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Youth's Interest in Science and Innovation and the Conditions for Leadership in Russia

Abstract: The purpose of the study is to identify the interest of young professionals to work in the field of science and innovation, as well as the necessary conditions for realization of their leadership potential in the employment behavior and in interaction with the authorities.

The theoretical understanding of the behaviour and leadership opportunities for youth is based, first, on the approach of D. McClelland, under which labor activity, its result is determined by the interaction of three variables: motives, personal capabilities and qualities. Second, on the theory of expectations of V. Vroom studying work motivation. Thirdly, on the theories of positive leadership, in particular used the concept of distributed leadership by D. Bradford and A. Cohen, and terms and the conditions of group leadership of N. Tichy.

Using data from a survey of graduates conducted in 2015–2016, IEIE SB RAS (2573 respondents) identified the motives of choice of profession graduates and their preferred areas of employment. Shown significant differences in motivation between those who want to work in the field of science and innovations and those aimed at other areas of employment.

Data from the all-Russia surveys of young scientists and innovators, conducted in 2003–2004, 2010 and 2011 (1192, 1328 and 1032 respondents, respectively), allowed to characterize leadership resource of youth and the prerequisites of successful leadership. It is proved that the role of young scientists in the innovative development should be strengthened by granting them more resources and responsibility for decision making.

Keywords: Youth, interest in science and innovation, conditions for leadership.

Research Problem, Objectives and Methodological Approach

The relevance of studying of labour and educational practices is associated with the need of effective replacement of personnel for the economy, in particular in scientific and educational sphere, ensuring the involvement of young people able to implement new technology, science and innovative entrepreneurship and to modernize social institutions.

Studies show that "as a result of falling of prestige of research and teaching, reducing the social status of scientists and teachers, low level of wages, the vast majority of University students do not want to tie their future with science and education" [*Todosiichuk*, 2011, p. 36; *Ashcheulova*, 2012; *Gorshkov*, 2010, p. 168].

Object of the study: peculiarities of values, behavior, social-labor practices and use of human potential of the Russian youth.

Under educational and work practices, we mean behaviors with rules interwoven into them, on the basis of which individuals engage in education and work: they study, work, reshape themselves, turn into professionals or build up their creative potential, and also change the rules and regulations governing activities in these areas. Here we draw on P. Sztompka's definition of social practice [*Sztompka*, 1993, 1996, p. 273].

The purpose of the study is to identify the interest and motivation of young professionals working in the field of science and innovation, as well as the necessary conditions for the realization of their leadership potential, as in the employment behavior and in interaction with the authorities.

We choose to interpret the term "*innovators*" in a broad sense — encompassing firms and research institutes as well as individuals involved in innovation activities. This definition is used by German and English researchers analyzing regional networks of innovators [*Kantner*, 2011]. The broad interpretation also applies conveniently in our case, when we analyze the materials of surveys of young people involved in innovation activities.

In Russia, innovation processes do not give the desired result because of the unavailability of social institutions and actors. Requires involvement of young scientists to work effectively, because the number of researchers significantly — about 28%-decreased over the period from 1995 to 2014. Since 2009, reduced the number of PhD students [Indikatory, 2016, p. 41, 44–48]. The actual problem of Russia's modernization is creating incentives for key actors of innovative development and elaborating social policy, promoting the development of human potential.

Briefly outline the theoretical and methodological approach to the study of motivation and leadership of youth in development. The theoretical understanding of the behavior and leadership opportunities of youth is based, first, on the approach of D. McClelland [McClelland 2007, p. 566–567], under which labor activity and its result is determined by the interaction of three variables: motives, personal capabilities and qualities. Also used the methodology of the theories of human capital, human development [UNDP, 2015], structure-activity approach to the study of labour practices [see, for example: *Archer*, 1994; *Zaslavskaya*, 2003, 2008; *Sztompka*, 1993; *Shtompka* 1996; *Yadov*, 2013].

Second, on the theory of expectations of V. Vroom [*Vroom*, 1994], in which motivational factors of work are described as a set of variables, superimposed on each other: the expectation of the conformity of obtained results to their own efforts, the expectation of rewards corresponding to these results, as well as individual values of reward to a person.

Third, on the theories of positive leadership, in particular, used the concept of distributed leadership by D. Bradford and A. Cohen [*Bradford*, 1997], and terms and conditions of group leadership of N. Tichy [*Tichy*, 1997, 2004].

What Motivates Young Professionals to Choose a Career in Science and Innovation?

In this part of the study we ask the following questions: How does the motivation of a young person who chooses a career in science and innovative entrepreneurship differ from

that of a professional who has no interest in these careers? Are there at all any differences in motivation between them?

The database on career choice motivations and possible careers in science and innovative entrepreneurship includes the results of a sociological survey conducted by the IEIE SB RAS in 2015–2016 (coordinator: I. I. Kharchenko). The data array used in our study contains responses characterizing the work practices of 2573 graduate students of 12 universities in the Novosibirsk region. As part of the survey, researchers interviewed 454 final-year students of Novosibirsk National Research State University (NSU), one of Russia's leading universities preparing specialists for science and for the innovative segment of the economy.

