

PERSPECTIVES OF INTELLIGENT AGENT R&D FOR ORGANISATIONAL MANAGEMENT AND TEACHING IN EASTERN EUROPE

It is very important for us living at the fall of the Millennium and looking optimistically forward to the future to correctly understand and extrapolate the tendencies of humankind development, to find our own niche and to professionally contribute to this development. Diverse usage of information technologies, formation of Information Society on the Planet, intense integration processes in most humanitarian, technological, scientific areas, globalisation of information interchange form the basics which makes intelligent agent r&d highly relevant. Practical application of the results of our research may drastically facilitate to world integration processes and add mobility to human society.

Integration processes today assume world-wide proportions irrespectively of social structure, readiness or indisposition of country authorities, state of political or economical relationships. As for me, I have pleasure to look through Slovenian magazine INFORMATICA. (An Intern. Journal of Computing and Informatics, Ljubljana, Slovenia) irrespectively of the reason why NATO bombers do the job in Yugoslavia. Moreover, research facilitating to the creation of Information Society indirectly influences to increase the level of security, of democracy and, therefore, of amenity in political and economical spheres (I do continue reading INFORMATICA as well as TIME magazine while they are bombing).

As far as we represent the very part of the word, being from time to time the pain in the ass for the EC in particular and for the whole world, our internal view on possible perspectives of practical utilisation of intellectual agent r&d for stimulation of East-West integration processes might be interesting to the audience.

We'll start with the problems which break down the development and economic growth in the countries of ex-USSR, we'll give the survey of the EC programs already working for the countries of this region and finally formulate the proposal for co-operation in intelligent agent research and development and our opinion on possible application and dissemination of the results.

1. The problems we have in university education, organisational management and governance in NIS countries as well as in Eastern Europe

The problems we have here in NIS and former socialist part of Europe are originated mainly by principal differences between communism and democracy and ineffectiveness of socialist way of rule and economy building. The major of them are:

1.1. The legacy of the glorious past (well established traditions from one side and command style with its consequences from the other).

From one hand, the expertise of former Soviet scientific schools and Universities, their well established traditions both in research and teaching are well known and proved to be effective and result oriented. From the other - command style and methods of governance and management under socialism forced our science and education to loose flexibility and initiative. The management procedures, the process of funds distribution, are pretty bureaucratic. The officials who take decisions on project or teaching curricula evaluation often judge not by professional quality, but by their personal interest. The consequences are:

- Once command press is soften - the quality of teaching and research goes down.
- Once a researcher has no opportunities to do his research - he looks for some other surroundings.
- Once a student sees no perspectives in receiving education of such a quality or in making scientific career - he doesn't study and goes to some other ways of making quick and easy money.

1.2. The lack of stability.

NIS countries (as well as the former socialist countries of Eastern Europe) are in the process of transition from socialism to capitalism. The times and the events the West suffered from on its early stages of development in the past are afloat here and now. The process of reconstruction often hits drastically major spheres of life and puts the order of things up side down. It causes instability and incertitude for those who run business or manage an enterprise or have investment plans. The consequences are:

- National authorities are unpredictable, national and regional budget figures are red, economical and fiscal policy is very hard, black economy sector is growing.
- Education, Science, Culture are not sufficiently financed and decline. Only those survive, who have reorganised their own enterprise to be economically effective in unstable markets.

1.3. Low living standards, low level of motivation.

Due to the communist background the living standards in these countries are still very low and the difference between neuvough russe and the average is very big. The average salary for teaching staff at a Ukrainian university for instance is roughly about USD 600 - 960 per year - completely insufficient for living. The consequences are:

- The motivation to do the job with appropriate quality is very low. In case somebody really does something - his salary is not the primary point of stimulation. Those, who teach, do it just due to the tradition and the feeling of self-respect. Those, who do research, work for their own interest and possible future perspectives: professional growth, recognition, possible contracts.
- People are seeking for some extra jobs giving some profit for living. When a person works at several places his primary goal is not to do the job with the best of his knowledge and skills, but just to finish it as quick as possible. The results are often unacceptable due to bad quality.

1.4. The opportunities.

Judging by 1.1 - 1.3. - the situation is quite grim. Your first impression on any prospects of joint work with this part of the world may be denoted by one word "NEVER". It is really wise. Wall street analysts wrote in one of the surveys 2 years before that investments to NIS countries are of extremely high risk and admonished of making investments to NIS economy for the period of at least 15-20 years.

