# Innovative Activities and Skills

**Leonid Gokhberg** and **Valentina Poliakova**, National Research University – Higher School of Economics, Russian Federation

With the transition to a knowledge-based economy, innovation has become a driving force for economic and social change. It is already more than just a factor in the production of goods and services—it has become a form of mass awareness of both innovation and its implications.[1] In this central role, successful innovation requires the population to obtain a higher level of education, to be more creative, and to boost their ability to perceive essential achievements in science, technology, and innovation (STI) and implement those in daily practices. Progress today therefore depends not only on an economy's level of development in STI, but also on the depth of its penetration into society as well as the intellectual potential of the population, its competence in generating and applying new knowledge, and its ability to adapt to qualitatively new trends of STI development.

Population plays multiple roles in innovation.[2] It acts as the subject of production, a role that requires not only basic STI knowledge but also an ability to continuously perfect professional and technical skills. As consumers, people perceive and use new products and technologies. As citizens, they may engage in discussions of critical STI issues and of respective government policies. A lack of necessary skills in any particular part of the population becomes an obstacle to the creation and distribution of new technologies and social practices throughout society. Because technological changes occur rather quickly and on a global scale, such a lack puts nations that have not carried out a timely transition to the new technological structure at risk of being left behind.[3]

For this reason, national governments seek to learn more about the types of skills needed for innovation and about efficient ways to engage the population in innovative activities, including, in a broad sense, the generation of innovation and its implementation, social recognition, and dissemination. This chapter provides some insights on human capital inputs into innovation on the basis of relevant surveys (see Box 1).

## Readiness to innovate

People perceive innovation at both macro- and micro-levels. While the former is associated with a nation's economic and social progress, the latter is connected to the quality of an individual's life. The balance of these interpretations indicates social legitimation of innovation in the 'lifeworld' where 'people both create social reality and are constrained by the preexisting social and cultural structures created by their predecessors'.[4] The case of the European Union (EU) is exemplar: the average ratio between the two groups that clearly recognize the importance of innovation for both economic growth and personal lives is 1:1 (42% and 43%, respectively) (Figure 1). The picture for the Russian Federation is rather different: it demonstrates a substantial gap between the perception of innovation as a source of economic growth (39% of respondents in 2011) and its actual impact on daily life (17%). Even though the first group has nearly tripled during 2009–11, the second group remains stable.

Further to the work of Inglehart (1997), we suggest that such discrepancies between perception and impact assessments correlate with an economy's position on a transition curve towards a post-industrial, innovation-based economic model. The percentage of respondents who understand the economic value of innovation—that is, its effects on the competitiveness of companies and their products—in the Russian Federation is two- to threefold lower than the EU average. The gap with countries notable for the highest shares of innovating companies in industry, such as Germany, Luxembourg, Belgium, and Sweden, is even greater. In those EU countries with minimal scores of innovation activities in industry, such as Lithuania, Bulgaria, Latvia, and Romania, appreciation of the economic value of innovation is lower

