Higher Education and the ICT Industry

IT STAR is going forward with the preparations for the "Universities and the ICT Industry" event, which will take place in Rome, Italy on 26 May (detailed information with respect to the program and arrangements is contained on p. 16) Among the speakers and participants will be key representatives from Academia, Government and the Business sector.

To set the stage, we have invited separately the views of leading experts on matters related to the conference theme, which we publish below.

Universities and the ICT Industry

by Sokratis K. Katsikas
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According to the *Magna Carta Universitatum* (the "constitutional chart" of European Universities), a University can be functionally defined as an institution that preserves, transfers, assesses and expands knowledge. It preserves and transfers knowledge through the educational process and it assesses and expands it through research. This definition allows the identification of two discrete but closely intertwined functions of the University, namely teaching and research. Both processes are, of course, supported by administration. Therefore, in order to discuss the relationship between Universities and the ICT industry, one has to address this relationship as it applies in teaching and in research. In the sequel, we will focus this discussion on ICT-related studies in European Universities.

The goal of the true University with respect to teaching is to produce well-qualified scientists and engineers with a strong scientific background in basic sciences, thorough knowledge of current and emerging technology, coupled with communication skills, with the ability to effectively interact and interoperate with scientists of other disciplines and with management and leadership skills. The question that has been tantalizing both Universities and ICT industry in Europe in the past years is "Do the Universities provide the kind of graduates that the industry wishes? If not, what should be done?" There is no easy answer to this question. One has, first of all, to acknowledge the fact that there is no *single* kind of ICT University graduate that the industry looks for. Large industries, particularly multinational, place more emphasis on the solid scientific background of the graduate, and are willing to undertake the cost of training these personnel to their specific work environment in turn for the ability to follow technological advance over longer periods of time, whereas SMEs would rather opt for more specialized personnel, ready to offer their services immediately. Fortunately, the diversity of European Universities allows for the provision of both requirements, even though there are very few (if any) individual Universities that can provide both. However, one should take into account the fact that, in Europe at least, SMEs form the bulk of ICT industry. Does this mean that European Universities should try to respond to the industry needs placing more emphasis on the professional training of their students rather than on equipping them with scientific knowledge? I think not. The answer lies, as in most cases, in the quest for a reasonable compromise between the perceived needs of the industry and the goals of the University. This can be achieved through an arduous but absolutely necessary process of close and continuous interaction between Universities and the ICT industry.

A true University must also be actively engaged in research. Moreover, its research must be strongly interweaved with teaching, because this will benefit both processes. With respect to our discussion, the crucial question here is "Do the Universities engage in research that is useful for the ICT industry?" Fortunately, in Europe, the answer to this question is affirmative. The European R&D framework programmes have largely succeeded in bringing Universities and industry together and in funding research that is useful to both. There is, of course, a large variety of the degree to which this cooperation has been achieved, among European Union member states.

One could safely conclude that satisfactory interaction and cooperation in research between European Universities and the ICT industry has been achieved, whereas there is still a long way to go in terms of teaching. In any case, one should keep in mind that this is a continuous process that needs to be actively and sincerely sustained by both sides.

Recent Advances in the Industry-University Cooperation - A Hungarian View

by Gábor Péceli

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Head of Department, Budapest University of Technology and Economics

This contribution gives a short overview of recent and current cooperation forms of the ICT industry and the Faculty of Electrical Engineering and Informatics of

BME. This Faculty was established in 1949, and rather soon, due to its special situation, became a relatively strong background institution of the Hungarian electronic industry. The reason is simple: on one hand, even up till now, this is the single faculty in Hungary, which offers MSc equivalent degree in electrical and computer engineering (5 years Diploma engineering degree). On the other hand, up until the political changes of 1989, the Hungarian measuring, and communication equipment industry was a strong and important supplier of the Eastern European market. This position was "defended" by different regulations of the regional governments. Even if this situation is already a real history, there are still imprints of these decades in our education, because our departments could serve as research and development units of various local players of the electronic industry. We were forced to be innovative due to the fact that the majority of the latest electronic components were hard to buy, and the quality of the available instrumentation was rather limited. This shortage of facilities was rather beneficial in the "education" of problem solving.

