Entrepreneurship in Scientific and Technological Areas as a Key Actor in the Innovation Economy: Issues and Perspectives of Development in Russia

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Abstract
The article gives the picture of the results of the research project, which aims at theoretical foundation of issues and perspectives of development of entrepreneurship in scientific and technological areas in Russia. The results of this theoretical analysis help to elaborate the guidelines for the Russian government to support innovation entrepreneurship. The paper dwells upon a new model of a university as the basis for development of its cooperation with business. While carrying out the strategic analysis of the Russian entrepreneurship in scientific and technological areas, some methods have been applied, e.g., social monitoring and benchmarking. The author shows some ways how to improve innovation infrastructure, formed by the Russian research & education institutions and designed to help and facilitate the activity of innovation entrepreneurship. The emphasis is also laid on a better staffing for small enterprises in scientific and technological areas.

Keywords: entrepreneurship, R&D, Russia, innovation, infrastructure, university.

Introduction
Small innovation enterprises, which are formed around leading universities, academic and industry-oriented research institutions, contribute to a significant competitive advantage of the regions in innovation economy (Audretsch, van der Horst, Kwaak, Thurik, 2009). They can generate knowledge, raise highly-trained human resources for the innovation sector of economy, promote innovation processes and bring technologies to a high-tech sector of economy quite effectively (Carayannis, 2008). However, in Russia innovation entrepreneurship does not perform these functions in full. Meanwhile all levels of government realize and seek changes towards more favourable conditions for developing of innovation entrepreneurship.

To facilitate that process the investigation is being conducted. The project “Monitoring and analyzing of current situation with entrepreneurship in scientific and technological areas and providing guidelines how to enhance its work with government support” (the project leader is Prof. Molchanova) has been carried out by the Centre for Strategic Innovations, School of Public Administration, Lomonosov Moscow State University, since 2009 (2009-2010). The work has been initiated by the Ministry of Education and Science of Russian Federation within the framework of federal programme “Human Resources for Science, Research, Education and Innovation in Russia” (2009-2013). The aim of the project is to elaborate some government measures and mechanisms, directed at enhancing the work of enterprises in scientific and technological areas, and at supporting public-private partnerships on federal and local levels.

This article presents discussion of the project results. They show the potential of the Russian entrepreneurship in scientific and technological areas if they cooperate with universities and other knowledge-based organizations. Besides, the article focuses on the problems faced by innovation entrepreneurship in Russia and on the ways those issues can be tackled and solved.

Key Success Factor (KSF) approach
Theoretical framework of the research is based on the KSF approach. One of the core factors of competitive innovation economy in Russia is entrepreneurship in scientific and technological areas. In other words, one of the key success factors of the strategy aimed at building up innovation economy in Russian Federation and its regions is the development of innovation entrepreneurship based on close cooperation between business and research & education areas. This approach has given rise to the structure of the research, has necessitated the strategic analysis of innovation entrepreneurship in Russia and its supporting infrastructure, and the examination of weaknesses and strengths of entrepreneurship, together with its problems. Hence, some ways to improve innovation infrastructure, formed by research & education institutions and designed to help and facilitate the activity of innovation entrepreneurship, have been worked out. These ways in their turn can contribute to elaboration of strategic initiatives and guidelines for the government to support entrepreneurship in scientific and technological areas.
Research Methodology

While carrying out the strategic analysis of the Russian entrepreneurship in scientific and technological areas, some methods have been actively applied, such as social monitoring, systemic and comparative analyses and benchmarking.

During social monitoring, the project team has done the following:
- representatives from 429 small innovation enterprises in 7 federal regions of Russia have been interviewed (see Table 1);
- 23 experts-executives from innovation infrastructure of universities (science parks/research parks, centres for technology transfer, etc.) and from small enterprises have been interviewed, with the objective being to investigate the main tendencies in small innovation entrepreneurship development and its problems within the framework of innovation infrastructure of large universities.