From the other hand there are some opportunities we have here. It's funny but these opportunities are originated by the same reasons as our numerous grave problems:

- **Opportunity No 1** lies in the fact that those businesses, establishments, enterprises that succeeded in making themselves working and growing, have gained experience of great value. They know the formula of being successful in unstable and aggressive surroundings and have used this prescription to themselves.
- **Opportunity No 2** is implied from the low technological level in our Universe-of-Discourse. It might be clear that those sitting on palms and eating bananas are lots more mobile to try new technologies than the guys wearing Rolexes and performing financial transactions via home banking facilities. Seriously speaking it means that it is easy in the environment with embryonic digital infrastructure and information flows to reason decision takers into testing and accepting new information technologies as far as they had nothing before and feel themselves very mobile.
- **Opportunity No 3** is that there is no alternative to the process of East - West Integration. The process is already supported by EC and those who are the first get most profits.

Thus, the advantages we have are specific experience, flexibility and mobility as well as no alternatives to start working.

We'll see the pioneers in Section 2.

2. EC programs (FP5) admitting NIS (+Eastern European +Non EU) countries participation

Categories of East European countries by participation opportunities are presented in Table 1.

2.1. Programs with EU financing for NIS

For the moment there are only two EC programs financing the teams from NIS countries - Tempus TACIS and INTAS.

2.1.1. Tempus TACIS (source: <http://www.etf.eu.int>)

The Tacis Programme supports the process of transformation to market economies and democratic societies in the New Independent States and Mongolia. Within this framework, the Tempus Tacis objective is to promote the development of the higher education systems in these partner countries.

Tempus Tacis does this by providing financing to encourage interaction and balanced co-operation between higher education institutions in the partner countries and the European Union.

Within the context of higher education co-operation, Tempus Tacis seeks to address specifically:

- issues of curriculum development and renewal in priority areas;
- the reform of higher education structures and institutions and their management;
- the development of skill-related training to address specific higher and advanced level skill shortages during economic reform, in particular through improved and extended links with industry.

Project applications to the Tempus Tacis Programme must fall under the priority subject areas specific to the partner country concerned. They are set by the national authorities of the partner country and the European Commission so as to ensure that the priorities are in line with the overall Tacis objectives and the national strategy for higher education development and that complement other European Union activities in the partner country.

Table 1. Categories of East European countries by the participation opportunities in FP5 programmes

OPPORTUNITIES FOR ORGANISATIONS FROM NON E U COUNTRIES to participate in the Fifth Framework Programme of the European Community for RTD 1998-2002 (FP5) (Excluding Nuclear Programmes)		
04/09/98		
ASSOCIATED STATES = may participate WITH COMMUNITY FUNDING once the Association Agreement is in force	CANDIDATES FOR EU-MEMBERSHIP	BULGARIA, CYPRUS, CZECH REPUBLIC, ESTONIA, HUNGARY, LATVIA, LITHUANIA, POLAND, ROMANIA, SLOVAKIA, SLOVENIA : - Mandate to negotiate Association Agreements requested from Council. The Agreements are expected to enter into force in time for FP5.
	EEA – EFTA	ICELAND, LIECHTENSTEIN, NORWAY: as above.
	OTHERS	ISRAEL: the negotiations of the Association Agreement have been finalised. SWITZERLAND: has asked to become associated to FP5. - Before entry into force of the Association Agreements, all above countries may participate project by project on a self - financing basis.
PROJECT BY PROJECT PARTICIPATION in conformity with the interests of the Community = WITHOUT COMMUNITY FUNDING (exceptionally with Community financing if financing is duly justified as being essential for achieving the objectives of the project)	OTHER EUROPEAN	ALBANIA, BOSNIA-HERZEGOVINA, FORMER YUGOSLAV REPUBLIC OF MACEDONIA (as well as candidate states, EEA-EFTA and Switzerland before Association Agreements are in force.) MALTA and TURKEY are also shown under Mediterranean Partnership. MICROSTATES AND TERRITORIES IN EUROPE.
	EUROPEAN NIS	ARMENIA, AZERBAIJAN, BELARUS, GEORGIA, MOLDOVA, RUSSIA, UKRAINE.
	MEDITERRANEAN PARTNERSHIP	ALGERIA, CYPRUS, EGYPT, ISRAEL, JORDAN, LEBANON, MALTA, MOROCCO, PALESTINE AUTHORITY, SYRIA, TUNISIA, TURKEY. - All above countries may participate project by project on a self - financing basis.
	COUNTRIES WITH COOPERATION AGREEMENT	AUSTRALIA, CANADA: Negotiations under way (first activity FP5). USA: Agreement expected to enter into force late 1998 (first activity FP5). ARGENTINA : mandate to negotiate an Agreement to be requested from Council SOUTH AFRICA: Agreement in force (FP5). CHINA, RUSSIA: Negotiations under way (probably first activity FP5) - The above countries may participate project by project on a self financing basis in the fields covered by the agreement once the agreement is in force (Russia as European NIS already before, the others as «any country»).
	ANY COUNTRY	- May participate project by project on a self financing basis only if its participation is also of substantial added value for implementing all or part of the specific programmes in accordance with the objectives of the programme.
	INTERNATIONAL ORGANISATIONS	- May participate project by project on a self - financing basis.
	CONSORTIUM COMPOSITION	A project is to be carried out by at least two legal entities from different Member States or from at least one Member State and one associated State (or by at least one of these and the Joint Research Centre). Participation from third States and of International Organisations must take place together with the minimum number of legal entities from the Community and any associated states.

