Informatics Education as a Driver for Country Development

Dr. Roumen Nikolov, Vice-Dean, Faculty of Mathematics and Informatics
Dr. Iliana Nikolova, Head of Department of Information Technologies
Sofia University, Bulgaria

roumen@fmi.uni-sofia.bg, iliana@fmi.uni-sofia.bg
Outline

- Sofia University and Faculty of Mathematics & Informatics
- European Dimensions of Informatics Education
- Implementing ACM/IEEE Computing Curricula
- Informatics Education Dynamics
- The Role of New Member States in Europe of Knowledge
- Education and Research as a Meta-industry and driver for country development
Sofia University – the biggest Educational and Scientific Centre of Bulgaria

- 17 Faculties
- 35,000 students and over 3,000 teachers & researchers
- 80 Bachelor’s and over 200 Master’s programmes
- Very important role for the development of the country

Challenges:

- to become a National and Regional High-Technology and Innovation Centre, an entrepreneurial university
- to adopt new standards and models of education
- to implement the new role of universities as an infrastructure of Knowledge Economy
- to build a sustainable university-industry-government partnership
Faculty of Mathematics & Informatics

Curricula re-design at BSc, MSc and PhD level:

- Implementing ACM/IEEE CC2001/CC2005 – BSc in CS, SE, IS
- Participation in Intel Multi-core Curriculum Program (Top Tier University Club)


- PhD program linked to EC IST RTD priorities
Centre of IST, Sofia University

- Large international partners’ network in Europe (more than 600) and in Bulgaria (more than 300)
- Strong links with ICT industry: Intel, Cisco, HP, Oracle, MS, SAP, SMEs
- More than 50 projects related to the European Space of Higher Education (FP4, FP5, FP6, FP7, Tempus, Leonardo, Phare, etc.)
- Several projects in innovation and technology transfer
- Country Case Study at the World Bank Knowledge Economy Forum II, Helsinki, March 2003
- Organises the annual European Day of the Entrepreneur; Intel Berkeley Technology Entrepreneurship Challenge for Central and Eastern Europe
ICT related projects

- 10 projects from 6-th Framework RTD Programme
- 15 projects from 5-th Framework RTD Programme
- 7 projects from 4-th Framework RTD Programme (INCO COPERNICUS)

- Many other national and international eLearning related projects:
  - internal (at Sofia University);
  - with the Ministry of Education and Science and Ministry of Transport and Communications
  - at EC level (PHARE, Socrates-Minerva, Leonardo, Comenius)
  - World Bank, Industrial, bilateral with other universities, etc.
Projects from FP6

- 6FP NoE Project KALEIDOSCOPE “Concepts and methods for exploring the future of learning with digital technologies”,
- 6FP IP Project TenCOMPETENCIES: Building The European Network for Lifelong Competence Development
- 6FP STREP Project UNITE: Unified eLearning Environment for the School
- FP6-2004-IST-NMP-2 PRIME “Providing Real Integration in Multi-disciplinary Environments”
- 6FP SSA Science.and.Society.7 Project PARCEL “Participatory Communication Activities on E.Learning”
- FP6 SSA 016020 ATVN-EU-GP “Academic Internet Television Showcases the Best of Good Practice Activities”
- 6FP IP Project GUIDE “Creating an European Identity Management Architecture for eGovernment”, http://www.guide-project.org
- 6FP BulRMCNet “Bulgarian Network of Research Mobility Centres”
- FP6 MOBILITY-2004-SSA REKS “Researchers in European Knowledge Society”
Projects from FP5


- 5 FP IST-1999-20852 (2000-2002) "Best Practice Pilot for the Promotion and Implementation of Teleworking Tools at European SMEs of the Service Sector (PROTELEUSES)"


- 5 FP "Best Practice Pilot for the implementation of Integrated Internet Based Remote Working Places for Virtual Teams (IWOP)"
- 5 FP "A Picture of Social Observation of Call Centre (TOSCA)"
- 5 FP WG-ECUA+: European COTS Working Group Extension
- 5 FP EXPERT Project: “Best Practice on E-project Development Methods”
- 5 FP COCONET “Context Aware Collaborative Environments for Next Generation Business Networks”
- 5 FP IST Project EUNITE - EUropean Network on Intelligent TEchnologies for Smart Adaptive Systems
- 5 FP INNOCONS: Increasing The Awareness On Innovation In The European Construction Sector
- 5 FP AFORO Project: “Agro-Food Roadmaps. A vision and work plan to implement future RTD trends for the transformation of agri-food industries into digital companies”
- 5 FP Innovation and SMEs Thematic Networks, BIGEAR NET Thematic Network on Stimulation of Business Innovation and Growth from Exploitation of Academic Research"
EU suffers from under-investment in human capital, especially in higher education;
Europe faces a chronic shortage of skilled ICT professionals – demand is expected to exceed supply by around 12% per year over the coming years;
Need to increase of at least 15% in the number of Math, Science and Technology graduates by 2010;
Increase of 1.2 mln R&D staff, incl. 700,000 researchers, will be needed by 2010;
EU produces more science graduates than the US, but has significantly fewer researchers in the labour market;
‘Brain drain’ - 85,000 EU-born S&E employees work in the US;
Europe of Knowledge: convergence of European Higher Education Area and European Research Area; Knowledge Triangle (education, research, innovation);
European Technology Platforms and European Institute of Technology;
European Year of Worker’s Mobility 2006 – mobility of researchers, teachers and students as a mean for preventing brain drain;
Erasmus University Charter and Erasmus Student Charter (2003);
Intel seminar “The Role of Universities in the Creation of a Knowledge-based Economy” (12 October 2006)

