The Dock of the Bay

The Summer issue revisits the subject of R&D in ICT, this time from the perspective of four leading ICT related research institutes in the IT STAR Region, with contributions from

- *G. Dzemyda, Director of the Institute of Mathematics and Informatics in Vilnius, Lithuania and L. Eriksonas, Project Manager at Europarama*
- *P. Inzelt, Director of the Computer and Automation Research Institute of the Hungarian Academy of Sciences*
- *M. Hołynski Director of the Computer Science Institute in Warsaw, Poland*
- *J. Stuller, Deputy Director for Research, Institute of Computer Science of the Academy of Sciences of the Czech Republic*

For a wider international outlook, *M. Bogdanowicz,* Institute of Prospective Technological Studies (IPTS) of the European Commission, presents the 3rd IPTS Report on R&D in ICT in the EU and its main observations.

This specialized issue focuses exclusively on R&D in ICT; yet we hope it would be of interest to the wider ICT community, including representatives of government, industry and civil society.

Take the Journey,

Plamen Nedkov

IT STAR representatives

Austria/OCG-E. Mühlvenzl, **Bulgaria**/BAS-K. Boyanov, **Croatia**/CITS-M. Frkovic, **Cyprus**/CCS-P. Masouras, **Czech Rep./**CSKI-J. Stuller, **Greece**/GCS-S. Katsikas, **Hungary**/NJSZT-B. Domolki, **Italy/**AICA-G. Occhini, **Lithuania**/LIKS-E. Telešius, **Macedonia**/MASIT-P. Indovski, **Poland/**PIPS-M. Holynski, **Romania**/ATIC-V. Baltac, **Serbia**/JISA-D. Dukic, **Slovakia**/SSCS-I. Privara, **Slovenia**/SSI-N. Schlamberger

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People

Dudley Dolan: new member of the NL Advisory Board

We are pleased to welcome Mr. Dolan as a new member of the Newsletter's Advisory Board.

Dudley is a retired Senior Lecturer from Trinity College Dublin. He has been a Vice-President of CEPIS and a Trustee of IFIP. He is a Founder and Distinguished Fellow of the Irish Computer Society and an Honorary Fellow of the British Computer Society. He was Vice Chairman of the CEPIS User Skills Task Force, which developed the ECDL. He is currently acting as Assistant Project Leader in the CEN Project Team working on End-User eSkills Framework Requirements and was recently chosen as Chairman of the CEN WS on ICT Skills.

Dudley is Chairman of Q-Validus and a Director of Taney Village Limited, which provides accommodation for the elderly. ∎

Letters to the Editor

Extracts from emails to the Editor with respect to the last issue ... comments and suggestions are always welcome – our coordinates are on page 1.

"I have seen the copy as soon as you distributed it via the web and must say that it is so good that even my article on DSI could not have done any damage :)"

Niko Schlamberger, SSI, **Slovenia** ∎

Cartoon of the Issue

" No ECDL Skills Card?"
The Delivery Co., June'10 ∎

EDITORIAL POLICY

This Newsletter maintains a world-class standard in providing researched material on ICT and Information Society activities from the perspective of Central, Eastern and Southern Europe (CESE) within a global context. It facilitates the information and communication flow within the region and internationally by supporting a recognized platform and networking media and thus enhancing the visibility and activities of the IT STAR Association.

The stakeholders whose interests this newspaper is addressing are

- IT STAR member societies and members
- ICT professionals, practitioners and institutions across the broad range of activities related to ICTs in government, business, academia and the public sector in general
- International organizations

Individual articles from the Newsletter may be reprinted, translated, and reproduced, except for denoted copyright protected material, provided that acknowledgement of the source is made. In all cases, please apply for permission to the Newsletter Editor.

Special arrangements for the production and circulation of the Newsletter could be negotiated.

The newsletter is circulated to leading CESE ICT societies and professionals, as well as to other societies and IT professionals internationally. Everyone interested in CESE developments and working in the ICT field is welcome to contribute with original material. Proposals for articles and material for the Newsletter should be sent two months before the publication date to editor@starbus.org. ∎

R&D in ICT

Some of the main conclusions of the 1st IT STAR WS on R&D in ICT (http://starbus.org/r_d_ws1/r_d_ws1.htm) held on 11 November 2006 in Bratislava were:

- The CEE countries are seriously behind the Lisbon objective of the Gross Expenditure on Research and Development (GERD) reaching 3% of the GDP

- The structure of GERD is far from the desired: more comes from government sources and much less from the business sector

- Establishing strong connections between academia and industry is imperative

- Multinationals in the region should diverse their involvement from pure commerce and simple manufacturing towards more knowledge-intensive activities, which could lead to the establishment of high-level research centers

- The importance of "curiosity driven" fundamental research was emphasized in line with the actions of the new European Research Council

- Information on research spending should be more transparent; the organization, coordination and financing of R&D activities is a hot topic and measures to help the participation of researchers in projects of the 7th Framework Program of the European Union is of top priority

Since then, IT STAR periodically revisits the topics of ICT R&D, mainly as they relate to ICT education and the partnership between academia and industry. This Newsletter takes another look, this time from the perspective of leading R&D institutes in the Region and on the backdrop of the Annual Report on ICT R&D in Europe (DG JRC - Institute for Prospective Technological Studies).

The articles focus on challenges and perspectives, including institutional R&D policy and research topics, financing, contacts with governmental institutions and industry, participation in Framework Programs and other EC and international activities. Given the high profile and experience of the authors, we trust the Summer NL issue will help to better understand the R&D in ICT agenda in the Region within the current pan-European setting.

The Editor

Challenges and opportunities for ICT RTD in Lithuania: The Case of the Institute of Mathematics and Informatics – www.mii.lt

by Gintautas Dzemyda and Linas Eriksonas

Prof. Gintautas Dzemyda is Director of the Institute of Mathematics and Informatics, Vilnius, Lithuania, head of the System Analysis Department, and executive Editor of the International Journal Informatica (www.mii.lt/informatica). Research topics: data mining, artificial neural networks, optimization, multidimensional data visualization.

Dr. Linas Eriksonas is Project Manager at Europarama, an R&D and innovationconsultancy firm, a member of the European Techno-Economic Policy Support Network. He has conducted policy analysis for DG INFSO, DGRTD, DG REGIO and DG Enterprise, and has been managing the ICT RTD technological audit in Lithuania.

Introduction

As the recent ICT technological audit in Lithuania has shown[1], the Institute of Mathematics and Informatics is one of the top three public RTD institutions carrying out ICT RTD in Lithuania; the other two being the Faculty of Informatics at Kaunas University of Technology and the Faculty of Mathematics and Informatics at Vilnius University. The ICT RTD community survey has further shown that almost a quarter of the star scientists in ICT RTD work at the Institute, though the Institute employs only 1/10 of the total personnel in ICT RTD. Having 115 researchers of staff, including 27 professors and 12 associated professors, the Institute currently provides doctoral training in Informatics Engineering, Informatics and Mathematics to 59 doctoral students (through joint programmes with other universities). This educational activity puts the Institute at the very centre of the ICT RTD community in Lithuania, which is also reflected in the fact that the Institute maintains the node of the national academic computer network (LITNET) and hosts a Grid cluster. The Institute of Mathematics and Informatics with partners regularly organises international conferences (e.g., this year the 15th Int. Conf. on Mathematical Modelling and Analysis, 10th Int. Vilnius Conf. on Probability Theory and Mathematical Statistics, 9th Joint Conf. on Knowledge-based Software Engineering, JCKBSE'10). It issues 6 in-

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ternational journals: "Informatica", "Lithuanian Mathematical Journal", "Mathematical Modelling and Analysis"[2], "Informatics in Education", "Nonlinear Analysis: Modelling and Control", "Olympiads in Informatics".