To identify the undergraduates' motivations for choosing a profession that requires high qualification levels, we analyzed their answers to the question: To what extent did the listed aspects of the future profession influence your choice? The question contained 13 clues, which we subjected to factor analysis; as a result, we identified 4 main motivations for the entire array of university students (the explained variance was 54%; the numbers in parenthesis show the contribution of each factor): (1) prestigious profession, career prospects, and earnings (18%); (2) avoidance of strenuous work (ease of enrollment and studies and availability of benefits, 14%); (3) creative motivation and interest in profession (12%); (4) personal self-fulfillment (10%). Moreover, the factor of personal self-fulfillment is represented by two mutually exclusive components: male students prefer to work with technology while females prefer jobs that involve communicating with people.

Then we checked whether the same set of factors applies to the motivations of students willing to work in science and innovative entrepreneurship and to those of people with different career choices. 27% of the surveyed undergraduates answered the question "Would you like work in science and research after graduating from university?" as "yes, I certainly would" or "yes, I would like to, under certain conditions". Among the students of NSU, a half (49%) of those surveyed intend to work in science and innovation.

We conducted the factor analysis separately for future professionals who are willing and not willing to work in science and innovation ("*interested in a career in science*" and "*uninterested in an academic career*"). We obtained four substantially similar factors and subjected them to rapid cluster analysis; as a result, we built a distribution of students by groups/clusters differing in their prevailing motivations. The results are given in Table 1. The future professionals who interested in a career in science have a distinct creative motivation; uninterested in an academic career have a distinct motivation for self-fulfillment.

The factor analysis for the group composed of NSU undergraduates also revealed four factors (the total explained variance was 62%). The interpretation of two of them coincided with the motivations identified for the entire array. Interestingly, the NSU group also showed a broad representation of such clusters as lack of interest in profession and avoidance of strenuous work. The interpretation of the other two factors, underpinning the identification of the clusters, differs from that for the entire array. The factor of creative motivation incorporated such a component as career prospects, which in the other cases was part of the first factor, i.e., prestigious profession, career growth, and earnings. The fourth factor, self-fulfillment, acquired a somewhat different meaning because the respondents wished to pursue the same career as their parents. We called it "self-fulfillment in the same career as a parent".

The most influential factor for the entire pool of young professionals is prestigious profession and economic motivation. However, NSU students more often show creative motivation, which also lies at the heart of career growth. A quarter of students lack interest in profession. They study only to earn a degree and, for NSU students, a degree from this particular university.

Table 1

Distribution of undergraduates from universities of the Novosibirsk region by clusters differing in the prevailing career choice motivation

Prevailing motivation in the cluster	Percentage of students in the cluster		
	science career choosers	non-science career choosers	NSU
Prestigious profession, economic motivation	38	40	
Lack of creative motivation and interest in profession	16	25	26
Avoidance of strenuous work	8	11	11
Self-fulfillment: preference for working with technology		24	
Creative motivation	38		
Creative motivation and career growth			39
Self-fulfillment in the same career as a parent			24
Total	100	100	100

Let us briefly describe the composition of each of the groups and their ideas about life success.

"Interested in a career in science" show a greater representation of males than females (z = 4,0); a half of this group (50,3%) finished not an ordinary high school but a lyceum, university-preparatory school, or special school with in-depth study of certain subjects (z = 6.4). Moreover, this group has a higher proportion of respondents evaluating their parent family's financial situation as below average (17%, z = 4.2). As a rule, they study at the university on a budgetary (non-paid) basis (z = 8.4), and most of them (69.3%) intend to pursue a career in their specialty.

This group sees more value in interesting professions (z = 2.8) and less value in prestigious professions (z = –3.2), compared with the alternative group (fig. 1). Obviously, potential scientists attach importance to good education and high qualifications (z = 3.2 and z = 3.5) and to public recognition (z = 2.7).

"Uninterested in an academic career". More than a half (53%) of this group are females who graduated from an ordinary high school (66%); a third of this group study at the university on a paid basis (32%, z = 7.0) or participate in a targeted enrollment program (whereby a company or public agency pays for his/her education; 7%, z = 4.0), which is a significant distinction from the alternative group. More than a half of these professionals do not intend to work in their specialty: 7% answered that they "do not intend to" and 48% said "maybe" (z = 4.0 and z = 9.1, respectively). Also, this group has a higher proportion of those who assess the financial position of their parental family as "a family with an average income" (66%, z = 4.1). They place more value in health, family, and friends (z = 3.0, z = 2.6 and z = 2.1, respectively). In terms of career and employment, they attach more importance to prestigious professions, material well-being, and working in a managerial position or running one's own business (z = 3.2, z = 2.2, z = 1.9 and z = 2.6).

Do the representatives of these two groups have different requirements for their potential workplace? For all the young professionals, the most important factors underpinning their employment choices are good working conditions, wage levels, and career prospects.