- Modernization of European Universities (EU Education Commissioner Ján Figel)
- University funding models across Europe (Minister Micheál Martin)
- Investing in Higher Education (Dr. Craig Barrett)
- The Establishment of Elite Universities in Germany (Prof. Arndt Bode)
- From Brain-Drain to Brain-Circulation: the New Member States Perspective (Dr. Roumen Nikolov)
The eLearning Industry Group: “eLearning has the potential to become a key engine in driving growth and creating more and better jobs in Europe.”
E-Skills Summit, Kopenhagen, 17-18.10.2003
E-Skills Summit Industry Consortium & 25 Pilot Universities
E-Skills Summit: Documents & Guidelines

- Curriculum Development Guidelines
  New ICT curricula for the 21st century: designing tomorrow’s education

- Determining the future demand for ICT skills in Europe

- ICT Job Profiles

- …
The need of new ICT programs

**Figure 1.1. Structure of the Computing Curricula Series**
Implementing ACM/IEEE CC2005 at Sofia University

- BSc in Computer Science
- BSc in Software Engineering
- BSc in Information Systems
- wide variety of MSc programmes
- PhD level
• Designing and reasoning about algorithms
• Development of new software technologies
• Design of programming languages
• Business value of information technology
• Strategic use of information technology
• Business processes
• Evaluation of emerging information technologies
  • Database design
  • Info storage and retrieval
  • Artificial intelligence
  • Intelligent decision systems
MSc Programs in Informatics

- Artificial Intelligence
- Computational Science and Engineering
- eBusiness and eGovernment
- eLearning
- Medical Informatics
- Information Systems
- Mobile Technologies and Distributed Systems
- Software Engineering
- Information Security
- Computer Graphics
- Mechatronics and Robotics
- MSIS Stevens Institute of Technology
Stevens MSIS Program: Importing IT Management Competence at Sofia University (http://www-it.fmi.uni-sofia.bg/msis/)
Become a Leader in Information Technology Management

We have what you need!
Regional Cisco Academy
Chronology

- 2000: established Regional Cisco Academy at Sofia University
- 2000-2001: certified 8 CCAI
- 2001: started teaching CCNA1-4
- 2002: started teaching IT1&2, Fundamentals of Java, Fundamentals of Unix
- 2003: started teaching CCNP
- 2005: started teaching Wireless LAN & Network Security courses
Cisco courses integrated in the University curriculum

**Faculty of Mathematics & Informatics**
- BSc Computer Science - CCNA1 (since 2001/2002)
- MSc Distributed Systems & Mobile technologies
  - CCNA1-4 (since 2004/2005)
  - Wireless LANs (since 2004/2005)
  - IT Essentials 2 (since 2004/2005)
- MSc Information Systems
  - CCNA1 (since 2003/2004)
  - Fundamentals of Unix (since 2003/2004)

**Faculty of Economics & Business**
- MSc Management Information Systems
  - CCNA1 (since 2003/2004)
  - Fundamentals of Unix (since 2003/2004)
ICT Curricula Dynamics: Intel Multi-core Curriculum Program, Sofia University joins the Top Tier University Club
The Role of New Member States in Europe of Knowledge

- During the last 15 years the Bulgarian population has decreased by nearly 1 mln people, most of them – young and well educated specialists who fuel the Western economies. Many cases of ‘brain-waste’ for EU: e.g. a former CEEC researcher working as a plumber in the US or in the EU;
- CEECs loose their great investments in education (for Bulgaria the loss is bigger than the national debt);
- By February 2002, 14% of the Marie Curie fellowship holders from CEECs moved to the EU and only 0.5% of fellowship holders from the EU moved to a CEEC country.
- Erasmus, Leonardo and ERA-MORE: are they mechanisms to speed up the ‘one-way’ mobility? Are the CEECs considered as the main suppliers of high-skilled workers?
- Andrea, A Czech student, says “You just can’t compare our infrastructures or the investments we make in the education and scientific sectors with that of other European countries
- Howard Moore, Director, ROSTE, UNESCO: “The countries of South-East Europe share some common problems to a greater or lesser extent – low investment in science, inadequate infrastructure in terms of research equipment; libraries, low industrial base and therefore very limited private sector involvement in science, and those issues lead to the chronic brain drain”.