As of 1 October the Institute will complete its integration into Vilnius University, thus becoming part of the largest higher education institution in Lithuania. The merger was occasioned by the major restructuring of the public research institutes by the Government in pursuit of making the top national universities more competitive and more research active. However, the doubts remain whether this merger will not come at the cost of significant decrease of research at the expense of teaching as the main value generating activity for higher educational institutions after the EU Structural Funds' unprecedented support to RTD and innovation sector comes to an end[3].

Despite the changes in the political environment the Institute continues to develop the core strengths in the following research and application areas, both in mathematics and informatics:

- Probability Theory and Mathematical Statistics, Finance Mathematics, Econometrics, Differential Equations and Numerical Methods for Their Solution, Computer Agent and Knowledge Logics;
- Software Engineering, Grid Computing, Data Mining, Decision Support, Optimization, Data Visualization, Operational Research, Recognition Processes, Signal Processing, Language and Multimedia Technologies, Interactive Systems, Web Mining, Fundamentals of Informatics, ICT in Education, Ontology-Based Engineering of Component Applications, Computer Networks.

If compared to the thematic structure of the EU Framework Programme, the Institute has competences answering the needs of the following FP7 ICT Objectives: Networks of the Future, Internet of Services and Advanced Software Engineering, Computing Systems, Language Technologies, Intelligent Information Management, ICT solutions for governance and policy modelling. However, despite the strengths in terms of human resources, national networking and core research areas, the Institute as well as the whole ICT RTD community in Lithuania are facing a number of challenges that if unmet could lead to a further marginalisation of the national ICT RTD at the expense of other RTD areas.

Challenge 1: Aligning institutional R&D policy with the changing environment

The first challenge is arising from the need to align institu-

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[2] "Informatica", "Lithuanian Mathematical Journal", "Mathematical Modelling and Analysis" journals are indexed by Thomson Reuters ISI Web of Science® database.

[3] Under the EU Structural Funds support 2007-2013 almost 1 billion Lt have been earmarked by the Government to be spend on setting up large integrated RTD infrastructures as part of the development of „science valleys" – a vision of a shared research and education facilities on the main campuses of universities in Vilnius, Kaunas and Klaipėda. ICT RTD infrastructures are planned on at least three locations - in Vilnius and Kaunas.

tional R&D policy with the changing R&D policy environment, which is not favourable to the fields of mathematics and informatics in Lithuania. ICT RTD is not regarded by the Research Council of Lithuania (which is administering programme-based R&D funding schemes) as the top research area. Usually, the informal priority is given to the long-established technological domains such as biotechnology, medicine, lasers, despite the fact that neither of them can sustain their R&D efforts without the help of researchers in mathematics and informatics, whether it is concerning gene sequencing, molecular modelling, pattern recognition or large-scale data processing. *The opportunity for the Institute is to align institutional R&D policy in line with the needs of dominant technological domains via joint projects.*

Challenge 2: Attracting funding in core research areas

The second challenge is linked to attracting funding for sustaining the core research areas at the Institute; any applied research cannot be generated without a continuous feedback from the fundamental science and frontier research. A weak ICT technology sector in Lithuania does not provide enough resources for co-funding of ICT RTD from private sources. Neither a public sector is capable to provide funds for bottom-up research. *The opportunity for the Institute is getting the funding for frontier research through grants available for research groups and doctoral research, and training through competitive funding at national and EU level.*

Challenge 3: Providing a value for governmental institutions and businesses

The third challenge is to provide value for governmental institutions and businesses in the environment which is becoming increasingly organised around certain policy and business interests and has little regard for scientific enquiry as a unique type of knowledge. The increasing emphasis on ICT as a generic purpose technology makes it difficult in policy and business circles to explain the value that ICT RTD-based technology can bring to a new high-tech product. *The opportunity for the Institute is to work closer with companies in developing technology for commercial governance, business support, health care, etc. products.*

Challenge 4: Participating in the ICT Theme of the Framework Programme

The fourth challenge is participation in the European Research Area through the Framework Programme and other research funding instruments at EU level to acquire knowledge and best practices necessary for sustaining the high standards of educational and research training in ICT RTD. The current structure of FP7 ICT is not favourable to the new EU countries, which lack a developed ICT technology sector, are heavily dependent on ICT technology imports from EU15 and cannot muster the resources necessary for competing at EU level. The analysis of the draft FP7 ICT Work programme for the period 2011-2012 has shown that the Institute's core research areas are the most competitive ones due to a large number of high-level experts in those areas in EU12 (Figure 1). *The opportunity*
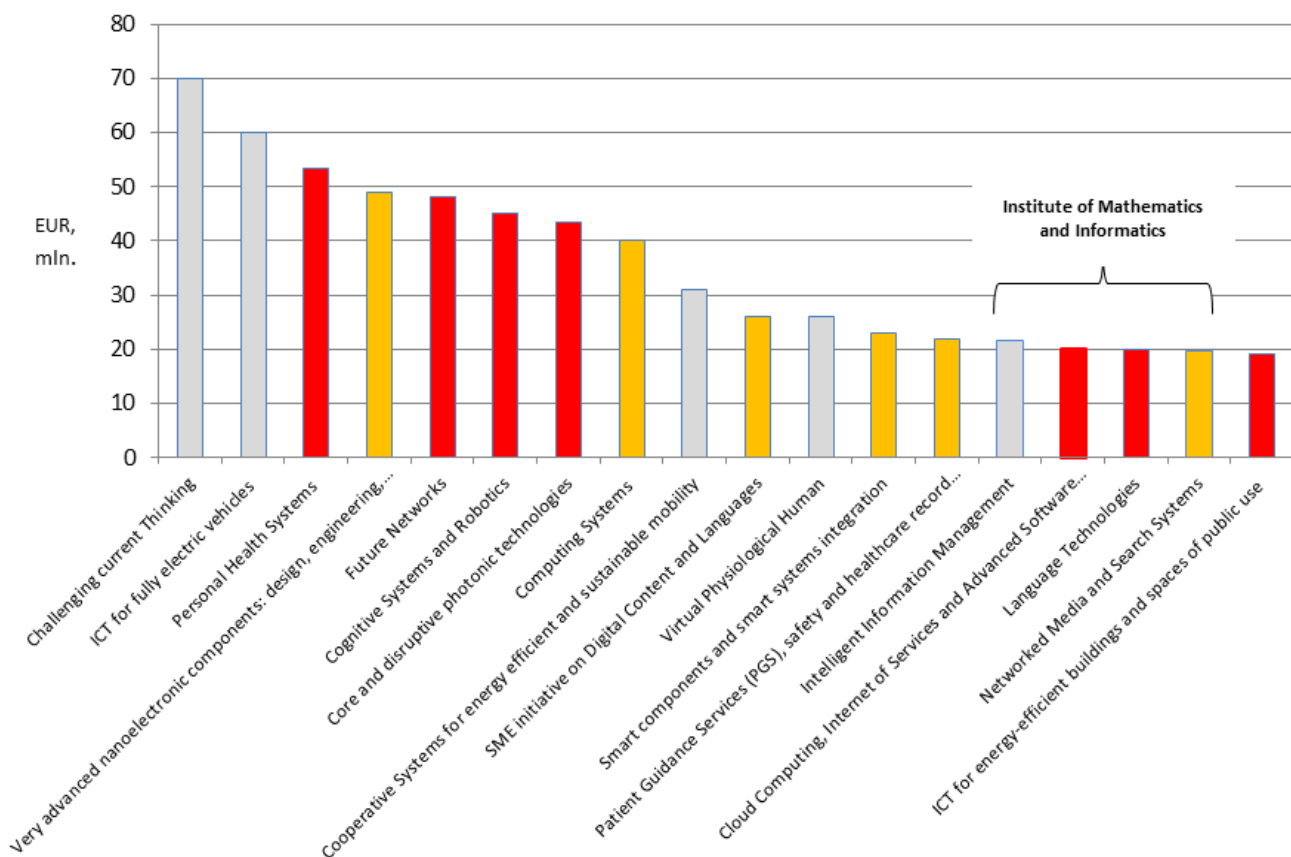
Figure 1: FP7 ICT WP Objectives with funding allocated to STREPs above 19,5 million EUR
(red indicates the areas with high competence and high number of researchers in EU12,
yellow: high competence but limited number of researchers, grey – no high competence identified in EU12).