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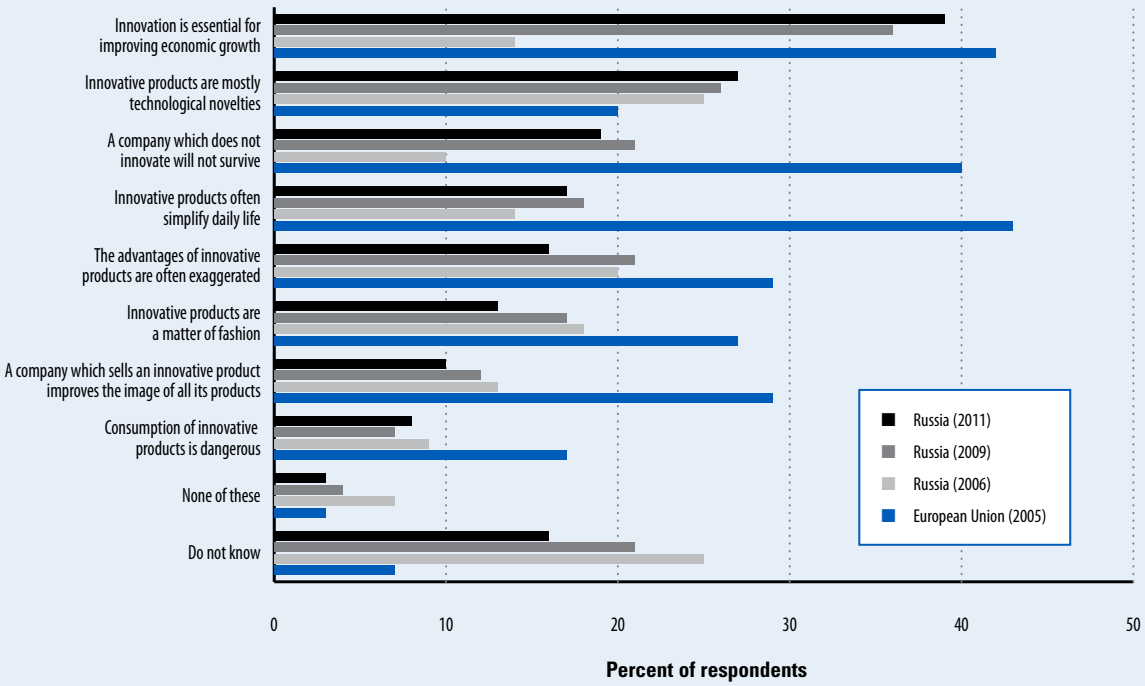
## Box 1: Surveys of public attitudes towards, and understanding of, STI

Public opinion polls on science-related issues began in the United States of America as early as 1970s. Since the 1990s, Member States of the European Union (EU), Brazil, Canada, China, Japan, the Republic of Korea, and the Russian Federation, along with some other countries, have been tracking public attitudes towards science, technology, and innovation (STI) as well as tracking public understanding of STI on a regular basis. Important motivations for tracking these attitudes with surveys have been the societal impact of tremendous successes in STI in addition to well-known technogenic disasters and their tragic aftermaths.

National surveys are usually based on representative adult population samples and cover a broad variety of issues, such as interest in STI and the use of respective sources of information (including various types of media, specialized literature, friends, etc.); test-based metrics of understanding of its major concepts (scientific literacy); assessments of its impact on the economy, society, and daily life; views on allied government policies; the social prestige of related occupations; measures of innovative skills (e.g., Internet and computer skills); the consumption of technologically novel goods and services; attitudes towards ethically controversial or dangerous STI areas (nuclear power, stem cell research, genetically modified organisms or GMOs); and so on. Special indicators vary according to a policy agenda and national particularities.

Survey findings are taken into consideration by national governments in the elaboration of priority programmes (education, space, environment, nuclear energy, biotechnology) and in their methods of communicating STI to the general public. The findings are also considered by businesses in their strategy planning for the market promotion of innovative products or actions in societally sensitive STI areas.

## Figure 1: Public perception of innovation (% of respondents)




Source: EU data are from Eurobarometer, 2005; data for Russia are from the Survey on Innovation Behaviour of the Population conducted by the Institute for Statistical Studies and Economics of Knowledge (ISSEK)/National Research University – Higher School of Economics (HSE), 2006, 2009, 2011.