Potential scientists place a high priority on such characteristics as pursuing careers that match their specialty and qualifications (table 2); flexible work patterns and creative nature

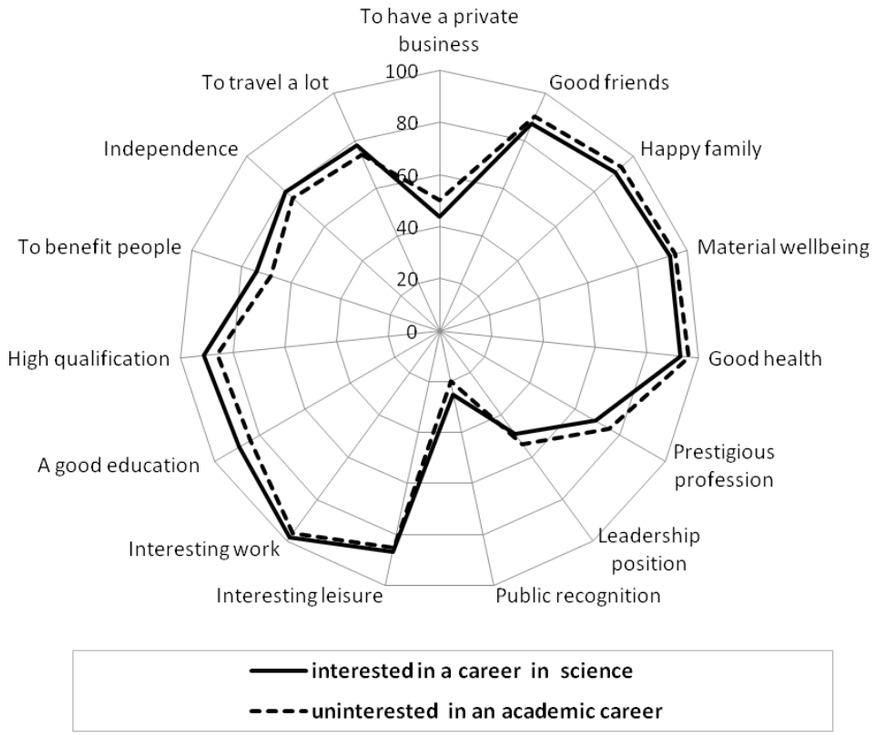

Figure 1. Proportion of young people who attach importance to certain components of life success, depending on their interest in an academic career, %

of the work; professional development and upskilling; social usefulness of their work; and an opportunity to obtain housing on preferential terms (the *z*-statistics varies from 2.4 to 7.8). Non-science career choosers are more focused on high wages, stability of employment, and avoiding the threat of dismissal. 71 % of these respondents do not consider pursuing a career that matches their specialty and qualifications as a necessary requirement.

We should also note the effects of certain factors on career motivations. Firstly, gender differences manifest themselves in a more expressed economic motivation in males (37 %). Female students tend to prioritize creative motivations (37 %). Secondly, students who graduated from a rural school more often show motivation for avoiding difficulties. One of the reasons is the opportunity to enter university on preferential terms due to the modest financial position of their families.

There are, as before, unequal opportunities for professional education, which depend on the accumulated social capital: among the students of Novosibirsk State University, there are considerably more graduates of specialized schools with in-depth study of certain subjects, lyceums, and university-preparatory schools.

Table 2

Workplace characteristics and working conditions important in the employment of science and non-science career choosers, % of respondents for whom the condition is mandatory

Workplace characteristics and working conditions	«Interested in a career in science»	«Uninterested in an academic career»
1. Career that matches one's specialty and qualifications	45*	29
2. Proximity to home	11	10
3. Good wages	60*	68
4. Good coworkers	49	51
5. Non-stressful work	20	20
6. Flexible work patterns	13*	9
7. Creative nature of the work	20*	13
8. Prestige	26	26
9. Career growth opportunities	64	61
10. Professional development opportunities	57*	46
11. Good working conditions	69	68
12. Social usefulness of the work	42*	33
13. Opportunity to provide high-quality services and make impeccable products	45*	36
14. Housing opportunities (private homes, communal housing)	20*	16
15. Absence of dismissal threat	23*	26
16. Labor unions	11	9

* is used to highlight item values that differ significantly for the two groups

Preferred employment

Most of those young professionals who, under certain conditions, are willing to work in science, would actually prefer this employment (fig. 2). The second best option for males is employment in the real sector of economy, while female students prefer employment in social welfare institutions and consider science as their second best option. Those males who do not see themselves in science prefer employment in industry, transportation, etc., and females, in health care, education, etc. Their second best option (for both sexes) is the financial sector, trade, and real estate.

Since the majority of young male professionals are interested in working in industry, construction, and transportation, and women, in the social sector, they can become a social agent of re-industrialization. Of course, if their professional competencies allow them to master complex technology.