### General framework of a questionnaire for enterprises in scientific and technological areas

<table>
<thead>
<tr>
<th>Subject matter</th>
<th>Question type</th>
<th>Question examples</th>
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<tbody>
<tr>
<td>Particularity of entrepreneurship in scientific and technological areas</td>
<td>Open questions</td>
<td>What are the specialists you need the most now?</td>
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</table>
| | Closed questions | • Government support for your enterprise is:  
  a) necessary;  
  b) more necessary than unnecessary;  
  c) irrelevant.  
• Which sources of finance do you use (your own sources, direct investment, grants, bank loans, other)?  
• Which institutions do you cooperate with within the framework of your scientific and technological innovation activity (research institutes, commercial banks, venture funds, angel investors, foreign financial institutions, universities, other organizations, do not cooperate)? |

| Evaluation questions | |  |
|---------------------|-------------------|
| • Evaluate your personnel according to a 10-point grading scale. Comment on your answer.  
• Evaluate your enterprise’s resource needs according to a 5-point grading scale. The resources are: engineering equipment, production and laboratory equipment, production and laboratory premises, offices. |

Source: Molchanova, 2010a, p. 151.

The research has incorporated facts and results from 108 publications of recent years, all of which are devoted to the issues and developmental tendencies of small entrepreneurship in scientific and technological areas in Russia.

Research results

A new model of a university as a basis for development of cooperation with business

There is a strong connection between the development of small innovation entrepreneurship and changes of “a large university” model. Traditionally, universities have been centres for training researchers and for doing fundamental research. Now they are also accumulating innovation activities, i.e., they are becoming “entrepreneurial universities” (Crow, 2008; Herrmann, 2008), and their aim is to facilitate innovation to be introduced into industry and other sectors of economy. Thus, a university would rather support numerous and maximally diversified scientific and technological innovation initiatives, than sign a few but large contracts, the latter has been quite typical recently for many institutions.

Such policy allows universities to transform from an exclusive type of organization into an inclusive one. A new university model is oriented to technology transfer and entrepreneurship development, what makes universities leaders in driving innovation economy nowadays. The efficient innovation policy of a university catalyzes innovations, creation of new jobs and economic growth (Litan, Mitchell, 2008).

It should be noted that our interviews have shown that there is a great potential for cooperation between small innovation enterprises and educational institutions alongside with other actors of the innovation system in Russia (see Figure 1). However, there are only 45% of small enterprises in scientific and technological areas, among those which we have studied, cooperating now with educational institutions, and there are a bit more than 10% of enterprises that would like to cooperate. All the rest are not interested in such cooperation or do not understand what it is for.
While a new university model is evolving, new intellectual approaches towards creation and expansion of an innovation infrastructure of large universities should be formed (Maggioni, Del Giudice, 2008). Thus, there is an illustrative example of the current problem with innovation infrastructure of universities in Russian Federation: the innovation projects are isolated and scattered; there is no synergistic accumulation of technological improvements. Some entrepreneurial structures functioning within universities have to seal off the breach between fundamental science and real sector of economy. A new role of knowledge in society changes the very character of interaction between universities and real sector of economy. In the industrial economy the universities supplied industries with technologies through contractual investigations, consultancy and other, external towards university, forms of interaction. Nowadays in our post-industrial society researchers and entrepreneurs are congregating into “knowledge pools”.

This brings about a formation of clusters with large universities or corporations as their centre, and many small innovation companies as their periphery. Hence a system emerges where theoretic research is still profound, but already is not the only source of knowledge. Active university spin-offs inject “cells of entrepreneurship” into contemporary academic culture (Sjolundt, Walhbin, 2008). Universities are becoming drivers of innovation process in the economy; they tend to be involved in creation of national innovation systems.

An important step in development of entrepreneurship in scientific and technological areas is a federal law of Russian Federation of 2 August, 2009, № 217-FL “Later enactments in the Russian Federation on creation of business companies in the state-owned research and education institutions to apply (introduce) the results of intellectual activity”. According to this law universities and scientific institutions have got a right to set up companies. By now in Russia there have been no companies established by universities. It is difficult to evaluate and assess the future impact of this law on growth of innovation entrepreneurship. On the one hand, some experts think that the law has been long awaited for, and they expect much from it. But one can also hear opinions that its ratification does not allow educational institutions to work much on innovation projects: there are still many unsolved issues which cannot be tackled by universities alone; many universities do not enjoy the ne-
cessary infrastructure even to get involved in such activity.