The areas of priority for UKRAINE are:

Priorities for Joint European Projects in 1999/2000

ACADEMIC PRIORITIES

- **Political Science**
- **Industrial Relations**
- **Social Studies and Social work**
- **Law** including European Law
- **International Relations and European Studies**
- **Environmental Sciences** only in relation to Energy
- **Agriculture and Food Science**
- **Publishing**

For all the above areas preference will be given to projects which:

- develop or update degree courses on the basis of short-cycle education (Bachelor/Masters)
- aim to develop modern text books
- aim to develop teaching material for distance education
- include a language training element

Priorities for Compact Projects in 1999/2000

1. UNIVERSITY MANAGEMENT

A Compact Project may review and improve the university administration/ management of the partner country institution by focusing on one or more of the following thematic areas.

- **Introduction of new management practices and structures in the partner country institutions**, for example at institute or faculty level. The aim is to improve the short- and long-term planning capacity of the institution, the management of day-to-day operations, the effectiveness of international relation offices, etc.
- **Improvement of universities' international relations and contact building**. This may include the strengthening of international networks, the implementation of well-thought out mobility plans to establish new international contacts, etc.
- **Strengthening of links between education institutions in the partner countries**. Creation or widening of subject area based networks of universities may be of help for the development of higher education. It can facilitate the exchange of experiences and the dissemination of good practices, as well as the interaction with the national education authorities on issues of common interest.
- **Strengthening of links between the partner institution and other parties in the partner countries**. The links with enterprises and the business community, with the local authorities, or with non-governmental organisations, may serve the renewal of the universities and foster their capacity to adapt to new emerging needs.

especially:

- Establishing national networks
- Creation of National Innovation Centres in the area of Education: projects (should involve the relevant national authorities)

2. DISSEMINATION

Consortia that have already benefited from a Tempus Tacis JEP or CP grant, or that have completed a project under an EU or other donor programme, can apply for a project that will disseminate the outcomes of their completed project.

Active TACIS JEP projects are presented on FIG 1.

Ukraine received ECU 5 million in 1996, ECU 4 million in 1997 and ECU 4 million in 1998

For Joint European Projects (1999-2001). The maximum sum awarded to a JEP will be ECU 500,000 for a full three-year period.

For Compact Projects (1999-2001). The maximum sum awarded to a CP will be ECU 200,000 for a full two-year period.