for the Institute is to target the areas which are related to its core research areas but are less competitive in EU12 such as Intelligent Information Management and also encourage doctoral students and their research groups to apply for Future Emerging Technology calls.

Challenge 5: Opening up international collaborations for breaking new grounds

The fifth challenge is closely linked with participation in bottom-up research schemes such as COST, Eureka! and other schemes funded and administered by the European Science Foundation jointly with national offices. The analysis of the ISI publication record of ICT community in Lithuania has shown that most of the publications are co-authored with colleagues from Lithuania. The evidences point out that the higher level of international co-authorships, the greater integration of a researcher on the international research scene which, in turn, reflects in a higher participation and success rate in FP ICT projects. The highest record of international collaborations in ICT related publications (according to Thomson Reuters ISI Web of Science) in Lithuania is held not by computer scientists but by physicists and biotechnologists. *Hence, the opportunity for the Institute as integral part of Vilnius University is to collaborate with the research centres and laboratories from other disciplines which are indirectly involved in ICT RTD such as Vilnius University Laser Re-*

search Centre, Institute of Theoretical Physics and Astronomy, Semiconductor Physics Institute and Laboratory of Bioinformatics.

To summarize, the ICT RTD in Lithuania in general and the Institute of Mathematics and Informatics in particular has strengths in a number of research areas which are relevant to the European Research Area and the leading technology domains in Lithuania. In order to meet the challenges posed by the changing political environment and the emergence of natural and physical sciences as the leading research domains in Lithuania (and perhaps in other EU12 countries), the leading ICT RTD institutions such as the Institute of Mathematics and Informatics are faced with a choice: to keep going without giving much respect to the policy pressures and the competition from other disciplines, or to seek interdisciplinary, political alliances. Only in the latter case the challenges could be met and a new value proposition can emerge from ICT RTD.

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R&D activities at MTA SZTAKI, the Computer and Automation Research Institute, Hungarian Academy of Sciences – www.sztaki.hu

By Peter Inzelt

Peter Inzelt is Director of the Computer and Automation Research Institute of the Hungarian Academy of Sciences (MTA SZTAKI). He holds a Ph.D. in process control, an MBA from Purdue University, and financial qualifications. Peter's research field is process control, production planning and scheduling.

Introduction

MTA SZTAKI is a research institute, governed by the Hungarian Academy of Sciences. Its staff consists of more than 300 full-time employees - more than 200 with university diplomas and more than 90 with scientific degrees. Around 50 percent of the researchers are under 35. Furthermore, 30-40 graduate and post-graduate students are working part-time at the Institute. The majority of researchers are engineers and mathematicians.

The fundamental task of the Institute is to perform basic and applied-oriented research in an interdisciplinary setting in the fields of computer science, engineering, information technology, intelligent systems, process control, wide-area networking and multimedia.

The activity of the Institute is closely connected with its financing scheme. About one third of the income derives from the budget of the Academy for basic research purposes. The results of basic research are measured by an internal system, which serves as the basis for distributing this sum among the R&D units. Another third comes from "competitive sources" (e.g., at present FP7, Hungarian and other R&D funds), and the last third from contractual work on the market, mostly industry-based contracts. The R&D units of the Institute are individual profit-centers; they should cover their direct and indirect costs and are free to use the profit (if any). As a result, our R&D units are interested both in basic research and applied work; and the yearly income of the researchers may contrast significantly. The Institute is more or less forced to apply its R&D results in practice in the form of contract work.

The Institute is very active in graduate and postgraduate education - co-operation with the major universities in Hungary and operating common chairs, postgraduate programs with them. More than 50 researchers of the Institute hold regular lectures/classes on graduate and/or postgraduate levels, and senior researchers hold part-time positions as university full professors. 20-30 Ph.D. students and 20-30 graduate students participate in the work of the Institute. We are interested in university connections: this is the way of finding talented young people, most of the national grants specify the participation of a university, and last but not least, our researchers like university titles.

R&D profile

We try to concentrate – as everybody – on research topics and people, with usual success. Unfortunately, we have smaller teams as well – mainly mathematicians who are usually not very co-operative but internationally acknowledged in their fields. Nevertheless, the Institute has 6-7 main topics, and the adequate units consist of 20 or more researchers. The most important topics are as follows:

- Control theory and its application in nuclear power plant, vehicle control
- Complex systems (e.g., production networks) consisting of autonomous, co-operating units of individual intelligence
- Algorithmic problems of new computers of several thousands of processors
- Cellular wave computing and sensory computing systems, bionics
- Distributed (e.g., grid) computing structures
- The next generations of Internet; semantic WEB, Internet security
- Data mining and information retrieval
- Mathematical research (stochastic systems, financial mathematics, operations research, symbolic computation, combinatorial computer science, graph theory)

The Institute produces yearly more than 300 scientific publications, 8-10 scientific degrees, and organizes 5-6 scientific events.

Competitive advantages and weaknesses of the Institute

To demonstrate the competitive advantages of the Institute one should mention the excellent R&D personnel, taking the internationally acknowledged leading teams, the 7 members of the Academy of Sciences, and the more than 90 researchers with scientific degrees into consideration; together with the numerous young people, referred to earlier. Our colleagues' scientific excellence has been made use of for many years also in applying scientific results into practice on contracts, and in solving technical and administrative problems connected with these activities.

The Institute has a fairly good infrastructure.

The main problem we face is that Hungary provides a small market and it is not easy to find contract partners. Large and medium-sized companies of the industrial, financial and other sectors appear to be multinational. Their R&D demand in Hungary is quite limited, and they prefer co-operating with universities, primarily to find the best young graduates. It is not easy to compete with multinational companies in the field of earnings – we offer more freedom in work, assistance in obtaining a Ph.D. degree. One finds it remarkable that we do not have brain-drain related problems. Consequently, we are interested in all kinds of international cooperation, and I am convinced we are fairly co-operative.

