On Romanian Experiences Related to Universities and ICT Industry

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of Regional ICT R&D **(Abstract)**

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CONTENT

General framework

Romania is now a EU member. With a population of 22 million and an area of 237.000 sq. km., Romania is the second largest in Central and East Europe.

Economy

Whether GDP per capita of Romania is still rather small, its rate of growth of GDP has been remarkable in the last 5 years, the economy showing healthy trends. The labour force is not hit by unemployment (5.5%). The average salary is slowly rising.

The productivity is still low, but local investments and FDI start showing their fruits.

ICT

IT in Romania has deep roots in the past. Romania was the first country in Easter Europe to build first generation computers: CIFA-1957, MECIPT–1961, and DACICC-1962. A competitive industrial base was built in the 1970s with licenses from Western Europe, USA and Japan. But technologies became obsolete in the period 1980-1989 due to lack of investments in hard

currencies. After 1989 almost all world major ICT companies have arrived in Romania in a sector now practically 100% private or privatized. They discovered the Romanian ICT best assets, human resources and a quickly developing market. There are more than 8.000 software and IT services companies in Romania. Most of them are small, but a process of acquisitions has started and the entry in EU will probably accelerate this process. Instead of only hiring Romanian experts in their research and production facilities in USA and Western Europe many multinationals have started create rather large R&D, production or service centres in Romania,

A look at the ICT market in Romania reveals a very high rate of all IT sectors in the period 2003-2006. The Internet penetration is explosive. The country is able to participate to the Digital Economy; the market is increasingly big, human resources are still abundant; the education system is very performing, eBusiness offers a chance to leapfrog stages; foreign languages skills are largely available, protection of intellectual property is enforced [Baltac 1].

Universities in Romania

Romania has an extensive network of 116 universities; both public and private. All universities have to be accredited by a special body belonging to the Ministry of Education. Universities or faculties that fail accreditation are dissolved. Most universities have appeared after 1989 and university network cover all major cities of Romania.

Universities in Romania		Engineering	Economy, Humanistic	Medical, Agriculture	Military	Arts	Theology
Public Universities	56	5	26	12	6	7	
Private University with accreditation	32		27				5
Private University with temporary accreditation	28		20			1	7
Total	116	5	73	12	6	8	12

Universities with ICT specializations

ICT studies have a long time established reputation in Romania. The first graduates of computer engineering left Politechnica University of Timisoara in 1966 and Politechnica University of Bucharest in 1967, followed quickly by University of Bucharest and Academy of Economic Studies in Bucharest. Before 1989 they were completed by universities or technical universities in Cluj-Napoca, Iasi, Craiova.

After 1989, both state and private universities organized faculties or specializations in ICT. The 46 specializations are of four categories:

1. Computer, telecommunications and electronic engineering with graduation in engineering - 9

2. Informatics with graduation in economics - 14

3. Accounting informatics with graduation in economics - 11

4. Informatics with graduation in mathematics - 12

ICT specializations are now present in 36 universities, 20 of them have one or two faculties of ICT profile. All of the universities with ICT specializations are located in cities with tradition in the field and good professors.

ICT Basic Specializations

Informatics (mathematics), 12

Computer, telecom and electronic engineering , 9

Accounting informatics , 11

Informatics (economics), 14

Chart 0
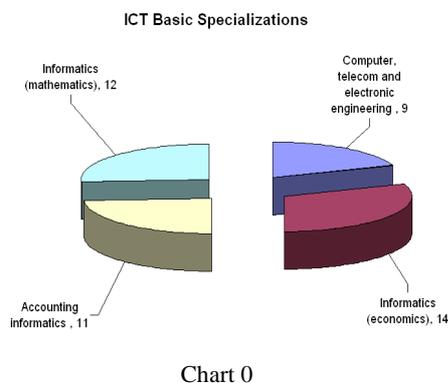
Every year 5,000 graduates leave the universities for the ICT industry or education system. Their theoretical and practical skills are considered to be quite satisfactory. This puts Romania at 13th place in the world as number of IT graduates. On per capita base Romania has more IT graduates than the United States, Russia, India or China. These people have language skills as a result of a traditional good foreign languages education in universities. One study found that 80% of the IT work force speaks English, 25% speaks French and 11-12% speaks German including native speakers. [PA]. One IT vendor certifier lists Romania as the fifth in the world after India, the United States, Russia and Ukraine[ii] as total number of IT certified individuals and on the same place as percentage of the population.

However, the decade of 1990-2000 marked a serious exodus of the IT experts, most of them to North America and Western Europe. In the last 4-5 years, the trend stopped, the percentage of emigration decreasing from 90% to 40-50%. ICT multinationals have opened and the trend continues centres in Romania, mostly in software, ICT applications and support. Among them Alcatel, Siemens, Solectron, Oracle, HP, IBM, Infineon, Huawei, Adobe Systems, Microsoft, SAP and many others. Salary increases vs. high quality of individuals and Romania's consolidation of its status of near-shoring country make majority of graduates now to stay in the country.

