Joint Bachelor Degree in Information Technology

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Key words: *Life long learning, Information Technology*

Abstract:

This paper will present the BIT2010 project, a project that will be developed and implemented during the period 2006-2009, under the Socrates-Erasmus Curriculum Development scheme, financed by the European Commission.
Based on the influence of the ICT domain on the most important world's economies, the emergency of new higher education programs in ICT is presented. The needs for a new ICT graduates' profile and a new ICT Curriculum were taken into consideration. Clear achievements in the areas of using computers and advanced digital technologies in higher education (virtual campus, e-Learning, virtual and remote laboratory) are reported. Some of these products and services are designed and produced by the staff of the involved universities

1   The rationale of the project

1.1   Heading EU i2010 Initiative

On June 2005, the European Commission has adopted the "i2010 initiative-European Information Society 2010" to foster growth and jobs in the information society and media industries in European Union. EU Member States are asked to define National Information Society Priorities in their National Reform Programmes to contribute to the objectives of i2010 [1].

The first pillar of i2010 combines all the regulatory instruments at the Commission's disposal which will allow us to create a modern, market-oriented regulatory framework for the digital economy. The second pillar brings the EU's research and development instruments into the game of digital convergence and sets priorities for our cooperation with the private sector to promote innovation and technological leadership. The third pillar seeks to promote, with the tools available to the Commission, an inclusive European Information Society, supported by efficient and user-friendly ICT enabled public services.

1.2   Skills Shortage

The Networking Skills Shortage - an IDC White Paper [2] published in September 2005- estimates that demand for networking skills in European organizations in 2005 can reach almost 963,000 full time equivalents (FTEs).

This number represents the total amount of work that needs to be done in the networking space, and the number of people needed to do this work — assuming they all spend 100% of their available time on networking. However, in terms of actual number of people with networking skills, IDC estimates the demand to be around four million skilled people assuming that people on average spend 25% of their time working with networking technology as part of other responsibilities.

1.3   EU Report on Information Society, 2007

The recent EU Report on Information Society [3], provide up-to-date information that are correlated with IDC Report. The economic growth of EU is estimated to be around 2% in 2006. The contribution of ICT to the economy is well established based on empirical evidence from growth accounting models that link the production and use of ICT to productivity. The impact of ICT on productivity in the EU has consistently been only half of the impact in the US over the last ten years. From 1995 to 1999, ICT accounted for 0.9% of the annual productivity growth in the EU compared to 1.7% in the US. From 2000 to 2004 the relative figures were 0.5% and 0.9%.

From 1995 to 2000, aggregate productivity in the EU grew by 1.8% per year. At least 55% of that increase was due to ICT. Between 2000-2004, productivity growth fell to 1.1% but the contribution of ICT remained high at around 45%".

These figures underline the key role of ICT in realizing the Lisbon objectives of competitiveness and growth and show that the BIT2010 project is addressing a priority domain.

2   Erasmus BIT2010 Project

2.1   New Profile of the ICT graduates

The problem of the skills shortage is not only the number of graduate students; it is also related to their ICT profile targeted to the actual needs of the today companies. The feedback received from the companies includes negative comments on the skills and the mentalities of the students graduated by traditional higher education, both computer engineering and informatics programs.

That is why we very much appreciate the point of view defined by the "Career-space" project [4]. This project argues the need for a new ICT curriculum that will produce a new ICT profile. The universities have "to meet the needs of the ICT industry to create and develop new curricula which contain elements from electrical engineering, elements from informatics, and a significant focus on the teaching, training and practicing of behavioural and business skills".

2.2   BIT2010 Consortium

The BIT2010 Socrates-Erasmus project was approved in 2006 and it is aiming to contribute to the Information Technology human resource development within the context of the Bologna Process and the "i2010 Initiative". The acronym is BIT2010 and it has the following objectives: (i) to design, develop and implement a new Joint European Bachelor Curriculum in Information Technology, to be offered both traditionally (face-to-face) and through ODL; (ii) to establish the BIT2010 Consortium as a frame for cooperation in the Information Technology area; (iii) to promote and to disseminate the European Higher Education Area good practice and the Bologna Process.

The BIT2010 project will design and implement a new Bachelor curriculum in Information Technology and will prepare its graduates for the unique challenges faced by today's technology companies and industries. The project will also train these graduates to become tomorrow's technological leaders. The teaching and learning in the program will be focused on computers and advanced technology in education, collaborative working, creativity, multidisciplinarity, adaptability, intercultural communication and problem/project solving. The BIT2010 consortium is based on six universities belonging to EU Member States: Austria, Germany, Sweden, Poland, Bulgaria and Romania.