International relations

In accordance with the efforts aiming at the development of the European Research Area, the Institute carries on establishing and operating international virtual institutes and laboratories. After years of preparatory work and research co-operation, the "Fraunhofer-SZTAKI Project Center for Production Management and Informatics" starts operations in 2010, within the framework of the Institute. The establishment of the Central European Grid Consortium, aiming at the harmonization of Grid research and infrastructure developments in Central European countries, was initiated also by the Institute. In the recent past of the Institute R&D co-operation with the Japanese firms RICOH and HITACHI were uniquely successful.

Researchers at the Institute take part in the management and working groups of the most significant international scientific organizations (CIRP, IEEE, IFAC, IFIP, etc). Several of our colleagues are members of Editorial Boards of leading international journals.

MTA SZTAKI has been a member of ERCIM (European Research Consortium for Informatics and Mathematics) for 16 years. The bureau of global WWW Consortium in Europe was taken charge of by ERCIM, and the office of WWW Consortium in Hungary is operated by MTA SZTAKI.

Several researchers of the Institute were invited to assist the formulation of the main trends in the 7th Framework Programme and to participate in the elaboration of the co-operation issues between the EU and the USA (National Science Foundation).

National and international grants

The Institute is active in the field of national, European, and other grants. These projects are important not only as financial support of R&D activities, but as a possibility to co-operate with leading institutions, universities and companies. The international projects help to increase the visibility and reputation of the Institute. At present, we participate in 16 FP7 projects (in 4 projects we are the coordinators). As examples illustrating our important research topics, we refer to some of our running FP7, other international and national projects:

-ADDSAFE: Advanced Fault Diagnosis for Safer Flight Guidance and Control (FP7, 2009-11)
-S-CUBE: Software Services and Systems Network (FP7, 2008-12)
-EGEE-III: Enabling Grids for E-SciencE-III (EGEE-III) (FP7, 2008-10)
-AC/DC Five Days Car project (FP7, 2007-10)
-JUMAS: Judicial Management by Digital Libraries Semantics (FP7, 2008-10)
-RELIAWIND: Reliability-focused research on optimizing wind energy systems design, operation and maintenance (FP7, 2008-11)
-VFF: Holistic, extensible, scalable and standard Virtual Factory (FP7, 2009-12)
-ADVANCE: Advanced predictive-analysis-based deci-

sion-support engine for logistics (FP7, 2010-13)
-EPIKH: Exchange Programme to advance e-Infrastructure Know-How (FP7, 2009-13)
-MEDUSA: Multi sEnsor Data fusion grid for Urban Situational Awareness (European Defence Agency, 2009-11)
-Energy efficiency in large-scale distributed systems (COST, 2009-13)
-EOARD: Switching Systems: Controllability and Design. (Air Force Office of Scientific Research, Air Force Material Command, 2008-09)
-HUNOROB: New technologies for distance programming of robots in 3-dimensional environment (Norwegian-Hungarian Fund, 2009-11)
-TRUCKDAS: Innovation of distributed driver assistance systems for a commercial vehicles platform (National grant, 2009-11)
-TEXTREND: Intelligent application platform for text mining (National grant, 2008-10)
-Supporting new generation WEB services and applications by secure, business-oriented GRID platform (National Grant, 2009-11)
-EJJT: Advanced Vehicles and Vehicle Control Knowledge Center (National grant, 2005-…)

Future Goals

We must take part in important European projects, must join the European research communities companies. All this needs competitive experimental background, better demonstrative ability and visibility. In connection with these needs, this year an up-to-date 3D virtual environment will be realized where from 2011 primarily robot-control-compositional tasks can be performed (this is where robots, for example in Japan or Norway, can be programmed – tested). The theme is backed by an extensive international co-operation. In parallel, a control experimental laboratory will be set up for demonstrating robust, fault-tolerance control algorithms of robot vehicles and UAVs (unmanned aerial vehicles). As we find, this can be a ground for European co-operation (concretely, joining the ESA projects and a common Bosch laboratory).

The major disciplines of the Institute, such as control theory, the special applications of cellular kilo-processors computers, the modern approach to production management and information sciences, computer-networks and their WEB instruments, certain mathematical disciplines will remain constant. We intend to co-operate in biological spheres (info-bionics), in the field of medical applications (we have pilot models in optical surgery, knee prosthesis), in the application of nano-electronics products (MEMs, sensors, actuators).

We intent to increase our activity in the field of 4th generation Internet, and also in semantic search, multimedia search, safety, WEB and in similar fields.

In the field of production control, the established Fraunhofer-SZTAKI Project Center on Production Management and Informatics will, as we expect, serve for new R&D results and applications. ∎

Instytut Maszyn Matematycznych (Computer Science Institute, Warsaw – www.imm.org.pl)

by Marek Holynski

Marek Hołynski is Director of the Computer Science Institute in Warsaw, President of the Polish Information Processing Society and representative to IT STAR. After graduating from the Warsaw Institute of Technology in 1975 he received his Ph.D. at the Polish Academy of Sciences. In 1981-89 he was professor at Boston University and research fellow at the Massachusetts Institute of Technology (MIT). Then he worked in Silicon Valley, designing computer graphics workstations (Indigo, Indy and O2) used for animation, special effects and TV/film postproduction.

The Institute of Mathematical Machines (IMM) is a Warsaw based research and development institute. As a public sector institution it is responsible for the development of innovative ICT technologies, their application and dissemination. These technologies include biometric devices and security systems, modeling and simulation, e-learning systems and services, documents management systems, electronic signature, knowledge bases development and some others. IMM also offers specialized professional training and European Computer Driving Licence (ECDL) courses.

IMM was established in 1957 as an independent unit of the Polish Academy of Sciences. The word „computer" did not exist in the Polish language at that time, therefore in its name the expression „mathematical machines" was used and we still keep it due to respect for tradition (even though occasionally we have to explain to the youth what „mathematical machines" are). The Institute was responsible for designing, experimental production and implementation of the first Polish computers XYZ (1958) and ZAM-2 *[an article on the first Polish computers was published in Vol.6, no.3, Autumn 2008 of the NL – Editor],* intended as tools for scientific and technical calculations. A number of pioneering achievements in the field of programming (i.e. the SAKO language) was also developed here and through this IMM became instrumental in the creation of the Polish computer industry.

For the next three decades the Institute continued to design and produce more and more advanced computers: ZAM-41, the first Polish personal computer MOMIK 8b, office minicomputers of the MERA-300 series, personal computer MAZOVIA 1016, minicomputers K-202 and MERA-400. Some of them are still in operational use! IMM also introduced many peripheral devices (ex. magnetic tape memories PT-2 and PT-3, line printers DW-3 and DW-21, drum memories PB-5 and PB-7), memories on thin magnetic layers (wires), and measurement devices for the electronics industry. During this period two IMM's branches in the cities of Katowice and Torun were established.

In the 90's, after the collapse of communism, our country experienced system, political and social changes, which at first led to a breakdown of production and export to the countries of the former Soviet bloc. The Institute underwent serious restructuring. The end of centralized research programs resulted in the lack of funds necessary for maintaining a large number of employees. Moreover, Western embargo was lifted, and a wide variety of computer hardware and software became available in every electronics store – there were no longer needs for designing and manufacturing our own computers.