Moreover, there are enough of those who might join the ranks of young scientists and innovators: about 15 % of all young professionals named science, higher education, and IT as their most preferred employment. The gap between the motivations and actual employment in this area suggests that public institutions are not prepared to effectively stimulate the entry and productive work in research and development. Wage increase and good career

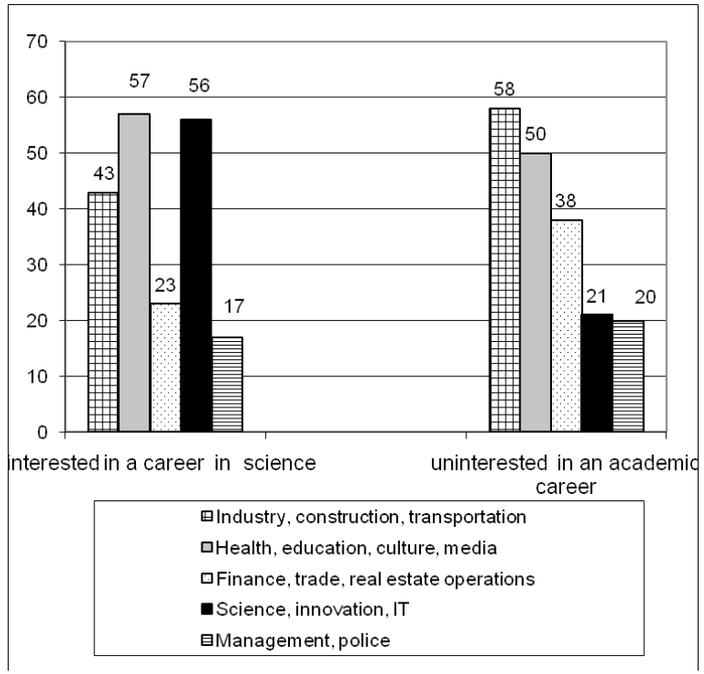

Figure 2. Preferred areas of employment for young people interested and uninterested in an academic career,% of those respondents who answered the question

prospects would attract and keep young professionals in science and innovation. This is evidenced by the equal representation of creative and economic motivations: each of these motivations dominates in a cluster amounting to 38 % of science career choosers.

Leadership Role of Young Researchers in Innovative Development of Russia

In studying the role of young academics in innovative development, we relied on the concept of *shared leadership* proposed by D. Bradford and A. Cohen. It applies to a group of people of the same intellectual, cultural, and social level. Importantly, all group members "... should have about the same personal achievements and possess effective communication skills and basics of both leadership and followership behaviors" [*D. Bradford*, 1997; cited by *Filonovich*, 2003, p. 12]. Young academics have precisely these qualities, so this group can practice shared leadership both within organizations and within a social-territorial community.

Another important element of our study is the group leadership conditions formulated by N. Tichy. A necessary condition for long-term successful development is the presence of leaders at all levels in the hierarchy, with top leaders cultivating leaders of a lower level in the organization. The leaders should (a) have a vision they can teach to the followers and (b) be able to teach and have a command of teaching techniques [*Tichy*, 1997, 2004].

As *the information base* were several large-scale surveys of Russian scientific youth. The data on young researchers' priorities and work motivations including incentives and barriers for their involvement in innovative development cover two periods: 2002–2004 and 2008–2011. The 2002–2004 all-Russian survey of young researchers (1192 respondents from 70 cities representing all the federal districts of Russia; coordinator: E. S. Gvozdeva) showed that at the beginning of the millennium young people were also oriented on innovative development and attached great importance to the improvement of culture and education. These areas were higher on their list of priorities even than an increase in salaries in the budget sector (fig. 3). According to young people, development of science and research-intensive businesses, affordable housing, new jobs, and increased labor productivity were more important for Siberia than for Russia in general. Unfortunately, Siberia is still lagging behind in these aspects. The data of the all-Russian Internet survey of researchers and innovators carried out in 2011 (1032 respondents from all the federal districts of Russia; project coordinator: E. S. Gvozdeva, project participants: D. D. Gazzaev and A. G. Tyrtyshnyi) show that, in the Siberian and Far Eastern Federal Districts, only 23 % of those responded participate in innovative projects, whereas this share is 41 % in the Central and 48 % in the Volga Federal District.

It was also in 2010 that, during a study on social practices of participation in innovative activities, three groups of young people[1] were surveyed (coordinators: A. I. Andreev and E. S. Gvozdeva). In our view, these groups represent the creative youth of Russia with a strong civil position who are trying to participate in innovative development in various ways. Moreover, we took 35 interviews of experts (government officials, scientists, representatives of high-tech businesses, and leaders among young researchers).

To describe the performance of young researchers and the results of their participation in innovative projects, we also use the materials of the survey of the most productive young researchers (1328 people, 2010, coordinator: A. Andreev). This group will be referred to as *creative leaders*; according to the regional Councils of Young Researchers and Professionals (CYRP), these young people showed the best performance in their regions. These young leaders submitted data on their research and social activities, and a part of them (290) filled in the questionnaire within the 2011 all-Russian survey.

[1] The first group — *students and young researchers from the CIS countries (1535 people)* — are the participants of Lomonosov-2010, an international forum of young researchers (Moscow), working in various fields; 11 % of them are from abroad. A majority of the participants are students (61 %); there are more women in this group than men (68 and 32 %, respectively).

