

УДК 378.147.013.83

International Project-based Educational Functions Developing Scientific, Infrastructural and Professional Competences of the Researchers Involved

Natalie M. Edwards*

Siberian Federal University,

79 Svobodny, Krasnoyarsk, 660041 Russia¹

Received 23.03.2009, received in revised form 30.03.2009, accepted 6.04.2009

The academic capitalism has inspired advanced requirements to academicians and researchers, globally. To meet them, both universities and R&D organizations have to modify paradigmatically and to prepare their researchers to efficient and economically expedient R&D work. Appropriate competences may be achieved in formal, non-formal and informal education frameworks. This paper considers an informal-based approach to the development of researchers' infrastructural and professional competences through involvement to international projects and thus, their educational functions.

Keywords: competence, learning by doing, international network projects, infrastructural skills, FP6/FP7.

Point

Since the «Iron Curtain» fall, the Russian science paradigm has being transformed alongside with European science in new economic environment. It is well investigated and described by many Western and Russian researchers. While considering the Russian science today's hardships and challenges, it looks reasonable to accept a constructive approach by A. Grudzinsky who regards them as «challenges» requiring rethinking of institutional and economic modes of research activity, rather than «losses» or «deprivations» (Grudzinsky, 2004). From this point of view, we could interpret the meaning of international research cooperation, as well as preparation to this mode of activity.

Contemporary researchers fail to provide any clear evaluation of economic profits gained by the Russian economy from international contacts. Still, we agree with the Russian researchers L.M. Gohberg and A. Yu. Chepurensko who state that wide contacts between Russian research organizations or separate researchers and international foundations or programs are a necessary prerequisite for their competence and professional development aimed at integration to the international research community.

Today, neither research, nor educational environment of any country separately is able to stay isolated from global-scale problems to be solved as they are common challenges in the present. Under globalization conditions, many

* Corresponding author E-mail address: klimnatal60@yandex.ru

¹ © Siberian Federal University. All rights reserved

research activities are implemented within the framework of large-scale programs funded by the government or the commonwealth, for instance the European Commission (EC) in the format of joint projects, predominantly by multinational consortia of several countries (Atkinson, 2006). In the European Union, the Framework Programs¹ successfully resolve the task of research idea preliminary development (Grudzinsky, 2004; Bellemin, 2005). A joint project development based on a research idea demanded by the European community is considered to be the first step of a single commercialization consequential chain for a RTD product or technology (Sijde and Cuyvers, 2007). Framework Programs in Europe are a strategic tool in its competitive activity against the USA and Japan, in the hitech market. The Framework Program initiatives are supported by inter-governmental tools of technology transfer and provide a substantial support to research and manufacturing teams at the stage of experimental prototype coupling to a marketable product. For the Russian researcher, this Seventh Framework Program is the fourth one available for participation within a multinational consortium (Schavan, 2007).

This paper is an attempt to concentrate on international project-based educational function, which includes research, infrastructural and professional competence development of the Russian researcher, by example of Framework Programs. Besides, many Russian science investigators underline the statement that this kind of participation enables to diminish the

risks associated with potential «brain-drain» of the Russian researchers and to attract overseas investment for RTD activity and through further RTD product commercialization (Batigin, 2000; Sinitskaya, 2007).

Examples

Since January 2000, the EC has implemented a concept of «European Research Area (ERA)», where participation of emerging or transitional economies, including Russia is of special importance (Akulshina, 2007; Schavan, 2007). Framework Programs serve as a realization tool for ERA. From the point of view of European experts, network long-term projects are the most resultant ones (Burger, 2004; Kelm, 2007; Taylor, 2007). They enable to share knowledge and skills, to train starting researchers within the network, as well as to consolidate the resources from the whole partnership network and therefore to avoid parallelism in research activities, which is costly and senseless in the era of information technologies. In this way, resource saving including the costs on researchers' training is provided for a number of countries. The Russian researchers have been involved in the programs since the Fourth Framework Program in 1994, within international research consortia. EU-Russia Cooperation Agreement on Science and Technology was signed on the 10th of May 2001 and renewed by common Agreement in October 2003 at the EU Summit in Rome. At a point of the Sixth Framework Program (FP6) ending (2002-2006), about 600 million Euros from the total budget of the FP6 were spent for funding projects with participation of third (non-European) countries including Russia, and 285 million Euros from this budget was spent for the international cooperation (INCO Program, 3 thousand projects) in thematic areas. A half of participants out of 8 thousand of research teams (40 thousand researchers) were from third

¹ «Framework programs» (FPs) have been the main financial tools through which the European Union supports research and development activities covering almost all scientific disciplines. FPs are proposed by the European Commission and adopted by Council and the European Parliament following a co-decision procedure. FPs have been implemented since 1984 and cover a period of five years with the last year of one FP and the first year of the following FP overlapping. The current FP is FP7, which runs up to the end of 2013 (CORDIS: http://cordis.europa.eu/fp7/faq_en.html#1).