The change to a real market-oriented economy resulted in a big transient: the Hungarian measuring and communication equipment industry was almost completely destroyed. Fortunately, in the nineties, the drastic technological changes in telecommunication and computer networking have caused a very rapid development within the country's infrastructure: the design and implementation of the missing local communication networks and services have generated again real engineering cooperation among university departments and the players of industry.

In recent years the frameworks of these activities have been further developed. A rather remarkable form of R&D cooperation is that of Ericsson Research and our Department of Telecommunications and Media Informatics, which involves many PhD students working on future and emerging communication problems potentially interesting for Ericsson Research in Hungary, and worldwide. Interesting R&D projects were and are conducted with Nokia, and Microsoft Hungary, as well.

Quite recently, the National Office for Research and Technology has launched new innovation centers at different local universities. The research and training activities of the Mobile Innovation Centre, established at our university, supports the local representatives of several major international companies, like Hewlett Packard, Nokia, Siemens Communications, Siemens PSE, Sun Microsystems, T-Mobile Hungary, Ericsson Hungary Communication Systems, and some others.

Another important example is the Innovation and Knowledge Centre of Information Technology, again at our university, which is involved in the development of various complex projects aiming at products and services based on novel system integration, and rapid prototyping technologies. This Centre serves a Consortium consisting of nine companies of the local ICT industry.

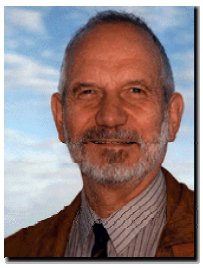
A further element of this network of ICT players and our university is the Budapest Unit of the IBM Centers for Advanced Studies, established in October 2006. This unit is in strong cooperation with our Faculty, mainly in the field of dependability issues of system design and integration.

As far as the measurement and instrumentation traditions of the country are concerned, the situation is less promising. The electronic industry in Hungary has been "transformed" into large assembly plants of major international companies, like Elcoteq, National Instruments, Bosch and several others. The departments of our Faculty can cooperate with these larger factories mainly serving their marketing purposes: donation of software licenses, laboratory equipment, etc. The average local ICT SMEs have serious financing and market problems. Industry-university cooperation in this field requires a series of small, step-by-step actions.

As a conclusion: in Hungary several promising governmental actions attempt to improve the industry-university cooperation. The majority of these programs are rather new, the outcome is hard to predict.

ICT-related Higher Education

by *Jan Wibe*



Norwegian University of Science and Technology – NTNU
Chairman, IFIP TC 3 on Education

This article is mainly based on what is happening at the Norwegian University of Science and Technology – NTNU
http://www.ntnu.no/portal/page/portal/eksternwebEN/
and focuses on the following themes:

- **Infrastructure**
- **Administrative systems**
- **Multimedia unit**
- **Courses**
- **Communication:**
- **Distance Education**
- **Dual-mode courses**
- **ICT Competence**

Infrastructure
Computer rooms are in plenty around the campus. It is now more and more common that students have their own portable computers, which they bring with them everywhere. One can log in on the university system wherever s/he is - at campus, home or any place.

Administrative systems
All employees and all students have access to email. We also have a student administrative system, which keeps track of the courses every student has signed up for. Library functions are available for everybody, students and staff. Electronic Journals are available as part of this system.

In recent years, Learning Management Systems (LMS) are more and more in common use, not only at NTNU but all over the world. At NTNU, the system contains many different functions, which I will not describe. The system is in use in nearly all courses. The staff undergoes technical training with respect to the system but few, if any training, regarding its pedagogical use.

Multimedia unit
NTNU has a multimedia unit with many functions. Lecturers come here and tape a lecture (video) for free. The video is streamed and available for students in a course, wherever they are.

Courses
Lectures are mostly given with on-site presence in university auditoriums. In few cases, lectures may be videotaped and available for students at any time by streaming. Another opportunity is to tape a lecture at the Multimedia unit.