The second group — *Siberian innovators (192 people)* — are the participants of the young innovator support program "Lavrentiev's Breakthrough," the Summer School organized by Technopark of Akademgorodok, and the Regional Innovation Convention and Leaders Forum within the International Youth Innovation Forum "Interra-2010" (Novosibirsk). A majority of them are men (62 %) willing to implement their developments and become leaders in the innovative sector. Most of them come from Novosibirsk and other Siberian cities; three fourths of them carry out R&D in engineering and physical and mathematical sciences.

The third group — *regional CYRP leaders (85 peop*le) — are the participants of the All-Russian Conference on Young Researchers and Professionals Support Problems (Moscow–Pushkino). They represent the Councils of Young Researchers and Professionals (CYRP) of almost all the Russian regions. They are older than the representatives of the two other groups; a majority of them are men (71 %) holding leadership positions both in science and in CYRP.

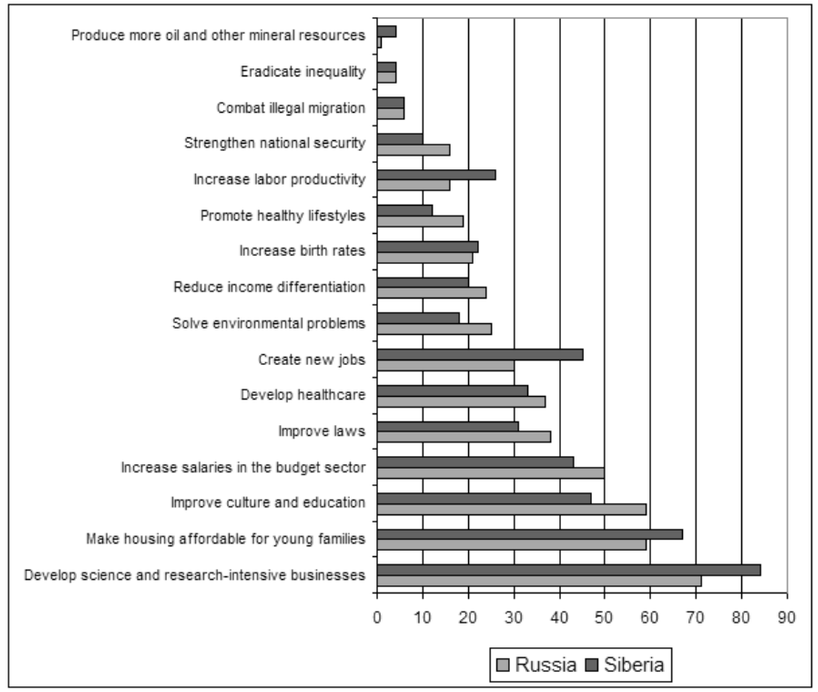

Figure 3. Priority areas of development in Russia and Siberia according to young researchers, % of those responded.
Source: Data of the 2002–2004 all-Russian survey.

Leadership Resource of Young Researchers: Performance and Participation in Innovative Projects

To evaluate the leadership resource of young researchers, we need to elicit the scope and patterns of their actual and potential participation in innovative activities. The major performance indicators are the number of publications and patents of invention and the scope of participation in innovative projects, teaching and other socially relevant activities.

The survey of Russia's most productive young researchers included interviewing representatives of all the eight federal districts of Russia. Over a half of *creative achievers* have an academic degree: candidate of sciences under 35 years of age (56 %) and doctors of sciences under 45 years of age (5 %). 58 % of this group are engaged in teaching, and 17 % of those responded, or almost a third (30 %) of those who teach, hold the title of Assistant Professor. The teachers group also includes young professors (eight people). Considering their high creative potential, let us look at the performance of this group, bearing in mind that the performance of the most part of young researchers is much more modest. The data on the creative activities of this group are given in table 3.

Table 3

Average number of patents and publications of young researchers by field of research, items per person

Type of publication	Natural sciences and engineering	Humanities	Social sciences and economics	No field cited
Total number of publications	40.9	27.3	34.6	26.3
Patents of invention	2.2	0.2	0.7	2.2
Including:				
papers in Russian and foreign peer-reviewed journals	7.6	3.0	3.7	6.0
monographs	0.7	0.7	1.8	0.5
textbooks	0.1	0.2	0.5	0.5
training manuals	2.4	2.1	3.9	4.6
popular scientific works	2.4	1.4	3.9	1.1
feature materials	2.8	6.1	5.3	1.8

Data source for Table 3 and Figs. 4, 5: The survey of young researchers — creative leaders), 2010, coordinator: A. I. Andreev

The share of young researchers whose works were supported by grants or financed within federal programs varies substantially depending on the field of research: 59 % in natural sciences and engineering, 52 % in humanities, and 32 % in social sciences and economics. Among the survey participants who did not indicate their field of research, 28 % received financial support.

The young researchers were also quite actively engaged in innovative projects and in the development of concepts and strategies for regions and individual sectors at the federal level. Innovative projects were implemented more often in the Central, Ural, and North Caucasian Federal Districts.