2.3   New ICT curriculum for the BIT2010 students

A new ICT curriculum was developed by the BIT2010 partners, based on the Career-space recommendations. This basic knowledge is essential for a broad understanding of natural processes and their utilization in technical applications. A broad foundation is also an important prerequisite to enable graduates to communicate effectively with colleagues from other areas using a common "technical language". The teaching of this core subjects should not go into too much depth, but should give students a balanced overview: it should also teach them how they can independently acquire the additional knowledge they need, both during their studies and in later professional life.

Currently, the BIT2010 Curriculum includes: Scientific Base (22%); Technology Base (31%); Social-Communicative, Language and Business Skills (13%); Application Base and System Solution Methodology (22%); Thesis (12%). Future engineers need a broad spectrum of knowledge in mathematics, science and technology. The key requirements here are knowledge of system functions in the field in question, and understanding of the technological possibilities (hardware and software) to realize or implement those functions with the help of procedural methods implemented by concrete applications and system solution methodologies.

Practical Work Experience – one semester as industry placement. This module was proposed because it is not sufficient just to learn about technical and other issues and pass exams; the techniques need to be used in real situations. This is particularly important to emphasize the connections between different aspects, to encourage a broad systems view and to illustrate the practical, technological and human constraints of solving real-world problems.

Not only does this give practical experience of real problem solving, it should also help the student more clearly to identify the kind of work she/he would enjoy after graduation. It may also lead to mutually beneficial contacts and networking opportunities.

An other important issue is focusing on Personal & Business Skills. Industry is seriously concerned that universities do not give enough attention to personal and business skills in their current ICT curricula, [5].

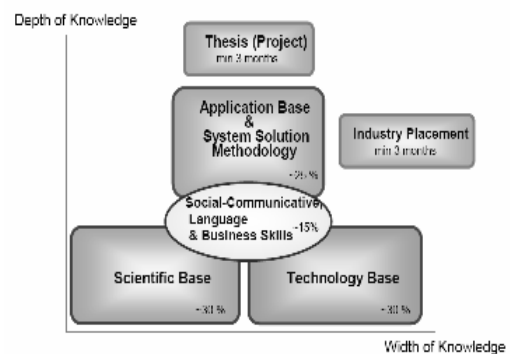Fig.1. Need for New ICT Programs   Fig.2. ICT Curriculum Model

The BIT2010 curriculum includes innovative practices of university, in particular as regards curriculum reform:
- Defining an IT focused educational offer, structured on the three Bologna cycles.
- A new Joint European Bachelor Curriculum in Information Technology, based on Bologna Process, that is offered both traditionally (face-to-face) and through ODL.
- Designing study plans based on the new IT industry required skills and competencies.
- Study plans includes a compulsory "practice" module
- Study plans include at least one semester to study abroad, through virtual or real mobility.
- Use of remote engineering and virtual laboratory.

- Use of virtual campus and eLearning technology.
- A Public-private partnership to access eLearning resources.
- Study plans includes an "industry placement" module (students will practice in a real–life environment) and some course modules focusing on entrepreneurial education in order to increase the employability of the graduates in schools and universities
- A new evaluation and assessment system and a grading scale suitable for this approach.
- University as Open Learning Center in the region, provides certain forms of learning with credits to traditional and non-traditional learners.

Recently, on March 2007, our university has participated as partner in preparing two proposals named "EUE-Net"(European University-Enterprise cooperation Network) and "Q-PlaNet"(A model Network for transnational Quality Placements in enterprises), under the EU Lifelong Learning Programme.

3   Advanced Digital Technology in Education

3.1   Learning resources based on e-Learning technology.

One of the main outputs of the BIT2010 project is to provide the students modern and valuable learning resources, most of them in e-Learning technology. Some of these resources will be produced by the partners, within the project. In Fig.3 is presented a screen shot from a training course included in the ECDL package (seven courses). These courses were designed and produced within the Department for Technologies. The design includes a text based area, located on the right side of the screen. The left side of the screen is dedicated to pictures, animations, audio items, video items, simulations etc. Demo versions of these courses are available at [6].

The students have also access to some eLearning resources provided by the public-private partnership established with: (i) CISCO Networking Academy Program; (ii) Microsoft IT Academy program. Additional information is available at [7].

Last, but not the least, in March 2007, the University Senate Board decided to start an internal project aiming to encourage the academic staff to produce new courses in eLearning technology.

3.2   Virtual campus communications

Our department took into consideration the use of the virtual campus as a tool for communication. A proprietary platform was developed and implemented [8]. The students have access to the following services: writeboard, calendar, chat, forums, internal messages, on-line courses, on-line exams, files (upload/download), administration, Fig.4.