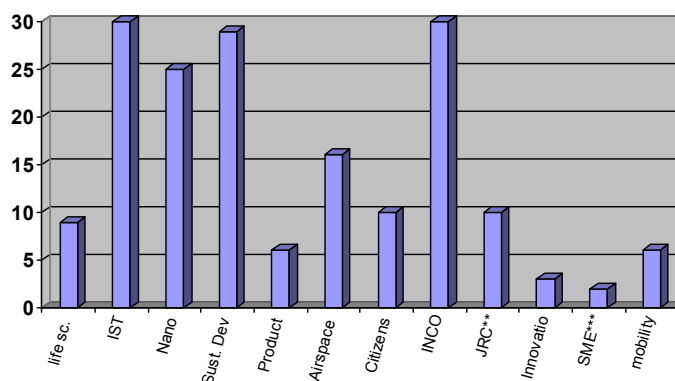


Fig. 1 Quantity of projects with the Russian participation funded by FP6 in 2002-2006, by thematic areas.

Note: * IST – information society technologies
 ** – JRC – joint research centers
 *** – SME – small and medium-size enterprises

countries in early 2000. The Russian participation in Framework Programs is represented by 600 joint projects (1994-2006), and 572 projects more have already been financed during the initial two years of FP7 (2007-2013), predominantly in thematic areas: life sciences, information society technologies, nanotechnologies and advanced materials, sustainable development, aerospace sciences and international cooperation.

The above diagram (Source: NIS-NEST Newsletter of January, 2007 by P. Jamet) shows that the major portion of joint projects with the Russian participation belongs to IST thematic area. That is also determined by the policy of the European Commission, which testifies of the funding trending towards information and communication technologies. In particular, statistics of FP6 indicates that 32 out of 300 participating organizations were Russian (11%) and the Russian researchers obtained 4.5 out of 30 million Euros (15% of the total IST budget). In nano-electronics, photovoltaic science and MEMS themes, 36 projects with the Russian participation obtained 40% of the total thematic budget funding (Burger, 2006).

Richard Burger, the Science & Technology Counselor Delegation of the European Commission

to Russia, accentuates the European dimension of the Framework Programs, which implies that all the projects and initiatives available for support within its scope i.e. financed from European taxpayers' budget, should include at least several European states. But at this, international cooperation is a major component of the Seventh Framework Program (FP7) and participation of third countries is welcome and fostered. In 2007, summarizing the FP6 outcomes the EC presented the proof for interest in and support for the Russian participation in the prior FP6: in the aggregate participants in all the Program blocks, Russia and former USSR countries (their participation is minimal in comparison with Russia) takes the first position (Kelm, 2007). First, Russia is ahead of other third countries in FP6 funding. Second, the Russian participants are considerable in quantity, if compared with non-European countries (Akulshina, 2007). The below diagram represents statistics by Richard Burger on non-European countries participation in FP6 INCO Program in various thematic areas, where Russia takes the leading position by the quantity of projects with its participation.

The next diagram provides some statistics on non-European participants of IST program

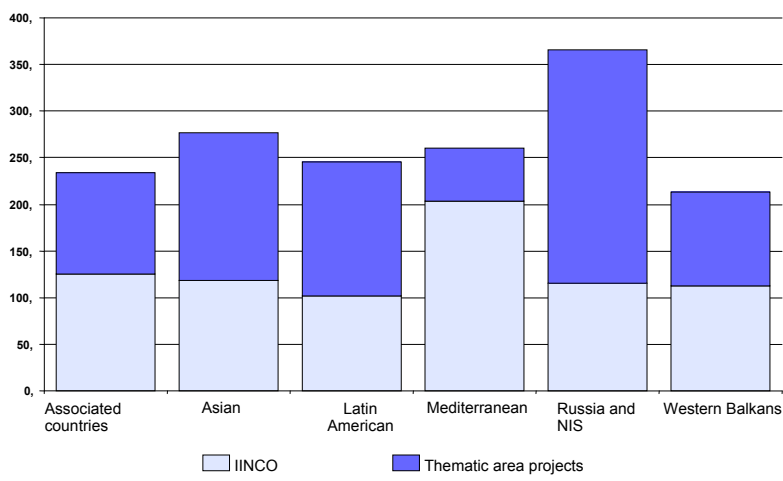


Fig. 2. Quantity of projects with the Russian participation in European Framework Programs in 2002-2006. Source: Richard Burger, Science Counsellor Delegation of the European Commission to Russia, Moscow, 23/06/2006