On average, 5 % of *creative achievers* have experience in running a small business, with this share being as high as 10 % in natural sciences and engineering (fig. 4). These are good figures; however, we should not forget that they refer to the most productive part of the youth.

A much larger share of the young people have experience in leading research teams or supervising postgraduate students (13 and 23 %, respectively). In general, this group is quite productive; they can indeed be a role model for other young researchers and take the responsibility for carrying out important tasks. Note, however, that the share of those between 35 and 42 years of age is very small in this group, only 17 %. It appears that those who have reached the 35-year threshold leave the research sector to work in other, more profitable industries.

We also attempted to assess the level of engagement in innovative activities of those groups of young researchers who took part in the sociological surveys (fig. 5). The participants were not asked to indicate the title of the innovative projects and funding sources; therefore, the data might be somewhat overestimated.

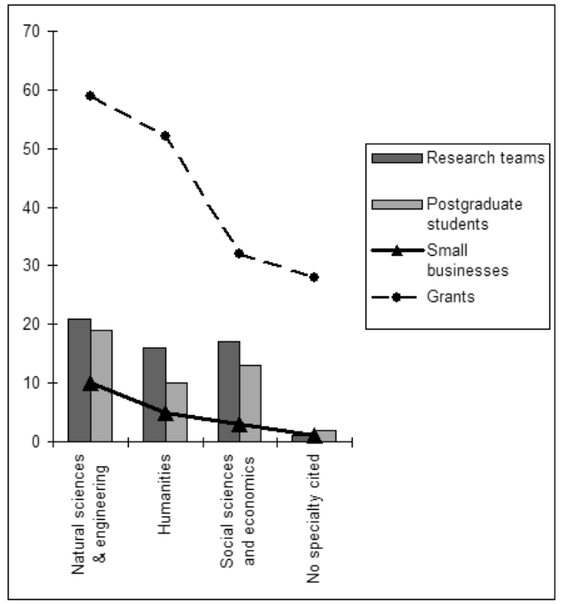

Figure 4. The share of young researchers (%) with experience in leading a research team, running a small business, supervising postgraduate students, or receiving financial support (grants) depending on the field of research

In particular, the CYRP leaders proved to be less engaged in innovative projects than innovators. In the next five years, a substantial part of the innovators are planning to set up their own business in the sphere of research or innovation (30%) and to implement their developments so as to transform them into a commercial product (27%). We hope that a majority of them will succeed; however, we should not forget that these are only plans.

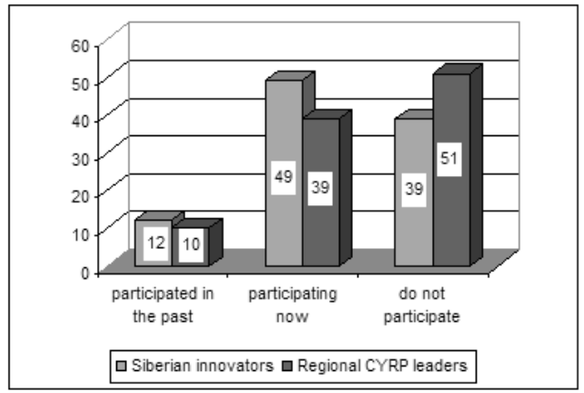

Figure 5. Distribution of the respondents according to their participation in innovative projects, %
Source: Estimates for the two youth groups who took part in the 2010 survey (coordinators: E. S. Gvozdeva and A. I. Andreev).

Conditions for Leadership of Young Researchers

It is important for a society to provide *sufficient conditions* for young people to become a full-fledged stakeholder group both in science and in interactions with government agencies. First of all, young people should have *freedom of choice to select their field of research* so as to better reveal their creative potential. In the Russian academic community, this is defined by the patterns of interactions related to the choice of a research topic. The situation is different when it comes to *efficiency of work*. On the one hand, research results produced by young intellectuals should be a significant contribution to innovative development. On the other hand, the efforts that the young researchers made in science should give them material and social protection. And if it is not so, would the young people be capable of delivering positive change?

The following factors are considered as conditions for successful leadership: (1) the leader is ready to take responsibility for the development of science and society; (2) one has freedom of choice to select one's field of research; (3) one has a possibility to formulate and advocate his/her point of view; (4) the followers have confidence in the leaders, and the leaders have confidence in the existing social institutions; (5) the society has enough resources to ensure a necessary quality of life for young researchers as well as to carry out research and introduce its results in the industry.

Let us analyze if the Russian academic community meets these conditions. According to our surveys, every second young researcher has never even thought about how they could change the situation in science for the better [*Gvozdeva*, 2009] because they do not see for themselves any possibility of participation in decision-making. More than a half of those surveyed believe that their opinion is not considered at all by government authorities at the regional and federal level and is not sufficiently considered by their employers (table 4).

Consequently, *the youth do not consider themselves responsible for what is going on in science and society as a whole.* However, young researchers indeed play a big part in the local community, because they can generate new ideas and be a source of innovative development of the territory.