**Table 1: The motivation for using innovations at households in the Russian Federation (% respondents)**

| User motivation | 2003 | 2011 |
|---|---|---|
| I admire technological novelties and use them whenever possible | 8 | 9 |
| It is necessary to use technological novelties to keep abreast of life | 35 | 41 |
| I use certain technological novelties as far as I need them in my job | 10 | 12 |
| My children encourage our family to use technological novelties | 3 | 12 |
| I almost do not come across modern technological equipment in everyday life | 21 | 12 |
| Modern technological equipment frightens me | 3 | 5 |
| None of these statements | 10 | 4 |
| Do not know | 10 | 5 |

Source: Survey on Innovation Behaviour of the Population conducted by the Institute for Statistical Studies and Economics of Knowledge (ISSEK)/National Research University – Higher School of Economics (HSE), 2011.

than the average by 10–20 percentage points. In other words, the larger the shares of innovating companies and allied employment, the more operational the abovementioned population's function as producers of innovation. Ireland and Portugal, which have high rankings for their industry innovation indicators, have been exceptions in this regard: their populations' disappointment, which is a result of the influence of the recent economic downturn despite the innovativeness of industry, has been translated into assessments similar to those of Eastern Europe.

For the Russian Federation, despite the yet-insufficient impact of innovation on daily life, the overall tendency of public opinion regarding innovative products looks rather favourable. During the last decade, the share of 'technological enthusiasts'—those who actively exploit novelties—reached 50%; another 12% were represented by the 'forced users,' who are motivated to use new technologies and methods by job requirements. Only a marginal stratum (5%) are still frightened by modern technological equipment (Table 1). Children have become a strong factor affecting technology diffusion, a fact explained by its deepening penetration into the contemporary lifestyle. However, nearly one out of eight respondents remains isolated from technological innovation—a warning signal reflecting the quality of life in certain population groups.

Four types of respondents can be distinguished according to their attitude towards technological novelties: 'admirers' (9%), those who respond 'positively' (65%), those who respond 'indifferently' (16%), and those who respond 'negatively' (5%). The first group is rather narrow and is represented mostly by men (61% of all admirers), the younger generation between 18 and 35 years of age (67%); one-third belongs to a higher-income category (compared with 16% for the overall sample); and 28% of admirers are university graduates (vs. 21% among all respondents). Such an attitude is an attribute of a specific lifestyle that is not generally widespread. The polar opposite groups offer quite a contrast: those who are either indifferent to innovation (e.g., do not use modern technological equipment in daily life or are not able to identify themselves with any survey statements) or who are even negatively motivated (i.e., frightened by technological novelties) are most frequently women, older than 55 years, and of poor social strata. Low income and conservative attitudes obviously hamper dissemination of innovative products.

The middle group—the positive users of innovation—is the most common and comprises two-thirds of the Russian population. These users are typical mainstream consumers;[5] their proportion can be interpreted as an important indicator of social demand for innovation, and is in fact a focal point of modern innovation policies.[6] The diffusion of positive attitudes reveals the increase of the population's receptivity to innovation. Subsequent changes in social behaviour caused by the recognition of the impact of innovation on economic growth and openness to novelties will stimulate the market supply of technologically advanced products and services as well as public engagement in new practices enabled by the latter.

## Innovative behaviour: Skills and activities

For analytical purposes, we divide participants in innovative activities into three basic categories: 'innovators', 'team members', and 'users'.[7] Each category is notable for a specific set of skills that plays a crucial role in each stage of the innovation cycle (see Box 2).

According to the Higher School of Economics (HSE) survey, innovators—those who have been engaged in initiating and/or implementing improvements at work (launching new or modifying existing products or services, technologies, business processes, etc.)—amounted to roughly a quarter of the sample population (27%). However, only

### Box 2: Skills for innovation: A measurement framework

Our analysis of skills for innovation is based upon findings of a 2010 Higher School of Economics (HSE) survey of the employed population with tertiary and vocational secondary education degrees in the Russian Federation.