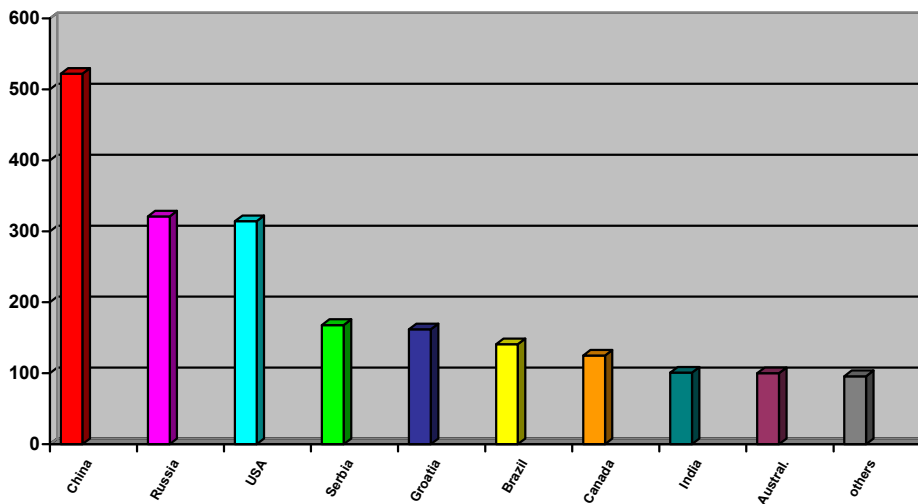


Fig. 3. Quantity of projects with participation of non-European research teams in IST Program, 2002-2006. Source: Richard Burger, Science Counsellor Delegation of the European Commission to Russia, Moscow, 23/06/2006

within the Sixth Framework Program (FP6), where Russia holds the second position by the quantity of IST projects surpassed only by China, whereas the USA, Canada, India and others fall behind tangibly. The diagram author Richard Burger notes that the Russian researchers were more noticeable in infrastructural projects.

Therefore, the Russian research teams have revealed their complete professional competence,

competitiveness and prognostic abilities in the major and now more demanded FP thematic area of IST, which made it possible to define and apply the points for the greatest research efforts.

Some positive aspects of the Russian researchers' participation in European Framework Program projects with a high percentage of the participation can be now considered from educational point of view, i.e. their competence

development, training and preparation function aimed at efficient integration into the global research area.

1. It is the European expert's opinion that *network projects* appear as an efficient form of multi-level training and advanced training for the researchers involved. It is determined by the objectives and the character of this type of activity. These projects represent virtual infrastructures of many R&D teams integrated into a research network and sharing the participants' resources. The European Commission both renders support to existing international infrastructures, and provides funding to establish new research infrastructures. The EC's information of 2006 states that two thirds of all FP6 projects funded were network ones. The distinguishing features of these projects are: rationalization of R&D activity through the team consortium on the base of common platforms, which eliminates parallelism in R&D activities; sustainable development of the infrastructure established is provided by the end of the project, i.e. international research cooperation is long-lasting; the projects of this type work due to a flexible schedule and practice a flexible approach to replacing researchers within the consortium if necessary; they work during 48-60 months; consortia consist of 6 -12 teams from various countries and get up to 25 million Euros from the EC. The activity is concentrated on a long-term integration of facilities and RTD efforts in addition to existing state-of-the-art in a specified research area. Realization instrument for these projects is called «Networks of Excellence» or experience exchange networks, where integrated activity is the system-building component. Integrated activity is aimed at a wider and effective access and employment of R&D infrastructures in European countries, associated with EU countries and third countries, when necessary. The basic feature of the integrated activity is a possibility to unite a

diversified consortium of the parties interested into a specific infrastructure class. In that case, the actors should simplify the development of joint activities and additional benefits and provide a wider access to R&D. For example, the actors and users must be prepared to advanced or unforeseen RTD activities in their research field, e.g. employment of up-to-date instrumentation based on a higher level of coordinated approach. In a wide sense, a closer interaction between large numbers of researchers working within and close to specific infrastructures will encourage multi-disciplinary efficiency and a wider knowledge or technology exchange in research areas, between research communities and the industry. With respect to researchers' scientific and professional development, integrating activity is of particular value since it is capable of combining the following models of infrastructure integrated initiatives:

- 1) networking activity;
- 2) transnational access and/or services;
- 3) joint research/technological development activity.