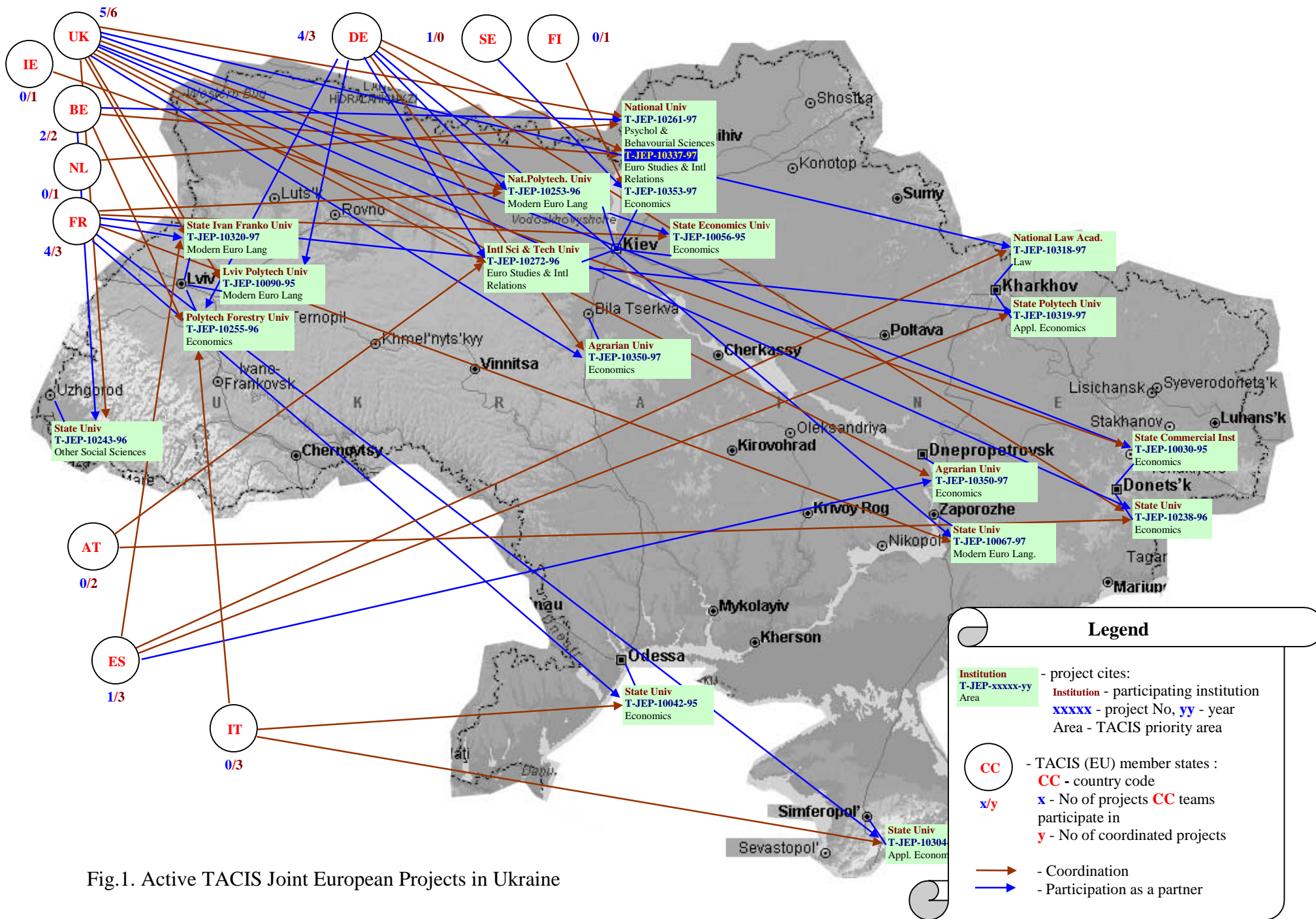


Fig.1. Active TACIS Joint European Projects in Ukraine

The Joint European Project and the Compact Project grants are divided into:

- Staff costs, equipment, publishing and printing, other costs and overheads, which altogether should not exceed 60% of the total grant

In addition the following ceilings apply:

Staff costs: maximum 25% of the total annual grant

Equipment: maximum 20% of the total annual grant

Overheads: maximum of 2,5% (fixed rate cost) or 5% (actual costs) of the total annual grant

- Mobility costs for both staff and student mobility, which should not represent less than 40% of the total grant.

For P JEP-01271-94 - preliminary project which preceded T JEP-10067-97 (Consortium composed of **Hannover Univ.**, **Hildesheim Univ.**, **Rouen Univ.**, **Zaporozhye State Univ.**; Project title: **Foreign Languages and New Technologies**) TACIS grant was ECU 624,830 with organisational costs - ECU 293,230 and mobility costs - ECU 331,600.

2.1.2. INTAS - the International Association for the promotion of co-operation with scientists from the New Independent States of the former Soviet Union (NIS)

INTAS was established in June 1993 as a European initiative to support **research projects** and **networks of scientific excellence** for the mutual benefit of teams from the INTAS members and the NIS. Scientific research projects and networks are selected on the basis of a peer review system from proposals submitted to INTAS in the framework of regularly launched calls, some jointly with other organisations from both NIS and INTAS members. In all cases, INTAS abstains from financing military research and from any political and commercial activities.

- **INTAS members:** Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the European Community;
- **NIS (New Independent States):** Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, **Ukraine** and Uzbekistan;
- **Co-Funding Organisation (CFO)** is a body from a NIS or INTAS member which offers funds for the joint financing of research projects with INTAS;
- **Open Call:** a call for scientific research project and network proposals solely funded by INTAS;
- **Joint Call:** a call for scientific research project proposals jointly funded by INTAS and a CFO;
- **Joint Research Project:** a partnership in which **each** participating team undertakes original experimental and/or theoretical research with a view to pooling the results in pursuit of one or more of the defined common objectives with a financial contribution from INTAS, or INTAS and another CFO;
- **Network:** a partnership in which the participating teams undertake to exchange information and develop specified common activities with a financial contribution from INTAS which covers the cost of co-ordination, including samples, communication equipment and travel and subsistence but makes no contribution to labour or other costs necessary for undertaking original research. Networks will be funded only under the INTAS Open Call;

Every proposal for a joint research project or network must be on a topic covered by one of the following fields, as specified in the eligibility criteria for the calls:

- 1A Nuclear Physics, Astronomy, Astrophysics;
- 1B Condensed matter, physics and Optics;
- 2 **Mathematics, Telecommunications, Information Technology;**
- 3 Chemistry;
- 4 Life Sciences;
- 5 Earth Sciences, Environment, Energy;
- 6 Engineering Sciences, Aeronautics, Space;
- 7 Economics, Social and Human Sciences;

Joint Research Projects

Scope

Proposals may be presented in all scientific fields for:

- new joint research projects;

– the extension of joint research projects previously funded under INTAS Open or INTAS Joint Calls, providing that they are due for completion by the 30 April 1998, that new objectives are specified in the work programme and all the eligibility criteria of this INTAS Open Call are met.