A relevant methodological basis for this survey was provided by the European Qualification Framework, which defined skills as cognitive (involving the use of logical, intuitive, and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments) meaning the ability to apply knowledge and use know-how to complete tasks and solve problems.[1] The literature often concentrates on skills as social values and attitudes rather than abilities,[2] although some scholars focus on practical skills.[3] However, both aspects should be taken into consideration to ensure comprehensive measurement.[4]

For survey purposes, the following classification was proposed: technological competencies (the level of engagement with advanced technologies); information skills (the ability to conceive and use information from different sources, including mass media and the Internet, and to use information technologies for communication and information search); management skills (project-management skills, managerial and organizational knowledge); marketing skills; entrepreneurial skills (the ability to start a new business, manage it, and assume responsibility and risk); communication skills; and personal qualities (creativity, proactive attitude, leadership, self-efficacy, tolerance, risk-propensity).

**Notes**

1 European Commission, 2010; Méhaut, 2012.

2 Florida, 2002; Batinic et al., 2008; Sojka and Deeter-Schmelz, 2008; Chell and Athayde, 2009; Zaytseva and Shulalova, 2011; Zaytseva et al., 2013.

3 Hanel, 2008; Smatko, 2012, 2013.

4 OECD, 2011a, p. 52.

60% of them (or 16% of the total sample) were identified as successful innovators who achieved their own desired goals. Their distinctive feature is that they exhibit the widest range of relevant skills among all the actors:

- Successful innovators are the most active in browsing professional information on the web (66% of respondents in this group); reading STI literature (68%); attending exhibitions and conferences (43%); and studying information about competitors, consumers, and/or suppliers (46%).
- They are technologically advanced because they are studying new professions (83%) and learning new work techniques (86%) and equipment (69%).
- They are notable for achieving the highest scores in e-skills: 75% of successful innovators use search engines (compared with 60% for the whole sample); 67% send e-mails with attached files (vs. 50%); 58% are able to install new devices (vs. 41%); and 47% use specialized software (vs. 33%).
- In addition to strong cognitive skills, they are best equipped with the knowledge of business processes and are experienced in team building and steering, developing enterprise strategies, marketing, and external communications.

In terms of personal qualities, successful innovators, to a large degree, exhibit entrepreneurship, leadership, self-confidence, and creativity (Table 2). Interestingly, unsuccessful innovators have similar psychographic profiles, but their skill range is more restricted. This similarity implies that the innovative potential of an individual is not an instinctive feature, and essential skills for innovation can be learned. The same is true for personal qualities, or 'soft' skills.[8] National education systems are therefore motivated to transform formal curricula and teaching techniques and to promote life-long learning aimed at supporting the innovative patterns of a population's behaviour and attitudes.

Successful innovators are accompanied by skilled employees (team members) who contribute to developing new ideas (15% of respondents). The percentage of efficient team members whose innovative projects have been implemented is even lower—7%. These workers are comparable to innovators in their skill profile, though it is narrower: their e-skills are less advanced and their professional duties are subjected to in-house operations. Even the efficient team members typically visit exhibitions or conferences (33%) or participate in strategy planning, fundraising, and communication activities less often than the successful innovators. Such team member employees are conscientious assistants rather than leaders: their core personal qualities include a proactive attitude and self-confidence, although they lack leadership, creativity, and risk propensity. Efficient team members are somewhat older than innovators (44 vs. 41 years on average) and less frequently have a university diploma (56% vs. 69%, respectively), but they are better skilled than their

**Table 2: Personal qualities of the innovative workforce**

| | All | Innovators | | Team members | | Users | | Non-participants |
|---|---|---|---|---|---|---|---|---|
| Quality | | Successful | Unsuccessful | Efficient | Inefficient | Active | Passive | |
| Entrepreneurship | 0.32 | 0.71 | 0.55 | 0.40 | 0.32 | 0.16 | 0.17 | 0.04 |
| Tolerance | 0.57 | 0.61 | 0.56 | 0.62 | 0.54 | 0.57 | 0.55 | 0.53 |
| Self-confidence | 0.42 | 0.60 | 0.51 | 0.46 | 0.44 | 0.37 | 0.36 | 0.19 |
| Leadership | 0.09 | 0.53 | 0.38 | 0.13 | 0.10 | –0.13 | –0.08 | –0.15 |
| Creativity | 0.10 | 0.51 | 0.40 | 0.17 | 0.08 | –0.01 | –0.12 | –0.19 |
| Activeness | 0.09 | 0.37 | 0.35 | 0.18 | 0.05 | 0.04 | –0.12 | –0.17 |
| Risk propensity | –0.01 | 0.15 | 0.10 | –0.04 | 0.05 | –0.05 | –0.11 | –0.13 |