Table 4

Distribution of the answers of creatively ambitious young people to the question: "In your view, is the opinion of the Russian youth considered in decision making?" 2011, % of those responded (1032 people)

Level of decision-making	Considered	Considered partially	Not considered	Do not know
By employers	7	46	40	7
By local authorities	2	31	58	9
By the government	3	28	56	13

Considering the fact that our survey participants represent the most ambitious and productive part of the youth, there are many leaders among them. These young leaders become the central persons in research teams which form around them, with these teams working on important research problems, and they determine the priorities and paths of future development. However, a fourth of those surveyed think that they are used as cheap workforce. Only a few of them indeed hold a leadership position: only 3% of the young researchers have such a big potential that they can share their knowledge and experience with representatives of the older generation (table 5). The group of those who indicate a keen competition between generations is much larger.

Table 5

Distribution of the answers of creatively ambitious young people to the question: "In your view, what intergenerational relations prevail in your industry?" 2011, % of those responded

Intergenerational relations	Under 35, 661 pers.	36 or older, 153 pers.	Researchers, 689 pers.	Innovators, 139 pers.	Average
mutually rewarding cooperation	39	55	43	40	42
young people are used as cheap workforce	24	10	20	25	21
young people learn from senior professionals	25	25	26	22	25
older generation has to learn from young people	3	2	2	4	3
keen competition between generations	9	8	9	9	9

The followers having confidence in the leaders and the leaders having confidence in the existing social institutions is another condition for leadership. In general, young researchers have the highest trust in "family members/relatives" and "peers at work/university". This means that the situation is generally favorable for young leaders to step to the fore — they have a chance to win the support of their peers, who trust them and could become their followers.

At the same time, the attitude towards authorities at all levels is either that of distrust (towards local government officials) or neutral (towards the administration of the research institute or university and the RAS). The answers to the question "Do you think that the president of Russia can be trusted?" show that the level of confidence[2] in the president is higher among young people than in the other branches of government, mass media, and the church. However, the level of confidence has somewhat decreased in 2011 as compared to 2003–2004. The reason is partly that the youth's expectations related to solving the housing problem were not met and partly that innovators encountered many problems in implementing their R&D results (absence of effective innovation support schemes). Nevertheless, young researchers still believe the president has a critical influence on the patterns of the country's development and protection of their interests.

The low level of the trust index in local authorities (–54 in 2011) is explained, on the one hand, by the low awareness of young people about the specific activities of local governments and, on the other hand, by insufficient support of young researchers and their work, which is considered to be due to a lack of interest on the part of local authorities towards these issues. A part of those surveyed also stressed that academic supervisors generally prefer not to recruit young people to work on large-funded projects.

Availability of resources to ensure the necessary quality of life and effective work of young researchers is a most relevant condition, which can either attract or repel young people from participation in innovative development. During the transition to the market economy, the

[2] The confidence index is calculated as a difference between the shares of those who gave a positive and negative answer; it lies in the interval (100, —100). The minus sign indicates distrust.

interest in science as such fell dramatically. The financial and human resource issues proved to be the most acute, and they have completely reshaped the prospects of the Russian science. A career in science lost its attractiveness, which was accompanied by a drain of most ambitious and mobile researchers away from science as a result of increased possibilities of working abroad and increased demand for creative young people in other industries.

The social standing of scientists is characterized not only by narrowed opportunities and decreased prestige in the society. Their needs and expectations to earn a fair wage for their work and provide their families with housing have so far not been met.

Young innovators from Siberia and CYRP leaders from Russian regions were asked the question "In your view, what hinders young people from doing science and innovations?", to which they were to give no more than five answers (fig. 6). The answer "scientists/innovators are not paid a fair wage for their work" was again at the top of the list (68 and 74 % of those responded), followed by "bureaucratic hurdles for innovations and venture businesses" (48 and 54 %) and "the youth are not interested; they have other values" (38 and 44 %). When a family is created and children are born, the housing and financial issues become more acute. This needs to be taken into account to ensure retention of gifted young individuals in the innovation sector when they come to the next stage in their life cycle. Otherwise, having obtained significant research results, made an invention, or developed a technology, they will have to earn a livelihood in other sectors as is a common practice nowadays.

Integrating the Efforts of Young Researchers for Innovative Development

Innovative development of Russia suggests a change in the principles of the organization of society and its subsystems. In recent years, there has been a marked change in the attitudes of government authorities towards young researchers partly because some of their development strategies fell short of expectations and the government is searching for a new outlook on the country's problems. In particular, the activities of the Russian Union of Young Scientists, the Coordinating Council for Youth Issues in Science and Education under the Presidential Council for Science, Technology and Education, and regional CYRP is targeted at the improvement of the organization of society and development of scientifically grounded programs for system transformations of social relations. Representatives of these youth organizations have been actively engaged in designing proposals for the Federal Target Program "Human Resources for Science, Research, Education and Innovation in Russia," many of which have been approved and are currently being implemented.