Thus, we decided to abandon production and turned the production unit into offices for rent – the IMM Office Center, which provided us with financial resources to continue research and development work. This translated into designing new modules of the measurement systems, access control, time and attendance systems, biometric and proximity readers, digital optoelectronic devices. As a result of previously conducted research in e-learning, we developed our own TeleEdu technology, offering e-courses creation and became partner in EC learning initiatives. Within the framework of the Leonardo da Vinci program, for instance, we have developed innovative, low-cost e-learning technology for creating, conducting, tracing and reporting electronic courses and tests, as well as their implementation and distribution.

IMM now operates under the auspices of the Ministry of Economy and about 15% of our budget comes from that source. Therefore, we are obligated to conduct projects that are important for state administration, like systems supporting operation of the departments of central state administration or security issues.

The major part of our income comes from large EU sponsored e-learning projects, programming and hardware tools for biometric technology used in person identification and attendance registration, developing websites and intranet systems supporting information resources management and group communication. Our market offer also includes document management systems, project management systems and customer relationship management systems.

Not all our development priorities are strictly market oriented. Some of them, like programming of bomb disarming robots, have very limited application. Others are important for general social reasons. This is why we maintain programs supporting ICT entrepreneurship, hosting at our premises technology transfer groups and start-up incubators.

One of our main goals here, at the Institute, is putting ICT research and development results to practical use, therefore, we pay a lot of attention to disseminate them through conferences, seminars and IMM's publishing activity. IMM publishes monthly newsletter "Techniki komputerowe" (on ICT technologies) and twice a year "Prace IMM" (research papers). In 2009 28 papers were published in external periodicals.

There are about 100 people working at the Institute - some 25% researchers (1/3 of which with Ph.D.), 30% technical support, 30% administration and 15% maintenance. ∎

Institute of Computer Science, Academy of Sciences of the Czech Republic – www.cs.cas.cz

by Julius Stuller

After graduating in Mathematical Engineering, Julius Stuller received his CSc. (~PhD) in Computer Sciences from the Czechoslovak Academy of Sciences, Institute of Computer Science (ICS). He was Associate Professor at the Faculty of Sciences and National School for Engineers, Monastir, Tunisia. Since 2000, Julius is the ICS deputy director for research.

The Institute was established on **July 1, 1975** as a *General Computing Center* (GCC) of the *Czechoslovak Academy of Sciences* (CAS). On **November 1, 1980** it was transformed into a *scientific institute* of the Czechoslovak Academy of Sciences. Since **January 1, 1993** it is called the *Institute of Computer Science* (ICS) of the Academy of Sciences of the Czech Republic. On **January 1, 2007** the Institute became a *public research organization*.

The **ultimate strategic goal** is the *transformation of the Institute into a renowned research center of excellence in Computer Science*. Its **long-term mission** is to perform *frontier research* (a leading research activity that co-determines world trends in development and applications) in Computer Science and to *transfer* the respective *new knowledge to society* in general and to *scientific community*, *students* and *application areas* in particular.

The Institute's **long-term research plan** is naturally focused on certain specific domains reflecting the *strength of the institute's research staff.*

In its research - in the selected areas of Computer Science - the Institute focuses mainly upon the problems inspired by current and emerging computing technologies and on the needs of the discipline and of society. The emphasis is both on identifying and harnessing of new approaches to computing (such as nature-inspired ones) and reasoning, on their creative applications and on strengthening of existing classical methods.

The institute's **research objectives** consist of *two basic* and *two interdisciplinary* research streams:

- **Basic research streams**
  - *Mathematical and logical foundations of computer science*
  - *Scientific computing and mathematical Modeling*

- **Interdisciplinary research streams**
  - *Neurocomputing and Modeling of complex processes*
  - *Medical informatics.*

Its **theoretical activities** concentrate in particular on basic research in *computational mathematics*, *computational complexity theory, computational intelligence, computational statistics, computational learning theory, computational logic* and *cryptography*. The institute's **interdisciplinary and application oriented research** aims at *non-linear modelling* and *prediction, environmental informatics*, *medical informatics, neuro-* and *bioinformatics*.

Closely related activities transfer and disseminate the respective knowledge and experience to the society, in the widest sense of this word. These activities include:

- *Application of the research* know-how for the benefits of the emerging Information and Knowledge Society, especially in selected interdisciplinary areas, such as health care and services, environmental protection, biomechanics, geomechanics, business, industry, etc.
- *Active and extensive participation in Ph.D. education* in the above mentioned research fields.
- *Wide international cooperation*, organization of scientific events and scientific mobility.

Applications are sought primarily in the fields of *environmental protection, meteorology, medicine* and *health care*, *biology, cognitive sciences, earth sciences,* and *web technologies*. In all these fields the Institute strives *to contribute to and to participate in the formation of the contemporary research trends*.

The general common denominator of the Institute's research goals is the investigation, development and application of those computing paradigms whose use can lead to a new quality in using the current and future emerging computing technologies. Simultaneously, the ICS aims at the transfer of the respective knowledge into the practice of computing and at the acceleration of this process. Last but not least, the Institute's ambition has also been a transfer of its know-how into university education.

Currently, there are 144 persons working at the Institute – 83 researchers and 19 PhD students, 15 technical support and 27 administrative staff. In 2009, 53% of the financing came centrally from the Academy, 35% from grant agencies and 12% from the private sector. ICS is at present participating in 2 FP 7 projects and publishes 1 Journal in English, "Neural Network World" (ISSN 1210-0552).

Research Departments

Department of Theoretical Computer Science

Computational complexity: Research in computational complexity follows several directions such as design and complexity analysis of efficient sequential, parallel, and distributed computational models, complexity of Boolean functions, cognitive computing, computational learning theory, and cryptography. Recently, J. Wiedermann, in cooperation with van Leeuwen (Utrecht University, NL), inspired by contemporary computational systems (Internet) and by processes of biological evolution have opened a new research field by investigating models of interactive evolutionary computing and their possible super-Turing computational potential.

Logics of approximate reasoning, fuzzy logic, theory of belief functions: The well-known school of **mathematical logic**, centered around P. Hajek, focuses on fundamental research in the set theory and in the field of mathematical models and theories of reasoning in the presence of uncertainty, randomness and vagueness. The school is developing alternatives to classical logic and probability theory such as mathematical fuzzy logic as a symbolic logical system, analysis of the theory of belief functions and new conceptions of possibility theory. The school shapes and co-determinates the research trends at the international scale

Mathematical theory of neural networks: Mathematical foundations of neural network models are studied along two main lines: nonlinear approximation theory and computational complexity. Research along the former direction represented by works of V. Kurkova is focused on high-dimensional approximation by neural networks, learning from data as an optimization problem, new types of architectures and learning algorithms among others. Along the latter direction the capabilities of neural networks for general computation are investigated in order to find out what is, either ultimately or efficiently, computable by particular models. J. Sima achieved significant results in looking for new sources of efficient computation such as analogue states, continuous time, temporal coding, non-uniform architectures, etc.