Communication
Communication between students and between students and tutors is essential. This can of course be done by email, but if you are in a course, it is part of the LMS. Internet communication by chat, phone and video is more and more usual. The most used systems are MSN and Skype. Such systems have a great potential in tutoring.

Distance Education
It is a trend to offer Distance Education courses. This has been done for a long time in Norway since we have had a very long tradition in this area given the scattered population. Up to recently, this has been predominantly offered by private institutions. Now, universities are more and more active in this area.

Dual-mode courses
These are courses that are offered both for on-campus students and, by distance education, to students around the world. With the potential of streaming videos of lectures and using LMS, we can see a trend towards this.

ICT competence
This may be divided in two areas:

- General ICT-skills

The general skills are not subject-related and include competence in using Word, Excel, email, Internet, Multimedia (picture, sound and video) etc. What could we conclude?
Word is used by nearly everybody, Excel more seldom and very few have competence in making web-sites and in using multimedia. Digital cameras are more and more common but few people master Photo-shop to edit digital pictures and to include pictures in web-sites.

- Special ICT-skills

Special ICT-skills are related to subject teaching. This could be divided in two areas:
One is general ICT-competence, e.g. how to use Excel in mathematics and how to use multimedia. The other relates to software packages. One thing is to have competence in using these tools – another is to use them in a pedagogical way.

Industry
The technical part of NTNU is the main actor in the cooperation with Industry.

EU projects are the main activity with partners from industry and universities in this regard and. there is also local cooperation with Industry in Norway: Statoil and Hydro are two big partners.

As an example, NTNU provides technical solutions in reservoir technology. Mathematics and Informatics departments have the necessary competence in these areas. NTNU is also active in providing expertise for SMEs through a project, which is running for some years.

The Industry, competing for contracts, needs language competence - an issue for the language departments.

Project Management Education Using e-Learning

by Prof. Asbjørn Rolstadås, Associate Prof. Bassam Hussein

Norwegian University of Science and Technology - NTNU

There is a rising conciseness among educators, corporate executives and universities to the potentials of bringing information and communication technology (ICT) tools into education and training for higher and continuing education.

Many companies are global entities. They undertake projects all over the world. Employees from their own global organization build up their project organizations. No doubt, most companies and organizations will be in need for an update of their competence in project management. Universities, research organizations and others will be in a position to offer continued education and training to fill this gap. The problem is, however,

that the people to be trained are more busy than ever and do not have time to leave their work for such an update.

The answer to this problem is a flexible continued education program that is based on distance learning. This will allow the student to obtain the training with a minimum of absence from work and travelling. Most of the training he or she will obtain in the home environment, either at work or at home. The flexibility offers the student strong influence as to when and where he or she should be trained. Yet, it is a challenge that the students shall work in geographically dispersed teams. This sets same frame conditions for their progress in the training. However, this is the situation they will meet in their future business if they have not already met it. An educational project can and will in this respect be handled like any business project.
Figure 1 shows an overview of a solution that has been used at the Norwegian University of Science and Technology.
The education is based on extensive use of distance learning. There is a mix between plenary and virtual sessions.

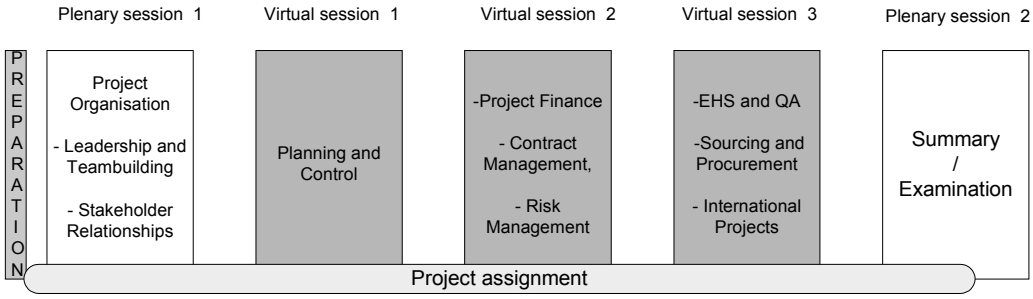


Figure 1. Example of a blended learning solution

A plenary session is based on traditional teaching methods such as lectures, assignments and group work. It is underlined that education should be interactive and aiming at activating students. This means that less time is spent for lecturing and more for training through group work. A virtual session is based on material that enables the course participant to select time and place for learning within certain limitations.

