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Building skills for the knowledge society

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Abstract: *The present paper takes into account the skills sets needed for the knowledge society, and the focus on ICT and e-business skills, innovation and knowledge management in organizations. It highlights the related challenges for learning providers, and in particular for regularly updating the higher education curricula and programs according to the labor market needs. The paper outlines two practical examples for provision of up-to-date training. The first one is related to designing knowledge management curricula based on a survey made in 7 European countries. As a second example is highlighted the case of Sofia University - CIST and its success in becoming a working model of university-industry-government cooperation in education, research and innovation.*

Keywords: *management skills and e-skills, knowledge management training, industry-academia collaboration*

1. INTRODUCTION

Global trends towards a knowledge economy are influencing the composition of the workforce, and the knowledge and skills required for success. The competitiveness of companies appears increasingly dependent on the ability to develop, recruit and retain a technologically sophisticated workforce. Special focuses have deserved world-wide research and technology, innovation and education which build together the 'triangle of knowledge'. Subsequently, after the Lisbon Summit, EU has put an emphasis on building a dynamic and competitive knowledge-based economy, for which are needed a set of skills and competencies, e.g. ICT (Information and Communication Technology) and e-business skills, entrepreneurial and innovation skills and creativity.

The new skills needs face universities with great challenges. First, they should be aware of the labor market trends, and the skills and competences required by employers. Second, universities need to provide up-to-date curricula and courses. Both call for a strong and multilevel collaboration with industry, and building in most cases an effective industry-academia partnership. The university environment in Bulgaria adds some other challenges. Universities have faced the difficult transition period of the country towards a market economy which led to downsized budgets, lose of highly-qualified staff, lack of new scientific equipment, etc. On the other side, a growing demand for university level education has been observed in the country, as well as demand for new types of qualifications and a new graduate profile. Finally, the new private universities which are much more dynamic and entrepreneurial, the coming EU integration, and the emerging e-Learning global education market have increased the challenges to the state-owned Bulgarian universities and require from them to be able to change and adapt rapidly to the new highly competitive environment [Nikolov, (??)].

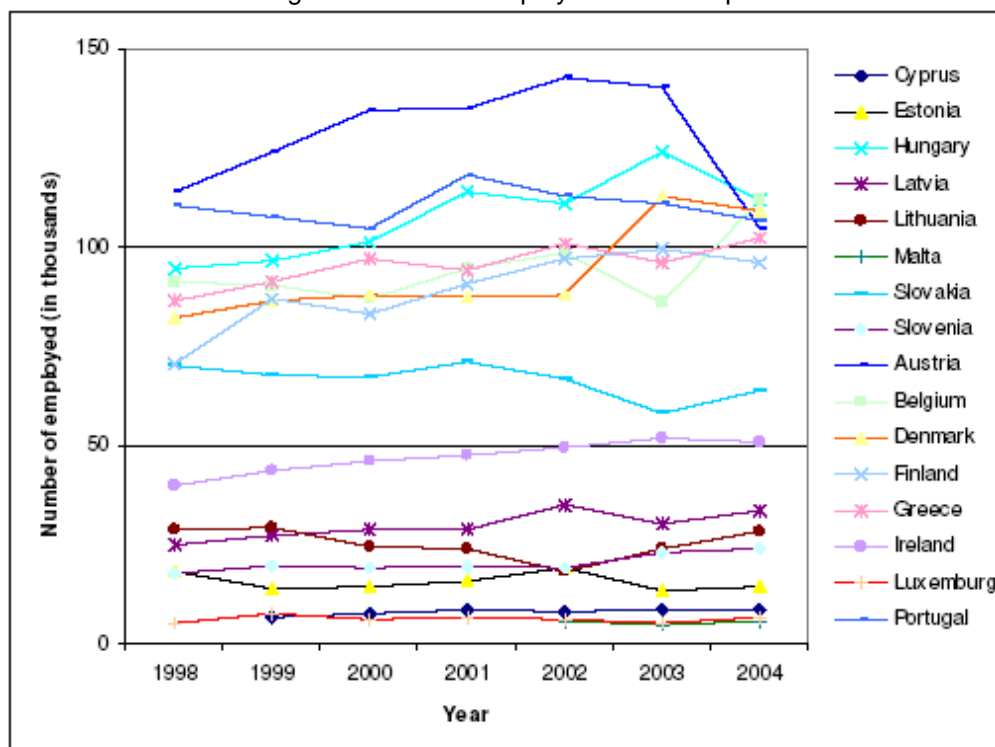
Taking the above into account, this paper presents some considerations on the new skills requirements and provides an example for developing a training course corresponding to the companies needs in knowledge management. It focuses at the end on the Centre of Information Society Technology (CIST) at Sofia University as an example of good practice in 'university-industry-government cooperation'.