Machine learning, data mining: Research in this area follows several directions. One of them is the extraction of logical rules from data, nowadays the main stream of data mining. The effort concentrates on further elaboration of the GUHA method, one of the oldest data mining methods, based on a combination of logic and statistics, as well as on rule extraction by means of decision trees and by means of artificial neural networks. Another direction of research concentrates on decision trees and decision forests from the point of view of classifier construction.

The department runs the seminar HORA INFORMATICAE (founded in 1993) devoted to theoretical computer science.

Department of Computational Methods

The department consists of several groups working in different but closely related fields:

Numerical linear algebra and matrix theory: The research effort in this group recently focuses on the analysis and implementation of scalable algorithms for solving extremely large generally sparse linear algebraic systems including preconditioning and implementation on parallel computer systems (M. Tuma, M. Rozloznik). A special attention is paid to the theory of convergence and numerical behavior of Krylov subspace methods (Z. Strakos, M. Rozloznik, P. Tichy), mathematical foundations and numerical methods in error-invariables modeling (Z. Strakos). Members of the research team also study mathematical properties of special matrices (M. Fiedler), theoretical and computational aspects of

problems with interval data and verification (J. Rohn, S. Ratschan).

Numerical methods for optimization, nonlinear programming and mathematical modeling: This research is oriented towards computational methods for solving no smooth large scale systems of nonlinear equations, which are applied to nonlinear complementarity problems and variational inequalities as well as efficient globally convergent variable metric methods for no smooth optimization and large scale nonlinear programming. Sequential quadratic programming and interior point methods are also investigated and implemented. As an accompanying activity, a large software system for universal functional optimization UFO is being developed (L. Luksan, J. Vlcek, and C. Matonoha).

The focus in mathematical modeling is on contact problems with friction in elasticity and thermo elasticity. Theoretical results are applied in several important areas in mechanics, geomechanics and technology (J. Nedoma, I. Hlavacek), and hybrid systems (S. Ratschan).

In addition to theoretical research the department is involved in important applications. Among them, the project on remediation of environmental problems caused by the chemical mining of uranium in Straz pod Ralskem represents a typical example.

The department runs the Computational Mathematics Seminar (founded in 1992) and organizes a series of international conferences.

Department of Nonlinear Modelling

The research activities of the department are mainly focused on the domains of modeling of complex systems and artificial neural network applications.

Modelling of complex systems: A system for weather and air quality prediction is extensively developed. The results are available for the general public on the internet under the acronym MEDARD (Meteorological and Environmental Data Assimilating system for Regional Domains).

Methods for identification and quantifying of synchronization phenomena in complex time series are studied. The developer approaches are applied in detection of cardio respiratory interactions with EEG brain signals and in analyzing the geophysical data.

Mathematical modeling of natural gas consumption is another area where the knowledge of modeling complex systems can be successfully utilized. The research team cooperates with Czech Gas Union, Czech Energy Regulatory Office and with several gas distribution companies in the Czech and Slovak Republics. The tasks to be solved include natural gas consumption prediction, load profiles modeling and risk management.

Neural networks applications: The applications of artificial neural networks cover many different areas including pattern recognition in the high-energy physics, statistical

analysis of large data sets, prosody control part of text-to-speech synthesizer, time series prediction and the dimensionality reduction problem. The research is focused to developing special types of neural networks (e.g. GMDH neural net and NNSU – neural net with switching units), construction of optimal neural network structures and optimal learning algorithms. The research team cooperates, for example, with CERN in Geneva, Institute of Nuclear Physics in Krakow, etc.

Department of Medical Informatics

Department activities belong to interdisciplinary and translational research in the fields of informatics and biomedical sciences.

Electronic health record, medical databases and health information systems: Research is focused on various approaches to data collection and on medical health data representation using new information technologies. Specific problems connected with medical questionnaires, data registers, electronic health records, semantic interoperability and medical databases are studied. Special attention is given to the multilingual electronic health record in cardiology and dentistry and to advanced user-friendly interfaces. Interoperability for continual shared healthcare based on HL7 and other international and national standards and nomenclatures is studied.

Electronic medical guidelines and biomedical knowledge bases: Research focuses mainly on formalization and structuring of free-text guidelines and systematic approach to their classification.

Biomedical statistics and data mining: The main attention is paid to research using advanced statistical methods for high-dimensional genetic data.

Information technology in education and training: The department is strongly involved in Ph.D. studies in the field of biomedical informatics that are under the auspices of Charles University in Prague and Academy of Sciences of the Czech Republic. The 1st International Summer School of Biomedical Informatics was organized by the department in July 2008. ∎

IPTS – 2010 Report on R&D in ICT in the EU

by Marc Bogdanowicz

Action Leader, The role of the ICT Industry in the evolving Knowledge Economy, IPTS Information Society Unit.

The Institute of Prospective Technological Studies of the European Commission has issued its latest "*2010 Report on R&D in ICT in the European union*"[4]. This report provides an analysis of R&D investments in the EU Information and Communication Technology (ICT) sector.

The 2010 Report includes data up to 2007, and, this being the third report of a series published annually, it now covers the period of ICT sector growth that took place between two important financial events: the 'dot.com' crisis and the current financial and economic crisis. This multiannual analysis confirms the consistency of the data over time and offers a privileged view of the major ICT R&D trends across those years (2002 – 2007).

The main observations of the report are the following:
- Worldwide, the ICT industry maintains its position as the leading R&D investing sector, due to its dynamism, its innovative capacity and the fact that it supplies general purpose technology to the rest of the economy.
- Europe has been, and is still, lagging behind its main competitors in terms of ICT R&D investment and ICT R&D patenting.
- This lag is largely due to the size of European ICT companies. For example, as compared with US ICT companies, EU ICT companies are smaller and did not grow as fast in the last decades. This is a particular weakness in the most promising segments, for example in the Computer Services and Software ICT sub-sector, where European Internet companies have failed so far to achieve a truly global scale.
- Europe is an important location for foreign ICT R&D investment, but international cooperation in R&D is evolving from a dominant EU-US relation to global networking where the US-Asia relation is taking a growing share. Here also, it seems that US companies are able to grasp opportunities more rapidly than European ones.

Interregional comparisons

The US, Japan, Taiwan and Korea are investing significantly more in ICT R&D than the EU (when comparing ICT R&D over GDP ratios). Although the EU and the US have roughly equivalent GDPs, the US levels of both business ICT R&D expenditure (ICT BERD) and public ICT R&D funding (ICT GBAORD) are double those of the EU.

In terms of R&D invested in ICT sub-sectors for the period 2004 to 2007, analysis of ICT companies data shows that R&D investments by EU companies have been growing –in some cases strongly- in all ICT sub-sectors. However, at the same time, the data also shows that US companies clearly outperform EU companies in several ICT sub-sectors that are key to the competitiveness of the EU industry, notably again Computer Services and Software.