Source: Survey on Innovation Behaviour of the Population, conducted by the Institute for Statistical Studies and Economics of Knowledge (ISSEK)/National Research University – Higher School of Economics (HSE), 2010.
Note: Numbers in the table are on the scale of –2.00 (minimal expression) to +2.00 (maximum expression).

inefficient colleagues. This finding provides additional evidence of the impact of training on technological capabilities and the innovative potential of firms.

The third important group engaged in the implementation of innovation unites new knowledge and technology users. It covers almost half of employees (48%) and is divided into two subgroups: 'active users' (22%) and 'passive users' (26%). Active users include those who have upgraded competencies during the last five years. This is the youngest group among all respondents, while the passive users are the oldest. In terms of core competencies, active users stand far behind both the innovators and the team members: they are insufficiently motivated to use innovation and less ambitious, with weaker leadership, creativity, and risk propensity qualities, but they are hard-working and tolerant. Such characteristics allow younger members of this subgroup to advance their position (by, for example, moving into the group of team members or even to become successful innovators) in the course of improving their professional qualities and developing their careers.

Beyond the abovementioned categories, 10% of employees with tertiary and vocational secondary degrees are not engaged in any innovative activities. This group is the least skilled and least well adapted for innovation, and its members usually occupy lower positions and perform the jobs that do not require special education. A large proportion of them have qualifications that do not meet the needs of the labour market. Their lack of self-confidence and creativity hampers learning and their ability to adapt to changing circumstances.

## Policy implications

Surveys of public attitudes towards STI and public understanding of it shed light on the linkages among social values, skills, and innovation. These linkages have to be taken into account by national governments when designing evidence-based policies aimed at building public trust to be shared among different parts of the society. No single approach to such a complex task can work in every instance, and a one-size-fits-all model is insufficient when applied to different countries. However, some successful practices are worth considering.

The Strategy for Innovative Development until 2020, adopted by the Russian government in December 2011, centres around promoting innovation culture, improving allied competencies, creating a positive image of innovative entrepreneurship, increasing the societal prestige of STI activities, and developing an innovation-friendly environment. An earmarked President's Decree of May 2012 urged all governmental agencies to ensure the coordination of sectoral policies and programmes with this document, which consequently allowed a comprehensive action plan as a whole-of-the-government policy to be established.

The primary component of this action plan is the reform of education, with the goal of supporting the development of innovative skills and personal qualities from early childhood. The plan is envisaged to upgrade education programmes by placing particular emphasis on modern information and communication technology (ICT)-enabled techniques and information resources, enlarging public support for kindergartens and schools, and establishing necessary outreach to parents and raising their awareness about the benefits of innovation. An infrastructure that helps to identify particular talents of students early and to promote those talents through individual advanced education services is being developed

in collaboration with leading universities. The training of qualified teachers is given particular attention, and certain measures are being taken to reconsider respective education standards for teacher training. Government-supported federal student Olympiads in mathematics, natural and social sciences, and information technology take place every year, and the winners are accepted by the best national universities. Tertiary education reforms include offering college-level applied baccalaureate degrees that combine fundamental knowledge with advanced technological skills in specific areas, stronger integration of courses in management and entrepreneurship into university programmes (especially for engineering), and strengthening universities' innovative infrastructures (with technoparks, business incubators, technology transfer centres, spin-off firms, etc.) and cooperation on research and development with companies.[9] Training in innovative entrepreneurship has also become a key priority for multiple life-long learning programmes and networks supported by universities, venture companies, industry, and regional authorities.