2. EUROPEAN FOCUS ON NEW SKILLS SETS

As stated above, at the Lisbon Summit 2000 the EU heads of state stressed the need to foster the development of e-skills, entrepreneurial and innovation skills and creativity in Europe. In the following years the issue of skills was put on the agenda at different fora all around Europe. One action line was related to e-skills, and another – to entrepreneurial and innovation skills.

A recent report on e-skills in Europe [RAND Europe, 2005] outlined the discrepancies between supply and demand of e-skills on qualitative (shortages of skilled staff) and quantitative (gaps or mismatches between skills availability and needs) levels. The report used the European e-skills forum division of e-skills into three groups – ICT practitioners' skills, ICT user skills and e-Business skills, whereas the last group was related to the application of ICTs in the organization and business processes. The European e-skills forum concluded that despite the downturn of the ICT industry, the long-term demand for ICT and e-business skills still exceeds the supply, in particular in user industries. Thus, the EITO¹ prediction from 2002 that “demand for skilled professionals will remain high for the years to come, but will change from being pervasive to being selective” is still valid. The main skills shortages have been considered in the area of networking, integration of applications in the front and back office and in deployment of e-business strategies. It is interesting to note that opposite to several technologically developed EU countries, in many New Member States (NMS) the ICT skills employment is growing (Fig. 1). This is to a certain extent due to the expansion of new segments related to the development of Internet, e-business, IST applications and services.

Figure 1: National employment of “ICT practitioners”



Source: RAND Europe (2005)

Generally, companies are seeking a combination of three types of skills – technical, business and personal. The greatest demand is found in companies in industrial sec-

¹ European Information Technology Observatory

tors, where IT jobs are related to support functions. In many cases these companies are not in a position to offer the skilled workers they seek attractive salaries and job opportunities. Thus, recruitment difficulties are often a reason for outsourcing web design and e-commerce activities, especially by SMEs [Gourova, 2003].

At EU level are considered as further skill needs management of intellectual property, technology transfers, managing innovation projects, information and knowledge management, etc. There is also a serious need for development of more forward-looking attitudes. Subsequently, many courses on management of change, quality management, etc. have been provided in order to complement traditional degree programmes or as a part of special programmes developed jointly by universities and companies according to the needs. Initiatives for education and training for entrepreneurship have been launched in many European countries, in order to 'nurture entrepreneurial spirit and new skills from an early age' [European Commission, 2003].

It is widely recognized that there is a need for more than just technology training or management training. It is necessary to provide engineers and software developers with much broader skills – for teamwork, for knowledge and project management, financial assessment of business or engineering solutions, development of complex projects and using available experience, etc – as well as profound professional knowledge. Analytical thinking, creativity, ability for learning and self-development, flexibility, self-confidence – all these skills are needed to improve employment prospects of individuals in the knowledge-based economy.

For bridging the skills gaps could be used different paths – formal education, training on-the-job, self-learning, working experience, etc. The dynamic changes of technologies face learning providers with the requirement for periodic update of the learning content and enrollment numbers in order to mitigate skills mismatches on the labor market. There is a big challenge especially for universities and vocational schools to follow and predict the employment demands. On the other side, higher education may be able to ensure e-skills supply in the middle and longer term. However, companies need to find solutions for labour shortages now. Rapid technological change requires continuous learning from citizens and employees world-wide. Therefore, many initiatives are underway for building an open, flexible and transparent lifelong learning system, mainly related to encouragement of company-training activities, use of existing company-based training facilities or the building of regional training centres. The focus in NMS, for example, is primarily on areas where the demand and potential for economic gain are greatest – business, law, ICTs, foreign languages, etc. Experts estimate that around 80% of big company spending on training is on IT training. In addition to traditional forms of training, all European countries use more actively the opportunities that distance education offers to enhance the variety of training courses and facilitate accessibility of educational materials and training.