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[4] The research and analysis was carried out by the Information Society Unit at the Institute for Prospective Technological Studies (IPTS), one of the seven research institutes of the European Commission's Joint Research Centre (JRC). This work was carried out in the context of the project "Prospective insights on R&D in ICT" (PREDICT), a research project co-financed by JRC-IPTS and the Information Society & Media Directorate General of the European Commission.
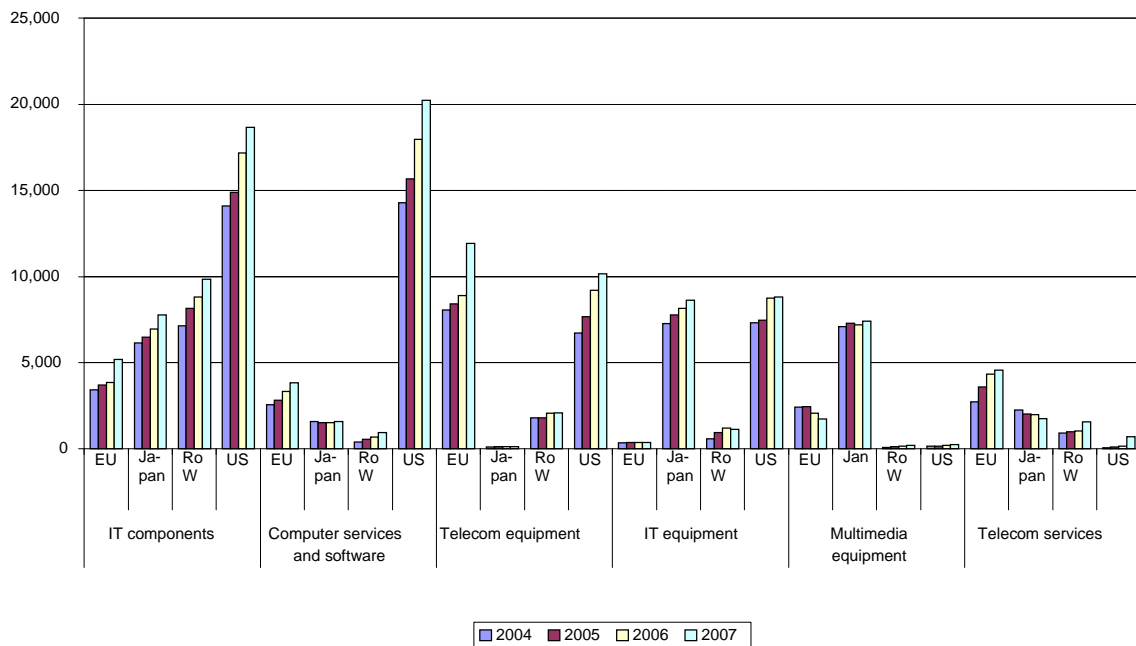
R&D investments in the ICT sub-sectors by EU, Japanese, US and Rest of the World (RoW). Source: ICT Scoreboard companies, 2004-2007 (€ million)

A further example of EU weaknesses in growing markets is that in the Internet industry, where companies like Google or Yahoo are dominant; in that segment, no EU company had invested sufficiently in R&D in 2007 in order to make it to the top 1000 listing.

Member States comparisons

The EU's three largest economies (Germany, France and the UK) and to some extent the next two (Italy and Spain) set the average EU trend. In 2007, Germany, France, the UK, Italy and Spain accounted for more than 70% of total ICT sector value added and 2/3 of its employment. These five countries together contribute more than 2/3 of EU ICT BERD, and they generate more than 75% of all ICT patents (Germany generates almost 45% of these).

Finland and Sweden invest the largest amount in ICT BERD in relation to their GDP (above the US level). Finland, Germany, the Netherlands and Sweden are the only Member States with ratios of ICT patent applications in relation to GDP either above or close to the US ratio. Finland and the Netherlands have the highest specialisation in ICT patenting.

In spite of strong ICT BERD increase the new EU Member States still have very low ICT BERD in relation to their GDP. Although several new Member States, such as Hungary, the Czech Republic and Poland recorded spectacular increases in ICT manufacturing employment, analysis shows that these countries are still hosting rather low value added activities.

Internationalisation of ICT R&D

ICT R&D is an international endeavour that is increasingly widely distributed. Analyses of a combination of indicators (global distribution of corporate R&D sites of major ICT companies and international patents in ICT technologies) show that the EU remains an important location for ICT R&D – for both EU and non-EU companies - but it is also noted that Asia is gaining importance in this respect.
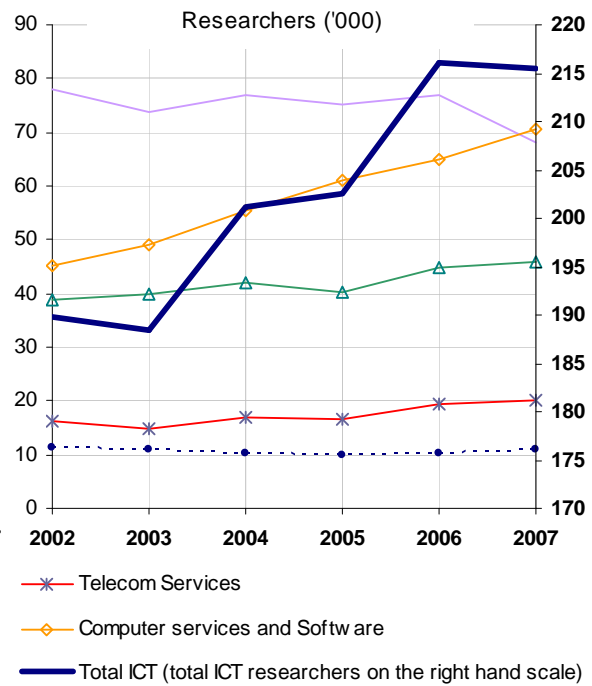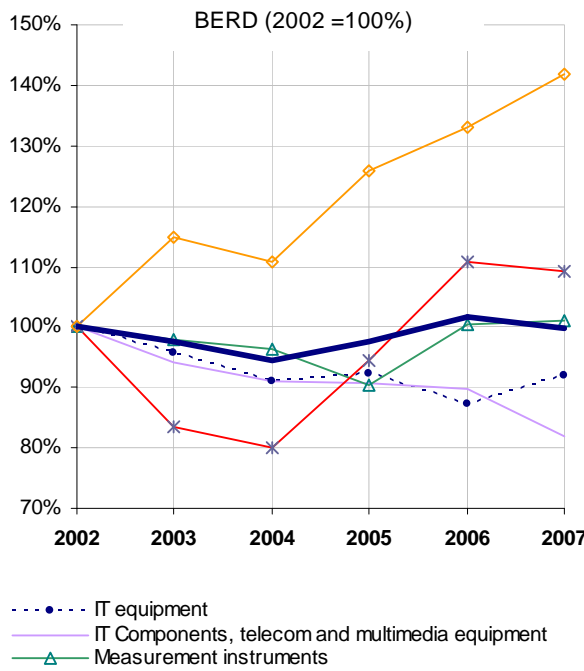
International patent analysis also indicates that US companies have taken a 'first mover' advantage in developing ICT R&D collaborations with Asia. For example the share of the ICT inventions developed in Asia owned by US patent applicants grew from almost zero in the early 1990's to 1.5% in 2006, while the share owned by EU patent applicants merely started growing in the mid 1990's and reached only 0.5% in 2006. Estimated by analysing priority patents applications filed in 2006 to all European national patent offices, the EPO and the USPTO.

The growing importance of ICT services, and in particular of the Computer Services and Software sub-sector

In 2007, total ICT sector employment exceeded for the first time its previous peak level of 2001. It therefore took six years for total ICT sector employment to recover from the effects of the dot.com crisis, with an important redistribution of jobs from ICT manufacturing to ICT services sub-sectors.