The young people themselves admit that they are not involved actively enough in modernization of the country's economic development (table 6). The role of a multilateral dialog between ambitious young intellectuals and business and government representatives is to create a pool of young leaders who will take responsibility for solving the country's problems. Note that these problems are always changing, which is largely due to a change in the era, which has been defined by Pierre Teilhard de Chardin as the era of large human collective units and science [*Chardin*, 1961]. In the ever-changing world, the intellectual elite (including at the regional level) should play the important role of an actor of development.

In the development of targeted innovation programs, it is important to build a tree of objectives, which should be specified in subprograms and individual projects and localized

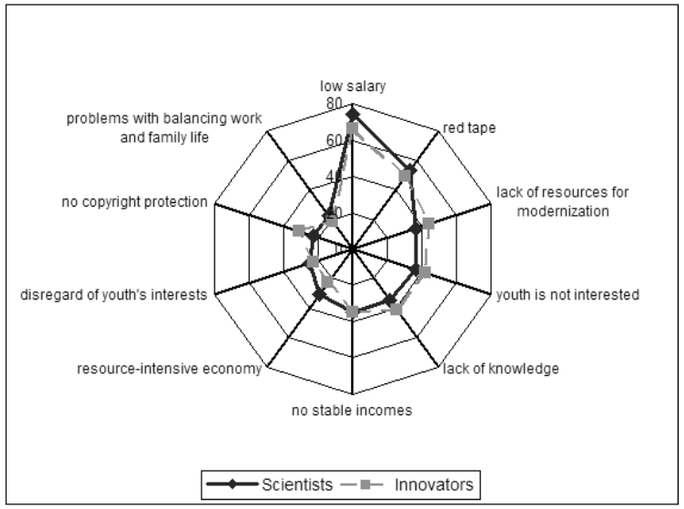

Figure 6. The share of respondent who indicated barriers in doing science and innovations, %

to different regions of the country. At this stage, the vision of the advanced youth could be very useful, of course, in collaboration with the senior peers, who are more aware of the resource constraints. In our view, young people could contribute to the solution of such a key issue in the country's socioeconomic development as the choice of ways to develop human resources who would be competent in technologies in the priority industries and would be able to develop and implement these technologies. Indeed, it is young people who would form this pool of human resources. It is often the case that researchers, engineers and chief executives are interested in new technological solutions, but managers reject innovations partly because of their outdated way of thinking and partly because of their fear of responsibility and risk. In this case, the specific competencies of young specialists as well as their leadership resource come to fore.

Table 6

Distribution of the answers of young people to the question: "In your view, is the modern youth actively involved in the development and commercialization of novel products and in innovative development of Russia?" 2011,% of those responded (1032 people)

Answer variants	under 35		36 and older
	Young researchers	Innovators	
yes	5	11	2
more likely yes	31	39	32
more likely no	48	41	44
no	10	7	13
do not know	6	2	9

The role of young researchers in innovative development should be strengthened by providing them with resources to participate in decision-making and take responsibility for the implementation of the decisions.

In a subsequent study, it would be interesting to find a method of empirical verification for the relationship between "confidence" and involvement of young researchers in the search for effective measures for the development of the scientific potential as well as decision- making and implementation of these decisions in cooperation with government authorities.

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Sustainable professional career in science and technology: interdisciplinary perspective and the Russian context[1]

We are faced with a contradiction in the approach to professional careers of scientists and engineers. On the one hand, we have an emerging environment, characterized by uncertainty, instability in regard to the status and the prospects of various groups employed in this sphere, growing mobility and diversity of career types, as well as bases for differentiation of their typology. On the other hand, the integrity and biography of a career as a process of accumulating knowledge, professional experience, resources of social networks and statuses remains an important requirement. And, from this viewpoint, it can only be long-term and consistent. Establishing a favorable professional environment remains the main task in resolving this contradiction.

The impact of various external factors on professional careers, including the science and technology sector, is becoming an urgent problem within the framework of various concepts and disciplines. Conceptual accuracy and thoroughness in the examination of external career factors distinguishes primarily the approaches to social psychology, sociology, management and organizational studies. This allows us to pose the question of infrastructure of professional careers in the field of science and technology. The conceptual framework from the viewpoint of various disciplines enriches our perceptions of it. This presentation offers an attempt to raise the problem of interdisciplinary interaction in relation to the study of the potential for regulating professional careers in the field of science and technology.

In the Russian context, its various aspects may need to be emphasized. We must take into account the specifics of the Russian situation, which during the recent decades was differentiated by the radical disruption of continuity, as well as the erosion of previous models of the work force regeneration in the field of science and technology; substantiation and establishment of new ones for more effective organization of activities in this field. In general, the analysis helps identify three levels of such infrastructure: a macro level (state policy in regard to science); middle level (on the level of a particular institution and organizations) and family level. This report utilizes data based on research projects supported by The Russian Foundation for Humanities grant № 16–03–50220).

Keywords: professional career, science and technology, sustainable career, professional association.

From the perspective of the mechanisms of their regulation, Careers in the field of science and technology are susceptible to the impact of changes in the social context, primarily, in the state policy towards the research and development sector. To a large extent, its productivity (success, efficiency) depends on the external environment created and regulated at the level of public policy. In this research paper, the productivity of a scientific and

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