Minimum partnership

There must be *at least* four participating teams of which two must be from different INTAS members (including the co-ordinator) and two from different NIS organisations.

Funding

– the maximum allowable funding per project (including all labour, travel and subsistence, equipment, consumables, other costs and overheads) is 30,000 ECU multiplied by the number of participating NIS teams, subject to an overall maximum of 150,000 ECU

(i.e.: 2 NIS teams = max. funding of 60,000 ECU, 3 NIS teams = 90,000 ECU,

4 NIS teams = 120,000 ECU, 5 or more NIS teams = 150,000 ECU);

– not more than 20 % of the total project grant will be made available to teams from INTAS members;

– teams from INTAS members can, to the extent necessary for the co-ordination of the project, claim the costs of labour, travel and subsistence, consumables and other costs, plus, in general, an overhead of up to 20% of their costs;

- NIS teams may request individual grants for team members, travel and subsistence, equipment, consumables and overheads (maximum of 10% of the cost of labour plus consumables).

Networks

Scope

Network proposals may be presented in all scientific fields. When based on projects previously funded under INTAS Open or INTAS Joint Calls, they must define new objectives in the work programme and meet all the eligibility criteria of this INTAS Open Call 97.

Minimum participation

There must be at least 3 teams from INTAS member states and 3 from different NIS organisations. The co-ordinator must be an active member of one of the INTAS member teams participating in the network. Participants may also choose to appoint some one from the NIS to assist in the co-ordination of activities within the NIS.

Funding

– the maximum funding per network is 10,000 ECU times the number of NIS teams, subject to an overall maximum of 60,000 ECU;

– not more than 30% of the total funding may be used for the benefit of the teams from the INTAS members;

– teams from INTAS members can, to the extent that they are necessary for the co-ordination of the network, claim the cost of travel and subsistence, samples for the network as a whole and other costs plus overheads up to a maximum of 20% of their costs;

– NIS teams can claim costs related to the provision of essential communication equipment (e.g. e-mail), travel and subsistence and the provision of samples required by the network. In the event that a NIS scientist is nominated to co-ordinate the activities of the NIS teams, he/she may apply for an individual grant to the extent justified for such co-ordination.

INTAS in figures (up to end 1996)

Founded 1993

Members 20

Partner countries (NIS) 12

Total projects funded >1,250

Total project teams funded >5,000

Number of NIS scientists funded >15,000

Total funding allocated 67 Mecu (million ecus)