From 1999 to 2007, employment increased by 27% in ICT services sub-sectors while it decreased by 10% in ICT manufacturing sub-sectors. This brought the share of ICT services employment to 68% of the total ICT sector. In 2007, the Computer Services and Software sub-sector alone accounted for half the total ICT employment in Europe.

A similar structural shift occurred for ICT value added with a steady increase of the share of the ICT services sub-sectors' value added. ICT Services accounted for more than 75% of total ICT value added in 2007, with the Com-

BERD (2002 =100%)

Legend:
- ····•···· IT equipment
- —— IT Components, telecom and multimedia equipment
- —△— Measurement instruments

Researchers ('000)

Legend:
- —✳— Telecom Services
- —◇— Computer services and Softw are
- —— Total ICT (total ICT researchers on the right hand scale)

puter Services and Software sub-sector alone producing 42% of the ICT sector value added.

The Computer Services and Software sub-sector is also the only EU ICT sub-sector with a strong and sustained increase in both BERD and employment of researchers: from 2002 to 2007, its BERD increased by 40% (see orange line in Figure 1, left) and employment of researchers by 56%. In 2007, the Computer Services and Software sub-sector became for the first time the leading ICT sub-sector in terms of employment of researchers (see orange line in Figure, right).

All such essential observations about the structure of the industry, its dynamics and its R&D are further detailed within the Report scheduled for publication in early June 2010 at http://ipts.jrc.ec.europa.eu/publications/index.cfm.

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MS News

Slovakia

37th International Conference on Current Trends in Theory and Practice of Computer Science, Hotel Atrium, Novy Smokovec, Slovakia, January 22-28, 2011

Tracks:
- Foundations of Computer Science
- Software, Systems, and Services
- Processing Large Data Sets
- Security and Trust

Organized in cooperation with the Czech Society for Cybernetics and Informatics - check www.sofsem.sk

Italy

AICA Congress 2010, 29 September - 1 October, L'Aquila
Check http://aica2010.univaq.it ∎

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1st ANNOUNCEMENT AND CALL FOR CONTRIBUTIONS

5th IT STAR Workshop on **eBusiness**
12 November 2010, Zagreb, Croatia

Host Society: Croatian Information Technology Society **–** www.hiz.hr

This one-day event will gather representatives of academia, government, industry and international organizations with the Mission to investigate the current state, problems and challenges in Central, Eastern and Southern Europe with respect to eBusiness, and to identify best practices and key issues of common interest and concern.

Program

The WS will investigate the state, problems and challenges within the following topical areas:

- Innovation in business processes
- Maximizing the impact of e-Business in a period of crisis
- Legal framework and security issues
- e-Signature & e-Identity
- e-Invoicing, e-Procurement
- e-Skills
- Technological Inter-operability
- Networked economy
- Obstacles to eBusiness

Participation

A maximum of 60 participants will attend this high-profile event. Each IT STAR member society is entitled to designate 2 participants from the respective country. The rest will attend by invitation on the basis of submitted and accepted proposals for papers and presentations.
.
Registration fee: No conference registration fees will be collected.

Important Dates

- **15 July** deadline for submitting abstracts to Plamen Nedkov <nedkov@utanet.at>
- **1 August** – confirmation of acceptance
- **1 October –** Full papers (max 6,000 words) due

A maximum of 16 papers will be selected for presentation at the Workshop. The edited papers and presentations will be published as a post-conference book.

Please visit www.itstar.eu for further information on IT STAR and its WS series.

Type of organization

Regional non-governmental and non-profit professional association in the ICT field.

Date and place of establishment

18 April **2001**, Portoroz, Slovenia

Membership

Countries represented (*see next page for societies*), year of accession, representatives

- Austria (2001) V. Risak, G. Kotsis
- Bulgaria (2003) K. Boyanov
- Croatia (2002) M. Frkovic, M. Glasenhart
- Cyprus (2009) P. Masouras
- Czech Republic (2001) O. Stepankova, J. Stuller
- Greece (2003) S. Katsikas
- Hungary (2001) B. Domolki
- Italy (2001) G. Occhini
- Lithuania (2003) E. Telesius
- Macedonia (2003) P. Indovski
- Poland (2007) M. Holynski
- Romania (2003) V. Baltac
- Serbia (2003) G. Dukic
- Slovakia (2001) I. Privara, B. Rovan
- Slovenia (2001) N. Schlamberger

Statutes

IT STAR Charter http://www.starbus.org/download/charter.pdf adopted on 23 October 2004 by the IT STAR Business Meeting in Prague, the Czech Republic.

Mission

"To be the leading regional information and communication technology organization in Central, Eastern and Southern Europe which promotes, assists and increases the activities of its members and encourages and promotes regional and international cooperation for the benefit of its constituency, the region and the international ICT community."

Governance

IT STAR is governed according to the letter of its Charter by the **Business Meeting** of MS representatives:

2009   Rome, **Italy** (November)

2008	Godollo, **Hungary** (November)
2007	Genzano di Roma, **Italy** (May)
	Timisoara, **Romania** (October)
2006	Ljubljana, **Slovenia** (May)
	Bratislava, **Slovakia** (November)
2005	Herceg Novi, **Serbia & Montenegro** (June)
	Vienna, **Austria** (November)
2004	Chioggia, **Italy** (May)
	Prague, **the Czech Republic** (October)
2003	Opatija, **Croatia** (June)
	Budapest, **Hungary** (October)
2002	Portoroz, **Slovenia** (April)
	Bratislava, **Slovakia** (November)
2001	Portoroz, **Slovenia** (April)
	Como, **Italy** (September)

Coordinators

2006 –	Giulio Occhini
2003 – 2006	Niko Schlamberger
2001 – 2003	Plamen Nedkov
	(currently Chief Executive)

Major Activities

- 4th IT STAR WS and publication on Skills Education and Certification - http://starbus.org/ws4/ws4.htm
- 3rd IT STAR WS and publication on National Information Society Experiences – NISE 08 http://www.starbus.org/ws3/ws3.htm
- 2nd IT STAR WS and publication on Universities and the ICT Industry http://www.starbus.org/r_d_ws2/r_d_ws2.htm
- 1st IT STAR WS and publication on R&D in ICT http://www.starbus.org/r_d_ws1/r_d_ws1.htm
- IT Professional Pool Database (in progress)
- Workshop and publication on National Experiences related to the EU's 5th and 6th FP http://www.starbus.org/download/supplement.pdf
- Joint IT STAR – FISTERA Workshop on ICT and the Eastern European Dimension http://fistera.jrc.es/pages/roadshows/prague%2004/FINAL%20REPORTrevised.pdf
- Support to Member Society initiatives and events

Periodicals

The IT STAR Newsletter (nl.starbus.org) published quarterly.

Web-site

www.itstar.eu   ■

IT STAR Member Societies

Austrian Computer Society – OCG Wollzeile 1-3, A-1010 VIENNA, Austria Tel. +43 1 512 0235 Fax +43 1 512 02359 e-mail: ocg@ocg.at www.ocg.at	**Bulgarian Academy of Sciences – BAS** Institute for Parallel Processing Acad.G.Bonchev str.Bl.25A SOFIA 1113, Bulgaria Tel +359 2 8708494 Fax +359 2 8707273 e-mail: boyanov@acad.bg www.bas.bg
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