ECSS 2006
Zurich, October 16-17, 2006
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From Brain-Drain to Brain-Circulation – How To?

- The Irish model (“Celtic Tiger”) - from Brain-Drain (1980) to Brain-Gain and Brain-Circulation (1990 +);

- Commissioner Janez POTOČNIK (April 2006, Sofia): “Bulgaria should also plan the use of other EU instruments to achieve knowledge and growth. I am thinking of the Competitiveness and Innovation Programme but even more so of the use of the Structural Funds to promote research objectives”.

- Ireland has used 60% of the EC development funds for infrastructure (highways, railroads, airports, harbours), and invested most of the rest for infrastructure for the Knowledge Economy (universities, research labs, innovation and entrepreneurship, high-tech infrastructure, improving competitiveness of economy). Effect – economic boom.

- Portugal used 90% of the EC funds for building traditional infrastructure. Effect - economic crisis.

- Lisbon strategy: “Implementation of the strategic goal will be facilitated by applying a new open method of co-ordination as the means of spreading best practice and achieving greater convergence towards the main EU goals”.

- Is the EC ready to use this method for strongly guiding and monitoring (even – forcing) the NMS to apply the EU best practice models for brain-reverse (e.g. the Irish, Finish, Swedish, Danish, UK)?
Building Europe of Knowledge Ecosystem

- Building a pan-European educational and research infrastructure
- Stimulating short-term and virtual mobility, rather than long term geographical one; Establishing better system of incentives for return back
- Establishing a European large network of virtual educational, research, innovation, technology transfer and business organisations
- Stimulating research activities and entrepreneurial education at early stages of education, even in the schools
- Establishing stronger mechanisms for technology transfer and knowledge mobility between EU-15 and NMS, including between different sectors, as a pre-condition for competitive business development
- Lifting the barriers for students, teachers and researchers for building their high-tech business start-ups
- Stimulating venture capital invasion, especially for early stage businesses
- Awareness-rising initiatives and events aiming at and building entrepreneurial culture as early as possible
- Building public-private partnerships for investments in educational and research infrastructure
Education and Research as a ‘Meta-Industry’

- ICT is the main instrument for turning education and research in an industry (eLearning, eResearch, eWork, eInfrastructure);
- eLearning in Informatics Education as a mean to overcome the e-skills gap;
- This industry could be considered a ‘meta-industry’ since it could positively influence all other industry sectors;
- It could become the most important asset of the NMS on their way to the Knowledge Economy;
- NMS are attractive destinations for foreign direct investments (FDI), that have radically changed many industry sectors, e.g. the food and beverages sector, cement industry, non-ferrous metallurgy, wholesale trade and banking in Bulgaria;
- FDI could radically change the ‘knowledge sector’ of the industry which should be built around the real knowledge producers – universities and research institutions;
- We might expect a radical change in building sustainable ‘university-industry-government’ partnerships in NMS;
- This is a real chance for Bulgaria to leap forward into the ‘Knowledge Economy’
Conclusion

Informatics education is not just an academic exercise
It can be considered a main catalyst for stimulating growth and creating a competitive economy
Recent ICT public events
Intel Berkeley Technology Entrepreneurship Challenge for Central and Eastern Europe, August-October, 2006

TURN INNOVATIVE IDEAS INTO REAL BUSINESS

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ECSS 2006
Zurich, October 16-17, 2006
IEEE 2006 John Vincent Atanassoff International Symposium on Modern Computing, October 2006
Forthcoming events
4th Sofia European Day of the Entrepreneur – November 7-8, 2006

- Main organisers: Sofia University and Sofia Municipality, in cooperation with the EC, Bulgarian Government, businesses, universities, SMEs, etc.

- Sofia – the first CEEC capital hosting EDE (2003);

- So far: 1500 visitors, 70 co-organisers, 100 foreign participants, 250 lectors, many satellite events, media coverage;

- EDE2006 under the motto “European Funds and Regional Development”
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**Conference Topics**

The conference welcomes submissions of original, high-quality papers in all areas of Informatics. These include, but are not limited to, the following two groups of topics:

**Classical subjects of Computer Science & Engineering, as classified by ACM:**

1. Discrete Structures
2. Algorithms and Complexity
3. Programming Languages
4. Architecture
5. Operating Systems
6. Human-Computer Interaction
7. Graphics, Visualization, Multimedia
8. Intelligent Systems
9. Databases and Information Retrieval
10. Real-time Computing
11. Software Engineering
12. Computational Science
13. Social, Ethical and Professional Issues

**Perspective topics derived from the EC FP7 IST priorities:**

- Communication networks and Grid technologies
- Embedded systems, reliable and efficient computing
- E-Society
- Information security
- Advanced information systems
- Knowledge-based, cognitive and learning systems
- Simulation, visualization, interaction and mixed realities
- Software technologies
- Technology-enhanced learning

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**Important Dates:**

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