Romanian ICT industry has become in the last 10 years a very human resources demanding industry. The creation of large R&D ICT centres for export and the high rate of growth of demand of ICT professionals for domestic ICT companies and IT departments has determined a pressure on the specific HR market both in quantity, mainly for several specializations, and quality and experience. As a result many individuals followed retraining programmes and joined the industry as software programmers, network administrators, project managers. Their number is estimated at 2,500-3,000.

ATIC Survey

A survey was conducted by ATIC under the coordination of authors in April-May 2007 to asses what are the expectations of the ICT industry from universities and the expectations of the universities from the industry. The questionnaire asked the opinion of respondents on the following topics:

1. Number of IT professionals needed annually in Romania in the next 3 years, by type of activity

2. The distribution of demand by programmers, analysts, system architects, data base administrators, security experts, salespeople, CEO/CTO, etc.

3. Estimation of losses by emigration and choice of different career path.

4. Opinion on the present university offer, quantitative and qualitative

5. Opinion on the present curricula

6. Specializations in critical demand

The survey was conducted both in industry and in universities. The next considerations reflect both the opinions of authors and opinion selected from surveyed persons/organizations.

ICT Industry Expectations

The general opinion in the ICT industry is favourable to universities. The graduates of various ICT faculties or specializations give satisfaction to employers and the quick development of foreign investments in ICT industry in Romania is a proof of this satisfaction. A relative high percentage of graduates from non-ICT faculties or specializations proves also the good training of engineering, economics and mathematics education, the largest part of these non-ICT graduates come from.

The survey pointed out, however, several improvements sought by the industry in the education system. This regards both education of professionals and education at the level of basic knowledge to use ICT.

Education of ICT Professionals

The respondents could not agree on the number of graduates universities should produce annually to satisfy the needs of the ICT industry. The opinions varied from 5,000-10,000 each year for the next 3 years. The losses by expatriation were evaluated from 10-40%, with 1-5% going to non-ICT jobs.

As statistics lack on this indicators, our evaluation is that the need of new entries to ICT HR market will be around 9,000-10,000 each year, ICT graduates counting as 90% of this figure.

The distribution of job profiles of the new entries shows the importance given to programmers, system architects and product/services sales.

1. Software programmers   30-60%

2. System analysts   10-30%

3. System architects   2-10%

4. Administrators of data bases, application, services   7-15%

5. Applications security experts   2-10%

6. Product, application, services sales   10-20%

7. CEO/CTO   1-5%

Similar estimations were made by respondents from universities.

Among the specialities claimed by ICT industry to be missing or insufficient covered in universities the survey pointed out: telecom network topologies, data base administration, UNIX, software testing and integration, C++, IT Storage Manager, IT Asset Manager, Information Services Manager, mobile devices programming, project management. One opinion from a major ICT consumer stated that the present list of job types in ICT in completely outdated.
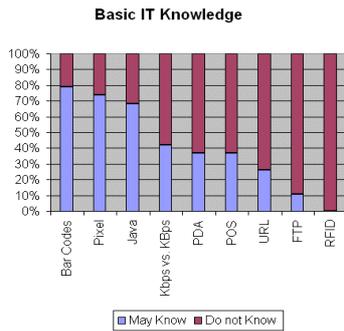
Basic IT Knowledge

Chart 0

Universities were asked to cover these new job types with master degrees and/or other post-graduates courses. Partnerships with foreign universities were considered to be a solution.

Almost unanimously, universities were asked to update annually their ICT curricula. The present curricula are judged by many as obsolete, not adapted to the new trends in ICT industry. A major consideration was that the universities insist too much on the theoretical training and tend to produce super-skilled graduates. The industry needs a small number of such people, the rest being too highly skilled become unsatisfied with routine work, predominant in many companies. Universities should produce normal skilled people; the super-skilled should be trained by post-graduate programs. The Bologna process started may solve this problem, but still it is on the table..

Education at the Level of Basic Knowledge to use ICT

The ICT industry counts on universities and education system at large, not only to produce ICT professionals, but to prepare the people to use IT applications, i.e. to have the basic knowledge to use ICT. This is important as ICT is not anymore a product or service for an elite, but as EU's eEurope states "Information Society is for all".
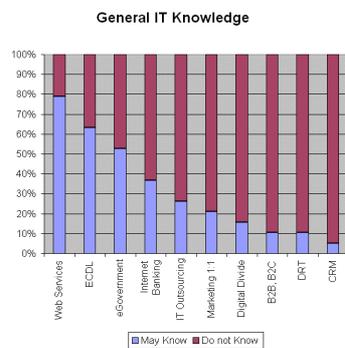
General IT Knowledge

Chart 0

The most important tool today is ECDL (European Computer Driving Licence) promoted by CEPIS (Council of European Professional Informatics Societies) through ECDL Foundation. ECDL provides a curricula and test certifying that a person achieved the basic level of skills to use ICT in their professional or private life.