Some problems of development of innovation infrastructure within universities

There are some good tendencies how the infrastructure of small innovation entrepreneurship in Russia is getting more mature. However, the specialists point out that there are some problems with it. Mainly they are connected with inappropriate governmental support for small entrepreneurship which eventually affects small-sized business counterproductively.

So, what are those problems in particular? Nowadays the experts more often indicate the following formidable obstacles encountered by entrepreneurship in research & education areas in Russia:

- There is a lack of qualified managers and scientists who have both knowledge and skills to commercialize the results of scientific work, to manage the innovation companies and projects; consequently, there is a lack of qualified human resources for innovation infrastructure.

- The level of internationalization (i.e., contacts with companies from other countries) and exporting potential of the Russian innovation enterprises is inadequate.

- The level of development of public-private partnerships in research & education and innovation areas is inadequate.

- The amount of governmental investments into small innovation entrepreneurship is insufficient; there is a lack of state financing on the initial stage (3-5 years) of creation of university innovation infrastructure or there is none.

- Extremely low level of social support of the employees in the small-sized businesses.

- There are no unified approaches to the monitoring of the activity of small innovation enterprises; there are problems in statistic registration of their activity, etc.

One more problem that hampers the creation of small enterprises in scientific and technological areas within current university infrastructure is that there is practically no rotation of small businesses in the science parks, information and technology centres (ITC) and other structures. This situation brings on interlock (decrease) of client base of the science parks. And when there is no “output”, there is no “input”, i.e., no new small innovation enterprises. Consequently, the science parks, ITC and other components of innovation infrastructure very often become a sort of “tenement houses”, which means that they generate profit from renting premises to small enterprises. As suggested by the specialists from ITC of the town of Zelenograd (Moscow region), one of the solutions to these problems which would allow speeding up the process of emergence of small science-intensive enterprises is to develop the network of “centres of collective use” (multi-access), of competencies centres where scientific teams-beginners and seed companies could use modern equipment and technologies.

However, it should be mentioned that the infrastructure services small enterprises are provided with are not of very high quality. They are consulting services concerning patents and copyrights; certification and standardization; technological audit; marketing and sales promotion; investments; partners and subcontractors. Thus, conceptual and practical decision of stimulating competition in the sphere of providing services by using innovation university infrastructure seems to be a good way of supporting small innovation enterprises with the high-quality services they need (Townsend, 2009).

Better staffing solutions for small enterprises in scientific and technological areas

During our research the focus was on the staffing problems in small enterprises. These problems are really daunting because small business in contrast to large business does not possess sufficient human resources which would allow it to differentiate the work among many specialists. Thus, the training process for the staff of small innovation enterprises becomes of utmost significance. It should aim at training interdisciplinary competencies and enhancing those competencies which employees already have. Besides, in particular, it should provide the employees in small innovation enterprises with flexible and continuous education in marketing, management and other areas connected with efficient operating of the business on the market in a fast-changing economic and technological environment. These are the areas of professional activity, as our research has shown, which usually differ from the university education of founders and top specialists in the small enterprises in scientific and technological areas.

On the other hand, a fast-changing business environment of small innovation entrepreneurship proves a set of questions the employees of such companies should answer, and the competencies they should have, to be very unstable and varied. Therefore, the training and consulting centres of innovation infrastructure face a problem of how to form a flexible network society of instructors and experts. In this connection it is worth noting here that in turn the entrepreneurs with high creative potential and those who are working successfully in scientific and techno-
logical areas, can be attracted more to serve as such experts and instructors. It would facilitate the exchange of the best practices among businessmen.

After analyzing the possibilities of training entrepreneurs in institutions of higher education, it is evident that contemporary universities are becoming the generators of entrepreneurial activity. There are several reasons for that:

- universities and entrepreneurial structures are exchanging information, knowledge and human resources with each other;
- universities take the responsibility to train both beginners and the already working entrepreneurs;
- there are changes in both nature of education process and its curriculum; they are more business-oriented now;
- many universities establish structures or provide programs which give the basics of entrepreneurship.