These three categories are obligatory in network projects because they are expected to provide the activity synergy effect. In the course of these project activities, the researchers obtain a valuable experience through informal learning, i.e. *learning by doing* and *knowledge exchange* within the R&D infrastructure.

2. Another group of projects with a high percentage of the Russian participation is *Coordination and Support of Actions* in one of ten thematic areas of Framework Programs. The educational effect of the Russian researchers' participation in these projects is expressed in mastering the R&D methodology and acquiring partners in project activity in order to promote and support R&D activity at European and international scale. This cooperation mode focuses on coordinating R&D teams around one thematic area. Coordination forms are diversified

and depend on the consortium initiatives: specific R&D events, such as international thematic conferences or workshops, study and analyses of research subject matters, operational support and useful experience or results dissemination, informing events, research staff exchange, establishment of regional/national information or contact points, thematic portals and other information and methodical resources to render assistance to researchers in various countries. Far from being research ones, these projects undoubtedly create favorable and supportive environment for researchers and are aimed at a wider involvement in the development of joint international projects in the future. Apart from the Russian researchers, many Europeans not acquainted with the Framework Programs or other European initiatives, benefit from these project initiatives, because they are introduced and involved into international research area and are provided with information and methodical support unavailable in their own organizations. These projects are based on a long-term strategic investment in the cooperation networks established, work due to a fixed schedule and a consortium of 1 to 26 teams from various countries with duration of 1 to 30 months, and get up to 2 million Euros from the EC (for the establishment and management of the network and events/initiatives implementation only).

3. Conventional research projects hold a special place within the Framework Program structure where a high activity rate of the Russian researchers is observed. These are specific targeted research projects, which suppose the development of a new knowledge or technology (Bellemin, 2005). It is known that these projects are the most attractive for the Russian researchers because of understandable and known format as they think it to be, i.e. a conventional research and development (R&D) format. The realization instrument for these projects is a «joint project»

and it is supposed to resolve a specific problem in a specified research or technological field. They are aimed at obtaining a new deliverable through employment of acquired or existing resources (resource integration). This project category is strongly practice-oriented and accentuated, which is already revealed at the stage of project proposal writing by each consortium member. Practical and end-user-oriented character of the future research is the most difficult part of the proposal for the Russian researchers, because as a rule they are not skilled or trained in the field of market research or research idea feasibility study. Traditionally, the Russian researcher is oriented exclusively at the R&D area of interest and believes that specific services should fulfill these activities, e.g.: possible applications study, search for prospective industrial partners and users, coupling with related research fields where the target R&D product could find another application (for instance, that was the case with laser applied to surgery, which was not supposed initially). On the contrary, the European researcher widely practices this approach, because they he is research idea bearers and is the crucial link in the chain «from science to business». This problem is resolved through plenty of European workshops for the researchers starting their project activities, and this practice requires conception in Russian researchers' training being a part of adults' educational area (Gromkova, 2005). A joint project usually works 10 to 60 months, obtains up to 25 million Euros and its consortium includes up to 15 research teams from various countries.

Alongside with progressing dynamics of the Russian participation in international research projects, some negative effects upon the scientific community should be also remarked. As investigations by Russian science researchers (Dezhina, 2001; Gohberg, 1997; Batigin, 2000; Strihanov and Sheregy, 2006; and others) state,

the research nature is strongly modified in R&D institutions as a result of researchers' growing dependency upon the Russian and international foundations. A small research team turns as the basic research unity. Research tends to be more short-term in duration. The researchers tend to schedule their long-term activities to a lesser extent. The Russian investigator I. Dezhina stated in 1995 already that about 24% of the Russian researchers involved in grant-funded research have a negative attitude to the idea of grant-based funding. One of the reasons explained there was discredit to proposals selection instruments (14% of respondents).

Many sociologists observe negative changes in research teams involved in grant-funded R&D programs (Gohberg and Shuvalova, 1997; Batigin, 2000; Grudzinsky, 2005, and others). The researchers also state that their colleagues tend to be less sociable and do not share new research ideas. Competitiveness aggravates, which is seldom accepted as a strong initiating factor fostering the R&D society development.