Large-scale inclusive innovation policy actions have been implemented at national and regional levels to broaden access to new technology and combat social exclusion. Several government programmes envisage funding to promote e-government public services, high-tech health aid and telemedicine, and Internet penetration to remote areas.

An important role in promoting innovative culture is played by innovation-development institutions—the Russian Venture Company, RUSNANO, the Agency for Strategic Initiatives, and a few others—which together have created a joint task force for popularizing innovation. The task force provides subsidies to STI museums, exhibitions, and media; organizes contests for individual innovators; and supports the innovation projects of young inventors and start-up communities. Information centres in sensitive high-tech sectors (such as the 17 centres established by the nuclear energy corporation Rosatom in the areas of its enterprises' presence) contribute greatly to the communication of STI knowledge to the general public and the popularization of science education among children. Another successful example of promoting innovation is the national Science Festival initiated by the Moscow City Government in 2006. Since its inception, the Science Festival has spread to 70 regions and involved more than 500 organizations—universities, research centres, innovating companies, museums, and so on. The Festival enjoyed over a million visitors across the whole country in 2013.

## Conclusion

The population's engagement with innovation requires greater attention from policy makers and from society at large. The findings analysed in this chapter suggest that, in most cases, people recognize the importance of innovation for socio-economic development, although such an appreciation is not always coupled with intensive penetration of innovation into individual lifestyles. A large part of the population remains isolated from technological advancements and uninvolved with any innovative activities. This isolation is explained by social barriers and the lack of personal attitudes, skills, and abilities needed to master knowledge and technology. This mixture represents a societal mindset,[10] reflecting the actual status of innovation-related values that embody people's active involvement with the social environment and its improvement by finding better solutions for specific situations at work or in everyday life. At the individual level, taken together with a composite of skills and personal qualities, it determines the role of a person in innovative processes and his or her intellectual and material progress that can result from seizing opportunities for life-long learning.

Groups of the population that do not participate in the implementation and consumption of innovation are at risk of being left behind by social exclusion and subsequent backwardness. This may occur because of a lack of means and adequate skills, but it may also be deliberate because of poor self-confidence and an inability to adjust to a changing environment. All these factors can significantly hamper innovation processes and, consequently, mark a space for inclusive policy actions. Popularizing innovation and allied novel practices aimed at upgrading competencies and developing an innovation-friendly environment are also important components of boosting competitiveness. Another critical element is the modernization of education systems so that they will ensure the development of knowledge, innovative skills, and personal qualities (such as entrepreneurship, tolerance, self-confidence, leadership, creativity, activeness, and risk propensity) from early childhood.

Given the changing nature of innovation and the long-term character of public awareness and trust building processes, the policies that address these areas have to be adaptive and continuous, and their efficiency will, to a great extent, determine the global competitiveness of nations.

## Notes

1 Gokhberg and Shuvalova, 2004, p. 8

2 Miller, 1996. Here and below, we follow the internationally harmonized definition of innovation: 'An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations' (OECD/Eurostat, 2005, p. 46). Although this definition was initially intended for companies, we apply it with certain modifications at the level of households and individuals and include, among other things, user innovation aimed at household improvements, entertainment, leisure, personal health and comfort, and so on, beyond technological and organizational novelties.

3 Miller, 1996; Gokhberg and Shuvalova, 1997

4 Ritzer, 2011, p. 219.

5 Rogers, 1962.

6 OECD, 2011b.

7 In some cases, people may simultaneously play different roles depending on their particular positions in specific innovation projects. For instance, an initiator can promote his or her own idea and at the same time implement a supporting function in a project run by another colleague. In order to produce more accurate analytical distinctions we consider pure, ideal types.

8 Chell and Athayde, 2009.

9 For details, see Gokhberg and Roud, 2012.

10 Gokhberg and Meissner, 2013.

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