Tendencies in education services, which small innovation enterprises are provided with, give an opportunity to describe some peculiarities of new entrepreneurial teaching paradigm. The teaching process is concentrated on the development of such abilities and skills as solving unusual managerial and other problems; creativity; “coopetition” (“coo” from “cooperation” + “petition” from “competition”), i.e., cooperative competition. If this teaching pattern is followed, then the entrepreneurial way of thinking is no longer a privilege of the economists and managers, rather, it becomes a characteristic of representatives of engineering and natural and scientific fields.

There are some key requirements how to train specialists for innovation entrepreneurship as entrepreneurs themselves and other experts in innovation activity see them. Those requirements include: teamwork and project-work skills; constructive and critical attitude towards universal theories, models and mechanisms; culture of taking responsibility; ability to analyze systemically and to solve complex problems.

Meanwhile, the Russian professionals still argue if it is possible to teach entrepreneurship. This important question of staffing is usually very topical at the initial stages of creation of small enterprises in scientific and technological areas. The key points here are entrepreneurial behaviour and entrepreneurial way of thinking, which can contribute to a solution to the problem. These categories are significant because the external environment is uncertain, and it is difficult to forecast changes in economic situation.

The staffing problem in small enterprises in scientific and technological areas, regardless of their stage of development, should be tackled systemically and efficiently. This approach suggests that for that purpose a multilevel system of special training, connected with future innovation activity, should be devised at classic universities. The main principles of teaching specialists within a framework of such a system are:

- multilevel approach towards training of different categories of specialists;
- module-like syllabuses and continuous updating of teaching materials;
- international cooperation, i.e., participation of foreign experts and representatives of innovation infrastructure; joint curricula; internships, etc.

Sometimes the arguments arise in academia whether to be involved in entrepreneurial activity or stay detached, in other words, there are some barriers to development of entrepreneurial culture. Scientists and instructors can be involved in entrepreneurial activity, but, and it should be underlined, they have to realize that the process of commercialization is extremely uncertain, chaotic and complicated. That is why they have to possess the qualities that are essential for a successful entrepreneurial activity in scientific and technological areas, namely: flexibility, ability to change the tactics and find new approaches swiftly; in short, a unique combination of scientific and entrepreneurial qualities.

The abovementioned peculiarities of staffing in small innovation enterprises cause the very competition between universities, which strive for attracting scientists and professors who are capable of contributing to university innovation entrepreneurial activity. To put it in other words, the staffing problem of innovation entrepreneurship is closely connected with that of universities. There is an evident interconnection: the more successful the innovation sector of the university, in which small innovation companies are included, is, the better staffing the university has.

At this point, it should be noted that the participation of Russian universities in the life of innovation commercial enterprises is associated with the conflict of interests. Universities in Russia are non-commercial organizations which function and produce knowledge as a public good. Instructors, scientists, PhD students and undergraduates may participate in emerging innovation enterprises, but it should not distract them from their main activity, i.e., carrying out scientific research and teaching or studying. Admittedly, this conflict of interests may devalue academic priorities, impede scientific independency, divert the universities from their mission to generate and disseminate knowledge that is useful and necessary for the society. To overcome this conflict, Russian universities should elaborate and implement special mechanisms;
likewise many American universities are working out a special policy about conflict of interests which arise when a small innovation enterprise is being created within the university.

Another staffing problem of small innovation entrepreneurship within large universities in Russia is that undergraduates and PhD students are not very much involved in the activity of small enterprises to commercialize knowledge. As our survey has shown, the main obstacles for the students, as they see them, to getting involved in entrepreneurial activity and being entrepreneurs are financial risks and a lack of proper business idea.