This *hybrid solution,* or if you like the *blended solution,* is primarily a cost effective way for delivering education and training for large number of distributed learners. It combines multiple instructional delivery approaches that give the learners the chance to decide the time and place for their own studies. At the same time, it gives the learners the valuable social dimension and the chance to interact and learn from each other as well as keeping the motivation high through all phases. Our university has been involved in the development and the implementation of several hybrid-learning projects for both the higher education and continuing education sector. Our experience has shown that training based on this combination of on-campus and ICT based strategies is the preferred solution specially for the continuing education sector because of the flexibility it offers with lower costs.

Having pointed out the advantages of implementing the hybrid solution to education, educators and universities and corporations should think twice before taking the step into hybrid learning. Our experience has also shown that bringing together ICT based strategies into training and education brings with it some serious challenges to the way educators and universities should organize and deliver training and education. Among these challenges:

1) It requires a fundamental *change* in the way the educators, universities and instructors think and work. It also requires a fundamental *change* in the way the learners work, interact and collaborate. Therefore *Change* is a key word for succeeding in implementing this new form of delivering education. What should be changed and how to apply and handle this change process is something managers and decision-makers in the universities and companies need to address and manage.
2) It requires tools and techniques for managing project management functions such as *scope*, *organization*, *risk*, *quality*, *cost* and *time*. Developing and applying these techniques are crucial in order to handle the large number of activities as well as the technical, administrative and academic personnel involved. On top of that comes the large amount of investments in technological platforms and infrastructure during the development and execution phases.
3) It requires clear definition and analysis of project stakeholders, including internal and external stakeholders involved in this type of projects. This is important in order to obtain valuable information about individuals and organizations that have an interest in the outcome of the project and how to optimize their contribution to the project success.

THE IT4PS PROJECT: Information Technology for Problem Solving

by *Cristiana Alfonsi*

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Abstract

IT4PS (Information Technology for Problem Solving) is a joint project between CRUI Foundation (the operating body of the Italian Universities Chancellors Conference: CRUI) and AICA involving several Italian Universities. The project started in the second half of 2003 and is expected to end by mid 2007.

The main goal of IT4PS is to support and to enhance the acquisition – by University students – of advanced skills in the usage of productivity tools (spreadsheets and database managers) and the application of these tools to daily problems of the students themselves. To this purpose, the project defined a learning methodology based on a problem-solving approach, using problems typical of the various University courses to introduce students to the acquisition of the above-mentioned advanced skills.

In its first phase – mid 2003 to mid 2005 – IT4PS addressed three different areas of application of productivity tools in University curricula: Economy, Medicine and Pharmacy, and Statistics for Social Sciences. In these areas, the project produced the following:

- Didactic materials, supporting teachers in their practical explanations of the problem solving approach;
- 2 authoring systems, allowing teachers to prepare guided solutions to problems (respectively, with spreadsheets and databases) and students to compare their own solutions with those of the teacher in a self-evaluating environment;
- 6 reference books (published by McGraw-Hill Italy) applying, respectively, spreadsheets and databases to the three areas of application;
- 1 reference book (again published by McGraw-Hill Italy) for the authoring systems;
- Field-testing of the problem oriented approach in some 20 Universities, involving more than 250 students.

The results of the field-testing were definitely encouraging (both students and teachers had very positive feelings about the problem oriented approach). However, the skills acquired by students were in general not sufficient to allow them to obtain an Advanced ECDL certification, mainly due to the package oriented approach of the certification itself.

To address this problem, a second phase of IT4PS has been launched, and it is expected to end in mid 2007. The aim of this second phase is to define a certification scheme specific of the IT4PS approach, where students will be asked to solve significant, context-oriented problems instead of simply demonstrating deep knowledge of the productivity tools.

References

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