3. AN APPROACH FOR DESIGNING A NEW TRAINING CURRICULA

As shown in the next example, especially helpful for responding to the changing training requirements is the EU program Leonardo da Vinci, which helps in designing and launching new training curricula and courses according to the current demands.

Within the Leonardo da Vinci TRAINMOR KNOWMORE project a consortium coming from 6 European countries (Austria, Bulgaria, Cyprus, Germany, Ireland and Romania) set the objective to develop an intergraded training framework (material and methodologies) for Organizational Knowledge Management (KM). By designing the training

curricula it was acknowledged that KM training design should respond to the expectations of the learners, delivering value-added flexible training methods, easy-for-use tools and time-saving learning solutions, designed to respond to the current and specific needs of the learning individuals.

Therefore, the project members have carried out in their country a thorough training needs analysis based on a questionnaire and followed by individual interviews in SMEs. On the basis of the identified exact needs and the profile of both the targeted groups and the potential users have been defined the characteristics of the training material and the methodology to be followed in the training phase. It is interested to stress that the outcomes of the training needs analysis clearly identify two possible training paths – one for the managers and another – for the knowledge workers.

Managers are interested most of all to identify, assess and “audit” the existing organizational knowledge, as well as to understand more properly how to acquire and store knowledge in organization. The topics of interest for top managers include also Assessment of knowledge, creation of knowledge, KM in organizational strategy and distribution and usage of knowledge. Avoiding loss of knowledge and “KM and personnel motivation” acquire as well top manager’s attention, in their efforts to establish more KM oriented strategy within their organization. On the other hand, knowledge workers from Austria, Romania and Cyprus are interested on first place in learning more about tools for auditing organizational knowledge, in Ireland – on KM in organizational strategy, and in Bulgaria – on use of knowledge and avoiding losses of knowledge. Introduction to KM, KM and organizational strategies, change management attract as well the interest for knowledge workers, dealing with basic and theoretical management approaches, directly influencing operational work in the organizations.

4. EXAMPLE OF UNIVERSITY-INDUSTRY COLLABORATION

The EU framework programs also help to identify training needs and support the introduction of new training paths and responding faster to the coming needs. They foster the practical building of long-lasting learning-research-innovation relations. As result of the research carried out within several EU programs – FP6, FP5, INCO Copernicus, etc., the Department of Information Technologies (IT) of the Faculty of Mathematics and Informatics (FMI) of Sofia University (SU) has developed in the last few years capacity to respond fast to the European educational trends and to the Bulgarian labor market needs. With its flexibility in introducing new curricula and programs it has attracted a lot of students to the newly designed Bachelor programs on Software Engineering, Computer Sciences and Information Systems, or the Master programs on Bio- and Medical Informatics, E-Business, E-Learning, Software Technology and Artificial Intelligence. Recently, it launched a joint program with the US-based Stevens Institute of Technology on Master of Science in Information Systems. The program offers a unique combination of business and global management topics and IT specialization. It aims to prepare next IT leaders in the region, delivering innovative and practice-based training.

At the core of these successes is a dynamic unit established in 1996 as an extension of the IT Department of FMI. CIST is considered the main driver of SU on its way to becoming an entrepreneurial university. It was established as an interdisciplinary research and training institution, motivated by the challenge to support the development, introduction and wide use of Information Society Technologies (IST). The main objective of CIST is to create and establish fruitful co-operation between the academic commu-

nity, industry, NGOs, public administration, local community, etc. for coordinating the efforts in spreading the IST wide implementation and use.

By developing the Centre was taken into consideration the framework defined by Clark which identifies five elements that constitute the irreducible minimum of entrepreneurial actions for an entrepreneurial university which understands the commercial value of knowledge – a strengthened steering core, an expanded developmental periphery, a diversified funding base, a stimulated academic heartland, an integrated entrepreneurial culture [Clark, 1998].

It is obvious that the ability to become entrepreneurial depends on a well organized management of the available resources at the university. Therefore a strengthened steering (administrative) core becomes a necessity. A strong and committed leadership appears at the starting point of entrepreneurial development. In order to strengthen the steering core and the fund-raising capacity of the university a number of dynamic and more entrepreneurial units have been set up following the CIST model. These units are directly governed by the Rector and Vice Rector of R&D. The need of affiliating CIST directly to the university steering core has also been recognized. In order to strengthen the capacity of CIST to achieve a regional and national influence a number of other structures have also been created, such as: Bulgarian Telework Association – BgTA; Sofia University Cisco Regional Academy, and Sofia University Microsoft IT Academy.