Furthermore, one should bear in mind that there is also a problem of cultivating entrepreneurial spirit in research and education area. The experts from many countries point out that even though universities have resisted commercialization for some time, during the last twenty years the situation in the developed world has changed (Molchanova, 2010b). Those changes have resulted in the fact that many universities themselves as well as their structural units are moving towards market relations. During our research many specialists have underlined the facts that it is important for the entrepreneurs to be recognized publicly; setting up small enterprises should be attractive; it should be admitted that small enterprises contribute a lot to the economic growth and to the increase in employment rate. These data should be included into politicians’ speeches, should be reported in mass media and should be supported by local authorities. There are some key principles to be followed here while solving the problem. They are, for example, a principle “to think about a little one first”, then a principle “to give a second chance”, i.e., to support honest businessmen who have gone bankrupt, a principle of “government responsiveness” to the needs and requirements of small entrepreneurship.

The findings of our research, namely tendencies and problems of small entrepreneurship in scientific and technological areas in Russia, will form a basis for elaborating future guidelines how to enhance government support mechanisms for the small innovation entrepreneurship in Russia.

Conclusions

Last years in Russia have been marked with many efforts to modernize the economy, to diversify it and to develop alongside an innovation path. Nowadays many large government projects to develop innovation area as well as to integrate large-sized business with education and science are underway. To illustrate this there is a good example of the technology town called Skolkovo, which is the biggest innovation centre in Russia, situated in the Moscow suburbs. Government actively supports the cooperation of scientific institutions with such large hi-tech companies as Russian Corporation of Nanotechnologies (Rusnano) and Russian Technologies State Corporation. Nevertheless, the sector of Russian small innovation enterprises is developing quite slowly. In practice, the potential of government support for innovation entrepreneurship has not been fulfilled yet. From the international experience it is known that small enterprises are often generators of radically new innovation ideas and initiators of innovation processes. Thus, the poor development of innovation entrepreneurship influences badly the innovation climate in Russia.

This article presents the results of the research that was looking at the reasons of an unsatisfactory situation with small innovation enterprises. It is shown here that there is a strong connection between growing small innovation entrepreneurship and a changing model of a large university. It is believed that the infrastructure, maintained in large universities to support small entrepreneurship, affects small business counterproductively. Enhancement of staffing solutions of small enterprises in scientific and technological areas is considered to be a key factor of small innovation entrepreneurship prosperity. It can be achieved through cooperation with leading universities.

One of the perspectives of further research of innovation entrepreneurship is the elaboration of mechanisms of public-private partnerships in education area to support small enterprises. The research team together with the author of the article as a project leader continues the work in this field (Molchanova, Livshin, 2009) and invites everybody who is interested in that to join them.

References

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Summary

The article gives the picture of the results of the research project, which aims at theoretical foundation of issues and perspectives of development of entrepreneurship in scientific and technological areas in Russia. The results of this theoretic analysis help to elaborate the guidelines for the Russian government to support innovation entrepreneurship.

Theoretical framework of the research is based on the Key Success Factor approach. One of the core factors of competitive innovation economy in Russia is entrepreneurship in scientific and technological areas. In other words, one of the key success factors of the strategy aimed at building up innovation economy in Russian Federation and its regions is the development of innovation entrepreneurship based on close cooperation between business and research & education areas. This approach has given rise to the structure of the research, has necessitated the strategic analysis of innovation entrepreneurship in Russia and its supporting infrastructure, and the examination of weaknesses and strengths of entrepreneurship, together with its problems.

While carrying out the strategic analysis of the Russian entrepreneurship in scientific and technological areas, some methods have been actively applied, such as social monitoring, systemic and comparative analyses and benchmarking. During social monitoring, the project team has done the following: representatives from 429 small innovation enterprises in 7 federal regions of Russia have been interviewed; 23 experts-executives from innovation infrastructure of universities (industrial parks/research parks, centres for technology transfer, etc.) and from small enterprises have been interviewed, with the objective being to investigate the main tendencies in small innovation entrepreneurship development and its problems within the framework of innovation infrastructure of large universities. The research has incorporated facts and results from 108 publications of recent years, all of which are devoted to the issues and developmental tendencies of small entrepreneurship in scientific and technological areas in Russia.