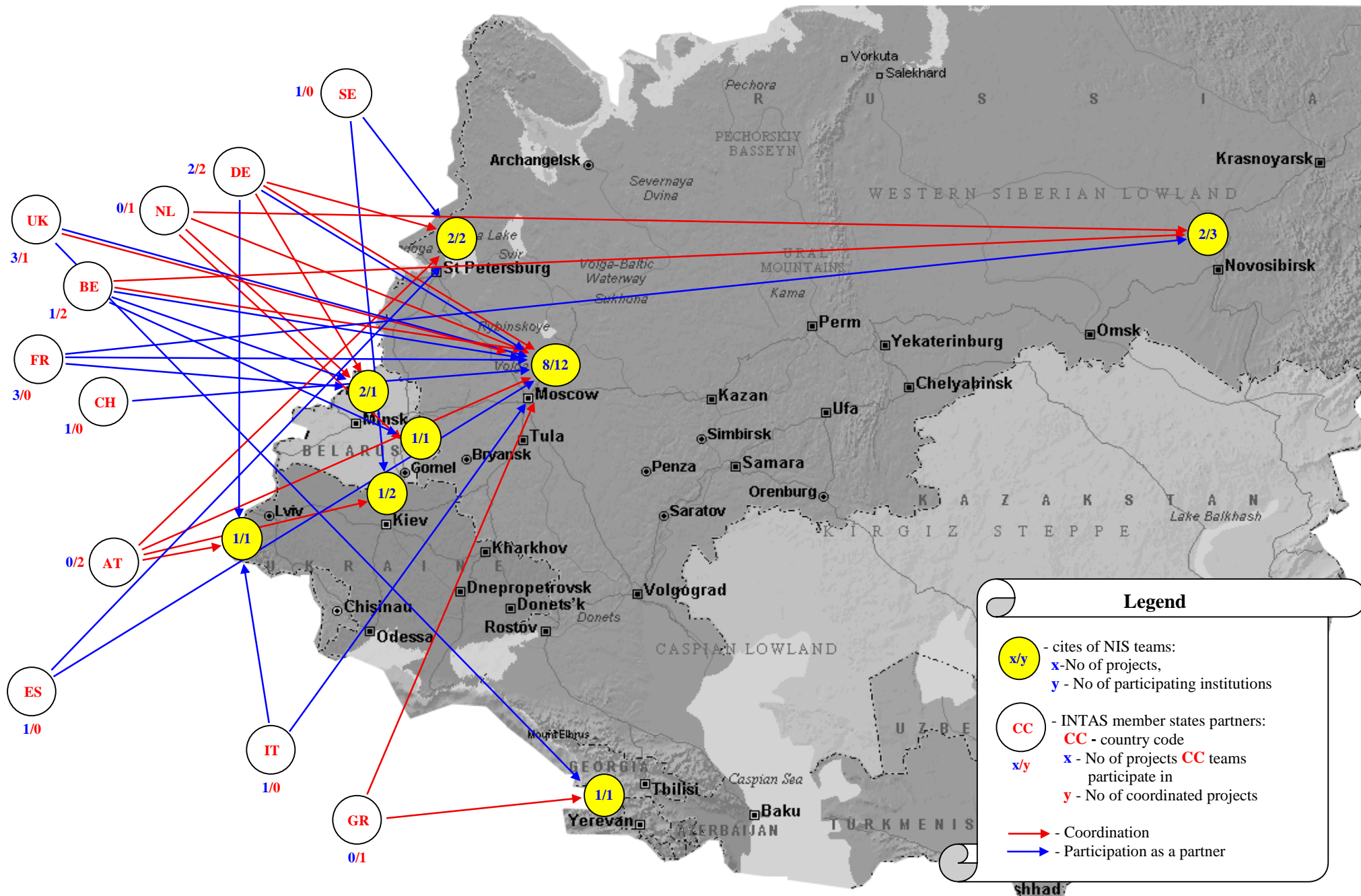


Fig. 2. Active INTAS projects, subfield Computer Software and Hardware

2.2. Programs without EU financing for NIS

Any FP5 program admits non - EU country team participation on terms depicted in Table 1. For NIS countries and Ukraine in particular it means that no EU funding is available. EU member states, however, may co-operate with altruistic NIS partners and apply for EU funding.

It's evident from the scope of the SIG that **Information Society Technologies (IST)** program is of particular interest. We have submitted our expression of interest to IST site:

Type: Company Expertise

Title: Modelling Evolving Object Societies in Virtual Information Spaces

Description: The expertise may be presented by our framework for modelling evolving societies of intellectual agents, used as personal assistants to support routine functions within an enterprise, or a department. Framework is based upon general diakoptical (modelling by part) method for modelling complex abstract systems. The principles for system disjunction are denoted as follows:

1. Each of the agents, members of an agent society, is a closed system defined by agent's role.
2. The interaction between the agents within a society is denoted by concepts of action and reaction.
3. Modelling of society's reaction to external action (influence) is implemented by substitution of the model of dedicated agent instead of more complex model comprising all members of the society.
4. Modelling of policy execution is based upon the extraction of interaction subgraph, having variable topology and comprising as nodes the agents participating in the execution of the policy.
5. Model of agent society is equivalent to the model of the member agent (of another society).
6. Agent society is a stable system.

Finite automata, semantic clustering, the notions of role, policy, action and reaction are used for proposed generalisation. The framework for modelling of evolving agents society is scheduled to become one of the basement stones for the implementation of the functional projection of virtual information space of a university (enterprise).

Partner skills: We seek partners with competencies in the following areas:

- semantically reach data models-semantic data clustering and extraction
- co-operative data/knowledge base systems
- data/ knowledge federation
- virtual information spaces / virtual enterprises

3. Co-operation proposal

Following the spirit of FP5 IST program we'll try to explore the ways to assist NIS countries integration into the Information Society by means of diverse utilisation of Intelligent Agents and Virtual Information Spaces paradigms and technique for:

- improving teaching quality (distant learning facilities, distributed/global library access, developing electronic textbooks and other study guides, implementing active learning and testing routines and tools) and thus lifting up cultural level, professional skills, motivation of the future generation;
- making enterprise/university management procedures more effective and up-to-date (decision making and decision taking support, intensifying routine functions execution...) and thus assisting to make NIS economy more predictable, marketable, steadily growing and more democratic.

The evident possible solution is to launch a cluster of mutually beneficial and closely linked projects - one having intelligent agents research as a primary goal and the others - for applying research results to real life (teaching, management and probably governance) and thus assisting to Eastern Europe integration into Information Society. We'll try to line out the possible cluster proposal in the most general way following FP5 guidelines.

Title: Intelligent Virtual Information Spaces for Integration into the Information Society

3.1. Objectives

Investigate the applicability of different intellectual agent frameworks and ontologies to Virtual Information Space implementation.

Determine, evaluate and validate the framework for Virtual Information Space design and implementation.

Determine, evaluate and validate the model and the framework for information interchange in Virtual Information Space Society.

Implement Virtual Information Space for a University environment.

Apply the results to improve and intensify university management procedures as well as to facilitate to decision making and decision taking support.

Apply the results to create new electronic environment for teaching: distant learning, new methods of teaching, new forms of textbooks etc.