For its successful development CIST is exploring the opportunities of a diversified funding:

- EU research projects - in areas related to Knowledge society and ICT, such as: e-Learning, e-Business and e-Work, Software Engineering, Innovation, Knowledge Management, Intelligent Systems, Interactive Multimedia, etc.
- Provision of training courses –for industry, public administration and individuals
- Industrial research and development funded by large companies provides a third channel of funding.
- A fourth channel of funding, still not explored sufficiently, could come from patents and intellectual property rights (IPR) that allow the university to license or sell the rights defined and exclusively make, use and market the inventions.
- The fifth channel of funding is venture capital. Unfortunately this channel is still under-developed at Sofia University.
- Sponsorship is the sixth channel of funding – which has been efficiently utilized for the annual joint event with the Municipality of Sofia – the European Day of Entrepreneurs.

For expanding the development periphery of Sofia University CIST has established a large network of partnering organizations both abroad and in the country. Members of the Sofia University national partnerships network in the field of IST are the Ministry of Education and Science, Ministry of Economy and Energy, the State Agency for ITC, BAIT², BASSCOM³, a large network of universities, and industrial partners.

The linkages established with all institutions referred to above have contributed to strengthening the knowledge transfer from university to economy and society, to setting the research and training agendas according to the real economy and societal needs, and responding to the challenges to research, education and technology development in Bulgaria. The recent strategy is to strengthen the national network in order to ensure better channels for technology and know-how transfers from the international network into the national one.

² Bulgarian IT Association

³ Industry Association of Bulgarian Software Development Companies

5. CONCLUSION

The paper focused on a group of interrelated issues, highlighting first the skills focus at EU level, expanding it into two practical examples – a recent approach in developing a new training curricula and a dynamic and entrepreneurial structure at SU. In this relation, some issues for further consideration could be raised:

1. As boundaries between IT and other jobs are diminishing rapidly, the professional competence of workers requires more than a specific job competence. The fast technology developments require educational institutions to broaden curricula and implement new teaching methodologies. At the same time, company interests are focused on skills in particular technologies. This poses questions: How can educational systems respond to rapid technological change and labour-force demands? What role should industry play in this process – should it be simply a supplier of technology and donations, or should it be a partner for building a technology savvy labour force?

There is a need for a broad partnership approach. More active involvement of industry in the educational process could take into consideration professors needs. Industry could provide assistance for developing more general technology courses at higher-education level and support industry-oriented individual tasks for students, projects and summer practice. Rather than attracting researchers with higher salaries, enterprises could involve professors in company research and innovation on a contractual basis and offer part-time jobs to students. This seems to be a more sustainable scenario for the future. Another possible option is the involvement of industrialists in teaching courses on topics related to advanced technologies and present company practice.

As the brain-drain of highly-skilled professionals is a hot topic for Bulgaria, as the only sustainable solution could be outlined the creation of high quality opportunities in the country. The answer is partly seen in the ERA⁴ and the Bologna process, and the actions for strengthening research collaboration, building attractive universities, and creating a favourable environment for study, work and life. The development of joint courses and degrees with EU universities could draw Bulgarian universities into the mainstream teaching activities of the EU, and strengthen their integration in the European Higher Education Area.

6. REFERENCES

- [1] Clark, B. R. (1998), *Creating Entrepreneurial Universities, organisational pathways of transformation*, Oxford: Pergamon
- [2] European Commission (2003), *Report on the implementation of the European Charter for small enterprises in the candidate countries for accession to the European Union*, SEC(2003)57
- [3] Gourova, E. (2003), *Insight into ICT professional skills and jobs in the Candidate Countries, Enlargement Futures Report Series 08*, JRC-IPTS, EUR 20749 EN
- [4] Nikolov, R. (???) , *Towards Education and Training as a Meta-Industry, ???*
- [5] RAND Europe (2005), *The supply and demand of e-skills in Europe*
- [6] The European e-skills forum (2004), *E-skills for Europe: towards 2010 and beyond*, EC DG Enterprise

⁴ European Research Area