Another negative effect resulted from the Russian research community integration into active international cooperation era is *research community stratification*, which is well investigated by A. Grudzinsky, E. Balabanova, O. Pekushkina, G. Batigin, and others. This phenomenon is treated by them as the «processes of inequality intensification in the research sphere» when «participation in international programs intensifies processes of social separation inside the research community and some initially existed inequalities, which were smoothed by the government funding provided to research, are now cumulated in character. On the one pole there are young researchers from the capitals actively participating in international cooperation, and on the other pole we can see excluded researchers of older age, which lagging elevates and chances to raise to the «leaders» go down».

Conclusions

1. Internationalization of science and research implementation format takes place as a fact and represents an actual task not only for the Russian, but also for the researchers globally who realize a new globalization paradigm in this human activity. A wide number of established international R&D foundations (hundreds), the ERA concept, and successful functioning of the European Framework Programs with participation of third countries and Russia in particular, are the proof.

2. The fact should be admitted that a significant (though the level of the Russian participation does not completely reflect our scientific capability) quantity of research teams are involved in the European Framework Program international projects (600 projects in 1994 to 2006). That testifies of a high and growing potential for the Russian researchers and a growing educational need in training and preparation of appropriate researchers.

3. The researchers involved in international projects during some years, benefit from a highly valuable, varied informal education through actual activity. Participation in European network projects simplifies the development of joint cooperation, eliminates investigation parallelism and creates additional opportunities and access to research. These projects perform a valuable educational function of research, infrastructural and professional competence development for the Russian researchers through the activity phase.

4. Participation in international projects is cooperation without «brain-drain», because it provides academic, economic, social and educational advantages for its participants. They enable both commercialization of RTD products, and integration into the global research area as an equal partner, which tangibly diminish academic emigration intents.

5. It is our position that both training and involvement of a higher number of the

Russian researchers and R&D teams in research integration is the only reply to enforced research community stratification of excellent researchers who has no infrastructural skills required in an international consortium as an integral part of their competence.

References

- A. Akulshina, «Russia and the European Union: Reinforcing Collaboration in R&D», *RTD Info, on European Research, special edition «Inside the Seventh Framework Programme»*, (2007), 30-31.
- Yu. Avraamov, «Consortium as an Effective Innovative Form of Continued Education, *Additional Professional Education*, 1 (2004), 7-11, in Russian.
- J. Atkinson, «Science and Technology: Bridge between Cultures and Countries» [Electronic Source]: *E-journal USA* (2006) // Access: <http://usinfo.state.gov/journals/itgic/1006/ijgr/atkinson.htm>.
- G. Batigin, «Invisible Border: Grant Support and Restructuring of the Research Community in Russia, Expert's Remarks», *Science Investigation*, 4 (2000), 67-79, in Russian.
- L. Bellemin, «Europe as a Partner in World Science», *RTD Info, special edition «INCO (International Cooperation)»*, (2005), 4-6.
- K. Berg, «Towards a Novel Education Concept», *International Cooperation*, 2 (1996), 9-10, in Russian.
- R. Burger, «Mobility and Research Partnerships» [Electronic Source]: *Proceedings of the International Workshop «Support for Research Career Development and Academic Mobility between the RF and EU»*, (2004), Novosibirsk //Access: <http://www-sbras.nsc.ru/ws/fp6/>.
- M. Gromkova, *Andragogics: Theory and Practice of Adults' Education* (Moscow: UNITY-DANA Press, 2005), in Russian.
- A. Grudzinsky, «European Technology Transfer: Cooperation without Brain-drain», *Sociology of Science*, 11 (2004), 123-131, in Russian.
- Kelm, G. «Russian Participation in IST FP6» [Electronic Source]: *European Commission Report*, 2007, Moscow // Access: <http://www.authorstream.com/presentation/Pumbaa-19194-Kelm-Russian-Participation-IST-FP6-Outline-Coop-3rd-Countries-2003-2006-Russia-FP6FP6-Exempl-as-Entertainment-ppt-powerpoint/>.
- A. Schavan, «FP7 Ushers in New Era for European Research Policy», *European Commission Report. CORDIS Focus Newsletter*, 275 (2007), 11.
- Van Der Sijde, P.C., R. Cuyvers, «Training Researchers to Commercialize Research Results», *Industry and Higher Education*, Vol. 17, 1 (2007), 29-37.
- N. Sinitskaya, «Participation in International Projects as a Factor for Additional Professional Education Development», *Higher Education in Russia*, 5 (2007), 50-56, in Russian.
- Taylor, F.W. *The Principles of Scientific Management: Classics of Organization Theory* (Fort Worth: Harcourt College Publishers, 2001)