The paper dwells upon a new model of a university as the basis for development of its cooperation with business. Traditionally, universities have been centres for training researchers and for doing fundamental research. Now they are also accumulating innovation activities, i.e., they are becoming “entrepreneurial universities”, and their aim is to facilitate innovation to be introduced into industry and other sectors of economy. Thus, a university would rather support numerous and maximally diversified scientific and technological innovation initiatives, than sign a few but large contracts, the latter has been quite typical recently for many institutions.

There is a great potential for cooperation between small innovation enterprises and educational institutions alongside with other actors of the innovation system in Russia. There are only 45% of small enterprises in scientific and technological areas, among those which we have studied, cooperating now with educational institutions, and there are a bit more than 10% of enterprises that would like to cooperate. All the rest are not interested in such cooperation or do not understand what it is for.

While a new university model is evolving, new intellectual approaches towards creation and expansion of an innovation infrastructure of large universities should be formed. A new knowledge-based society changes the very character of interaction between universities and real sector of economy. In the industrial economy the universities
supplied industries with technologies through contractual investigations, consultancy and other, external towards university, forms of interaction. Nowadays in our post-industrial society researchers and entrepreneurs are congregating into “knowledge pools”. Active university spin-offs inject “cells of entrepreneurship” into contemporary academic culture. Universities are becoming drivers of innovation process in the economy; they tend to be involved in creation of national innovation systems.

An important step in development of entrepreneurship in scientific and technological areas is a federal law of Russian Federation of 2 August, 2009, № 217-FL. According to this law universities and scientific institutions have got a right to set up companies. By now in Russia there have been no companies established by universities. On the one hand, some experts think that the law has been long awaited for, and they expect much from it. But one can also hear opinions that its ratification does not allow educational institutions to work much on innovation projects: there are still many unsolved issues which cannot be tackled by universities alone; many universities do not enjoy the necessary infrastructure even to get involved in such activity.

There are some good tendencies how the infrastructure of small innovation entrepreneurship in Russia is getting more mature. However, the specialists point out that there are some problems with it. Mainly they are connected with inappropriate governmental support for small entrepreneurship which eventually affects small-sized business counterproductively. The infrastructure services that small enterprises are provided with are not of very high quality. They are consulting services concerning patents and copyrights; certification and standardization; technological audit; marketing and sales promotion; investments; partners and subcontractors. Thus, conceptual and practical decision of stimulating competition in the sphere of providing services by using innovation university infrastructure seems to be a good way of supporting small innovation enterprises with the high-quality services they need.

During our research the focus was on the staffing problems in small enterprises. These problems are really daunting because small business in contrast to large business does not possess sufficient human resources which would allow it to differentiate the work among many specialists. Thus, the training process for the staff of small innovation enterprises becomes of utmost significance. It should aim at training interdisciplinary competencies and enhancing those competencies which employees already have. Besides, in particular, it should provide the employees in small innovation enterprises with flexible and continuous education in marketing, management and other areas, connected with efficient operating of the business on the market in a fast-changing economic and technological environment. A fast-changing business environment of small innovation entrepreneurship proves a set of questions the employees of such companies should answer, and the competencies they should have, to be very unstable and varied. Therefore, the training and consulting centres of innovation infrastructure face a problem of how to form a flexible network society of instructors and experts. In this connection it is worth noting here that in their turn the entrepreneurs with high creative potential and those who are working successfully in scientific and technological areas, can be attracted more to serve as such experts and instructors. It would facilitate the exchange of the best practices among businessmen.

Tendencies in education services, which small innovation enterprises are provided with, give an opportunity to describe some peculiarities of new entrepreneurial teaching paradigm. The teaching process is concentrated on the development of such abilities and skills as solving unusual managerial and other problems; creativity; “cooperation”. If this teaching pattern is followed, then the entrepreneurial way of thinking is no longer a privilege of the economists and managers, rather, it becomes a characteristic of representatives of engineering and scientific fields.

The mentioned peculiarities of staffing in small innovation enterprises cause the very competition between universities, which strive for attracting scientists and professors who are capable of contributing to university innovation entrepreneurial activity. To put it in other words, the staffing problem of innovation entrepreneurship is closely connected with that of universities.

**Keywords**: entrepreneurship, R&D, Russia, innovation, infrastructure, university.

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