Disseminate the results to several Universities in NIS and, possibly to some governmental institutions of Ukraine.

Facilitate to scientific, academic, technological exchanges between the project partners and possibly within one or more wider networks (eg. AgentLink).

3.2. Background & Justification for Undertaking the Project

Current state of the art concerning the research topic(s) including important gaps in our knowledge. How the proposed research will be innovative, either by in extending our knowledge or filling the gaps identified.

Actually this is the point to discuss and to figure out within the SIG. From our knowledge and experience we may state that:

Researches today pay keen attention to the problems and the methods of virtual enterprise and virtual information space modelling. Growing interest to these problems may be explained by the expansion of distribution and virtualisation in manufacturing and other business processes (rapid growth of diverse “hows” for doing real business by virtual means - electronic commerce, for instance - is a good example) as well as by the necessity to supply existing models (and legacy systems) with some dynamic character. It can be easily seen that the problem posed like this reflects the point of view of external observer or counter-agent interacting with virtual enterprise from outside. Another problem of similar importance is to create comfortable environment for the individuals acting inside the dynamic system we model - i.e. persons in charge of some certain functions. This internal point of view has, as its main goal, the task of bridging semantic gaps between native-to-user ways of presenting information and posing problems and the elements of information systems (IS) with formalised action interfaces.

The paradigm of virtual information space (VIS) is likely to be an acceptable way to model virtual and/or real enterprise. This framework provides suitable methods to represent these complex dynamic systems by means of terms of integrated IS. Contemporary bibliography on the problems of virtual enterprise modelling provides diverse ideas and methods for the design of such an environment. One of the approaches, for instance, is the usage of Concurrent Transaction Logic for building Virtual Enterprise Management Systems (VEMS). Concurrent Transaction Logic is used for modelling and reasoning the interactions within virtual enterprise model. This modelling method is oriented to the creation of a formal framework for description and reasoning about the interactions in temporary object societies, comprising dynamic system for gaining the certain goal. Some other approaches for creating functional models of real enterprises are worth attention. Imperial College Role Framework based upon the notions of role, policy, relationship is a good example. The frameworks representing interactions and interrelationships between functional elements inside a community within a virtual enterprise by means of workflows and co-operative agents paradigm form another attractive research direction.

We propose to apply frameworks based on Intelligent Co-operative Agents to design and implement the functional projection of our Unified Information Space (UIS). The architecture of UIS was presented at previous SIG meeting in Brussels (<http://www.cs.cmu.edu/~klusch/sig/reports/SIGM1-ua.ps>). The concept of UIS provides diverse possibilities to consider organisational and geometrical enterprise topologies in addition to its functional model together with the gateways from one projection to another and, moreover, transparently absorb legacy ISs. One more distinctive of our proposition is the attempt to take into account the dynamic character of UIS functional projection. Diakoptics, the concept of co-operative intellectual agents, methods of semantic data clustering and analyses and some elements of finite automata theory may be used to create adaptive evolving models of UIS functional blocks.

Main gaps in our knowledge within the diakoptical framework are:

- how to model processes in time?
- how to model interactions having cycles?
- how exactly to define input alphabets and to implement the rules for finite automata transitions?
- how exactly to design the mappings for result analyses?

The framework we have is rather for modelling VIS functional elements, but not the processes - workflows, job co-ordination, network planning, etc, though it has all the elements been necessary for process modelling. We plan to adopt or develop some formal means, like Concurrent Transaction Logic, thus enhancing the framework for process modelling.

If the proposal is part of a larger national or international project, explain its precise role and how it will fit into the wider context.

In case the cluster or one of its member proposals will intend to create a scientific exchange or academic exchange curriculum it is worth discussing it to be a part of AgentLink Network to facilitate from Agentlink's infrastructure - Summer Schools, Seminars, Workshops, Conferences, Etc. TACIS cluster part, if accepted, may be the possible ground for such a co-operation.

Justification for undertaking the proposed research, including possible applications (scientific, economic, social or other).

The project may be justified because:

- Research results may bridge the outlined gaps in our knowledge and skills in implementing such complex and practically useful systems as Virtual Information Spaces and Virtual Enterprises (one more step forward on the road to Information Society).
- Planned results are highly demanded in diverse areas starting from higher education up to industry and commerce both in the Eastern and in the Western countries.
- The project may facilitate to the further integration of Eastern (as well as Western) countries into united Information Society and thus lower the level of tension and unpredictability and higher the rate of comfort in the relationships between Eastern and Western neighbours.

Intelligent Virtual Information Spaces may be applicable as an evolving self - teaching media for:

- Decision making and decision taking processes support (thus improving management procedures in diverse application areas).

We're planning to apply this technology at Zaporozhye State University with possible dissemination to other universities in Ukraine. Intents are received from Donetsk State University for instance. The industrial management application is possible due to the preliminary intent from the Ukrainian State Committee of Medical and Biological Industry.