Licensee in Romania is ATIC (IT&C Association of Romania) and ECDL Romania is in charge with all ECDL activities. The results so far are encouraging. More than 75,000 skill cards have been issued and 35,000 licensees were granted to date (May 2007). Universities have responded with enthusiasm: there are 35 accredited ECDL test centres in Romanian universities. Several universities adapted IT curricula to ECDL and accept ECDL as a proof of practical ICT abilities. One university ("Gheorghe Baritiu" University, a private university from Brasov) asks for ECDL license before graduation.
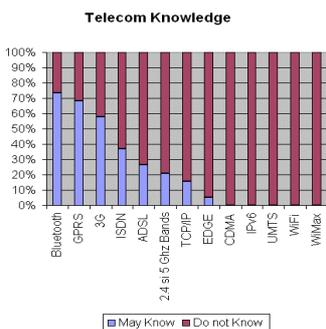
Telecom Knowledge

Chart 0

The high schools are also targeted by ECDL in Romania. An agreement with the Ministry of Education sets the target of 200 accredited test centres in schools. Despite efforts the figure to date is 128 and ECDL is included now in the curricula, but only 36-72 hours are provided, obviously insufficient.

A serious effort is still to be made to improve the ICT infrastructure in schools and universities and even more important to train the "trainers". The following case study shows how big the impact of non-basic ICT training is.

Case study of ICT basic knowledge

A survey was conducted by Vasile Baltac on a group of post-graduate students in management, all of them graduates of non-ICT faculties. They were asked to answer by "I know and I can explain to others", "I may know" or "I do not know" to 40 basic words or syntagms related to ICT. The term are common or used currently by the non-IT media or advertisers.
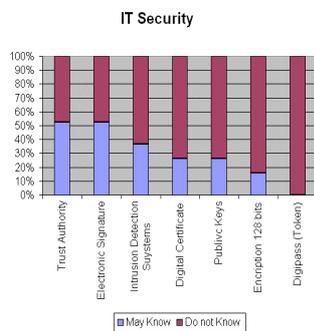
IT Security

Chart 0

Most of the "I know and I can explain to others" proved to be "I may know". The charts 2-5 show the percentage of "I may know" (merged with "I know") versus "I do not know".

In the Basic IT Knowledge Section, while barcodes and pixel used in consumer products made respondents to believe that they know what is about kbps vs. kBps, POS, URL, FTP and RFID (0%) are less known.

In the General IT Section, only web services, ECDL and eGovernment seem to be known. In fact web services were confused with Internet services.

Quite surprisingly telecom and security terms largely used by general public when subscribing to Internet services or Internet banking like ADSL, TCP/IP, public keys, 128 bit encryption were known by less than 50% of respondents. No one knew what CDMA, UMTS, Wi-Fi, WiMAX, Digipass (token) means.

The case study emphasizes the need to:

1. Generalize in all universities and high schools ICT curricula that bring next generation at an appropriate level to have all benefits of Information Society.

2. Renew ECDL and other general basic ICT skills curricula at short intervals

Universities Expectations

Universities at their turn have some important messages to the ICT industry. At first, they need industry support as the infrastructure they possess is not easily kept up-to-dated. It has to be said that the answer of the industry was positive and not only universities are sponsored with hardware, software, applications and know-how, but a new form of partnership emerged: partnerships in the form of Centres of Excellence. Such centres have been created by IBM, Oracle, Microsoft, SAP, Alcatel and others. This help despite the overall good impact on the training of students have produced a certain polarisation of ICT faculties, a few of them becoming leaders with the best points in HR recruitment:

1. University Politechnica Bucharest for system support

2. University of Iasi for application software

3. Academy of Economic Sciences Bucharest for banking applications, ERP and data bases

4. University Politechnica Timisoara for system applications.

These universities are responsible for 40-50% of graduates each year.

Within university environment there is still a reminiscence of the old concept of high level training for everybody. This is why some professors criticize the fact that very good students are hired by companies during their 2-3rd grades and neglect theoretical education and they are not any

more motivated for a scientific career. On the other hand foreign companies want middle educated workers not highly educated experts. The authors of the present paper do not agree with such an approach.

On the other hand, it is true that the new Bologna type scheme (3+2+3) does not produce the best results yet. The first 3 years are filled with many courses repeating high school topics and student are not given the specialization skills required by the industry, with dissatisfaction on both sides.

Curricula

Universities claim to have adopted their curricula 75-100% to the requirements of the Bologna recommendations. While most consider revisions to be made at the end of cycles (3+2+3), others consider a revision every year. Universities now are defining their strategy to be "clashed" with the strategy of the Ministry of Education based on European standards to be issued in September 2007.

Probably the most important issue related to curricula is the industry demand which is not clearly defined: large companies require narrow specialized graduates to produce immediately results, smaller companies and the IT departments in non-IT organizations want a broad specialization to solve a variety of task with the same person. It seems that this problem is not particular to Romania.

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May 2007

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[i] Prof. Vasile Baltac is the President and Dan Mihalca is a Member of the board of ATIC

[ii] http://www.brainbench.com/xml/bb/landing/offer/promotion.xml?contentId=2313