There is also two pilot test implementation of the platforms based on free software: Dokeos and Moodle. They are currently under evaluation.

3.3   Remote and virtual laboratories

The department took also into consideration the use of the computers in order to run simulation of different experiments, especially in the domain of Physics education. Nowadays computers a powerful and they are able to run complex piece of software, in real time, in order to simulate the behaviour of the real systems. Simulations might be less expensive and more efficient in training. We are able to report such products developed with graphical programming tools like Interactive Physics, Crocodile-Clips etc. Our experience with the students enrolled within our department shows that 15-30 minutes of initial training provide the students enough skills to produce interesting piece of software targeted to the need of learning Physics. The highly skilled programmers can use more advanced programming languages like: LabVIEW, Macromedia Flash etc. These were presented in ICL 2005/2006.
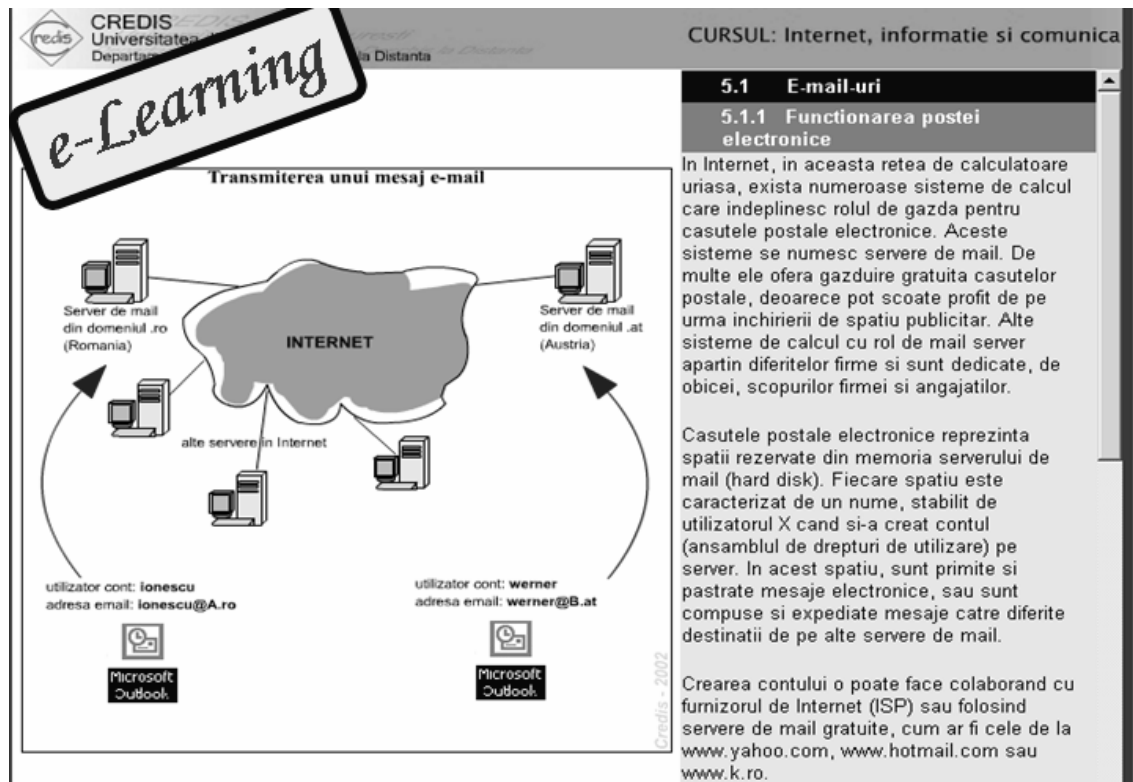
Fig.3. Screen shot of an e-Learning course

Fig.4. Screen shot of the virtual campus home page.

Also, the practical activities included in the CISCO Curriculum can be performed "by distance" due to the NetLAB platform installed and used within our department.

4. Conclusion

The international nature of this Joint Bachelor Degree will facilitate the recognition of diplomas and employment mobility across Europe. The project fulfils some important EU action lines (Joint study programs at European level, E-learning, i2010 Initiative etc.).
The BIT2010 curriculum includes innovative practices of university, in particular as regards curriculum reform
Clear achievements in the areas of using computers and advanced digital technologies in higher education are reported: virtual campus, e-Learning, virtual and remote laboratory.
Some of these products and services are designed and produced by the staff of the involved universities.
The project partners are aiming to express their gratitude to the European Commission who decided to finance the Socrates-Erasmus CD BIT2010 project.

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