- Personal assistance for routine functions (thus intensifying the usage of labour force and lowering the risks of human mistakes).

We're going to verify this approach at Zaporozhye State University Publishing Centre.

- Personal assistance in distant learning and student supervision (thus intensifying university teaching process).

There is a good opportunity to facilitate to T JEP-10067-97 TACIS project in the area of Modern European Languages currently run at Zaporozhye State University with dissemination of T JEP-10067-97.

Our background research projects

1991 - 1994 - **Methods and Tools for Database Applications Flexibility Enhancement** (Development of the methods and software tools based upon Active Data Dictionary approach for enhancing the properties of flexibility and reusability of Database Applications (RDBMS)). A Research Project financed by Ukrainian Ministry of Education.

1995 - 1997 - **Mathematical Models for Complex Dynamic Systems** (Design of the Methods for modelling Various Complex Dynamic Systems in different Application Domains). A Research Project financed by Ukrainian Ministry of Education.

1997 - 1998 - **Development of Integrated Computational Media of a University** (Design and implementation of integrated network computational media including university database shell based upon Internet and Intranet technologies as well as upon Active data Dictionary technique). Research Project financed by Ukrainian Ministry of Education.

Results: Implemented were the University wide Network and Integrated University Database Shell. Proposed and published was the architecture of the Unified Information Space architecture.

1999 - till now - **Design of Mathematical Models and Methods of Description and Co-operation of the Elements of Unified Information Space in a University - wide Network based upon the Principles of Diakoptics and Master - Agent Architectures**. Research Project financed by Ukrainian Ministry of Education.

Relevant papers

1. Borue, S. U., Ermolayev, V. A., Tolok, A. V., On an Integral approach of Complex System Flexible Mathematical Model Design. In "Mathematics, Physics", collected scientific articles, dedicated to the 10-th anniversary of Zaporozhye State University, Zaporozhye State University, Zaporozhye, Ukraine, 1995, pp 5-9. - (published in Russian).
2. Ermolayev, V. A., Kotsur, A. S., Tolok, V. A., On a Concept of ZSU Computational Media Enhancement. In: Theses of the Annual Scientific Conference of Zaporozhye State University, Zaporozhye State University, Zaporozhye, Ukraine, 1997, Vol 7, Part 1, 4p - (published in Russian).
3. Ermolayev, V. A., Tolok, V. A., Visual Intranet Interfaces and Architecture of Unified Information Space in the Concept of Virtual University at ZSU -- accepted to ENCOM'98, Atlanta, June 98 - (in English).
4. Ermolayev, V. A., Keberle, N. G., Active Data Dictionary - a Method and a Tool for Data Model Driven Information System Design --submitted to ER'98, Nov 16-19, 1998, Singapore - (in English).

5. Ermolayev, V.A., Keberle, N. G., On Possibilities to Enhance Relational Attributes by the Property of Calculability. Lecture Notes of Zaporozhye State University, Vol. 1, No 1, 1998, p. 38-44. - (published in Russian).
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4. Summary

Diverse usage of information technologies, formation of Information Society on the Planet, intense integration processes in most humanitarian, technological, scientific areas, globalisation of information interchange form the basics which makes intelligent agent r&d highly relevant. Practical application of the results of our research may drastically facilitate to world integration processes and add mobility to human society.

The former socialist countries of Eastern Europe are the weakest point in the world integration process. Therefore, the solutions for this part of the world are even more important and will most certainly work for the rest. The reasons are:

- The environment in post-communist countries for Information Society Technologies application is rather poor, unstable and possesses lots of specifics for high quality testing.
- There is considerably high demand for effective and reliable IT support for high- and middle-range management routines, decision making and decision taking everywhere, but specifically in this part of the world.
- The integration of Eastern Europe and NIS into Information Society will facilitate to the increase of the level of security, of democracy and, therefore, of amenity in political and economical spheres.

There are two of EC programs aimed to support Integration of NIS and East European countries into European Community in humanitarian, political, economical and scientific spheres - Tempus TACIS and INTAS. Moreover, EC Fifth Framework Program admits NIS (+Eastern European +Non EU) countries participation on self-financing basics. Some examples of currently active TACIS and INTAS projects are given on Fig. 2. and 3. As for the other FP5 programs admitting NIS teams participation on altruistic principles - IST is of particular interest due to its close relevance to the proposed joint project. Zaporozhye State University have submitted its statement of interest, containing company expertise description, to IST database.

Our proposition is to evaluate the possibility of launching a cluster of mutually beneficial and closely linked projects - one having intelligent agents research as a primary goal and the others - for applying research results to real life (teaching, management and probably governance) and thus assisting to Eastern Europe integration into Information Society. Proposed title is: ***Intelligent Virtual Information Spaces for Integration into the Information Society***. Possible objectives, our point of view to the background, justification and results dissemination, as well as the list of our previous projects and relevant papers are given in Section 3.