or multiple degrees) with non European universities is also happening for some of these programmes. For instance, VIBOT is also proposing a similar scheme with Asian Universities in Indonesia and Malaysia, where students obtained a double degree by doing their first year in Asia and the second year in France. The course contents are elaborated jointly then validated by each university and the procedures (selection, grading system, diploma supplement...) are reported in a signed MOA.

All these masters running in parallel with national master, mobility through the usual routes (Erasmus Student Exchange, student exchanges through MOAs..) are therefore offered to students registered in the national degree.

## VI. CONCLUSION

In order to enhance the mobility of citizens during their life, following the white book of the European Commission on LifeLong Learning, we should invent new strategies, using existing tools such as ERASMUS exchanges, IP, CD, ERASMUS-MUNDUS and TEMPUS. The interests are to put energy in common to develop and propose High-Quality International Modules, validated by International Curricula Networks, considered as parts of normal curricula within at least 2 partner universities in the consortium, and being proposed for Life-Long Learning, to any interested citizens.

Within this frame, the paper illustrates two approaches, an Erasmus-based ICN in networking at the bachelor level and an Erasmus-Mundus based ICN in Vision and Robotics at the master level.

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