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Hi-Tech Skills Anticipation for Sustainable Development in Russia

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It is evident that there is a heightened importance in Russia attributed to ensuring that students develop skills, which will enable them to be more productive and engaged citizens. This article deals with a skills anticipation methodology for seven hi-tech industries in Russia that resulted in the development of models for both soft and hard skills. There is a variety of widely applied methods – qualitative projection of labor market parameters, desk studies, documents analysis, foresight sessions, employers' and experts' surveys. As a result, new skills models are to help the specialists to effectively overcome the challenges, apply innovative decisions, and increase their technological knowledge.

Keywords: skills anticipation methodology, knowledge, hi-tech industries, educational policy, competence-based approach, lifelong learning, sustainable development, Russia

Introduction

The research described in this paper is critical for Russia and countries world-wide that face common challenges, such as labor force shortage, population ageing, and innovative economic development. The present-day global economy is extremely competitive. Only the highest level of competitive advantages will contribute to sustainable growth. A highly-qualified labor force represents one these competitive advantages. In order to sustain a highly-qualified labor force, it is necessary both to forecast the perspective skills, as well as reform Vocational Education and Training based on competence approach.

Persistent sustainable development in the framework of innovative economy implementation and a highly competitive labor market is problematic. Such economy development is possible only in terms of both, labor force and human capital development. Consequently, it is necessary to develop as well as improve human capital with the on 'lifelong learning.' The mechanism for 'lifelong learning' implementation is in the competence-based approach development and implementation, which was proven by the conceptual documents of the European Union (EU) and Russia (European Union Strategy 2020, see http://ec.europa.eu/europe2020/index_en.htm). Thus, the Russian Innovative Strategy 2020 mentions innovative skills, such as 'lifelong learning,' 'constant self-improvement,' 'professional mobility,' 'critical thinking,' 'teambuilding,' 'ability to communicate in everyday, business, professional English' etc.

Currently, the Ministry of education and science in Russia is contracting a number of research projects including a project on skills anticipation. The budget monitoring center at Petrozavodsk State University is implementing one of these projects titled 'Hi-tech skills anticipation.' Nowadays, skills anticipation is possible to perceive by means of combining both qualitative and quantitative methods. The budget monitoring center has elaborated its own skills methodology based upon quantitative methods as well as best foreign practice in qualitative projection.

Human Capital Development

The Northern Europe experience is especially unique in terms of labor force and human capital development. It should be noted that 'lifelong learning' doesn't necessarily end with tertiary education graduation in these countries. Graduates proceed with further vocational training or further vocational education. In accordance with the OECD *Education at a Glance 2011* report, more than 60% of the Swedish and Finnish population (OECD, 2011a) run vocational training annually, while in other OECD (Organization for Economic Cooperation and Development) member-states this number amounts to a maximum of 40%, while in Russia this number reaches a mere 15.8% (Federal Service of State Statistics 2009, p. 252). Moreover, the educational process in Sweden lasts 7.7 years, 8.4 years in Finland, 8.4 in Denmark (8 years on average) (OECD, 2010). In the OECD member-states the length of the educational process varies from 6 to 8 years, while in Russia it lasts a maximum 6 years. All these factors contribute to the unemployment duration of less than 6 months in Northern Europe (OECD, 2011b) and about 7.2 months in Russia (Federal Service of State Statistics, 2010, pp. 252–288). At the same time, the employment rates for the active working age in Norway amount to 90.2%, 84.4% in Finland, and 88.1% in Sweden.

Both perspective skills anticipation and qualification frameworks development are widely carried out all over the Northern Europe. It is widely perceived that the qualification frameworks are to be upgraded with the necessary skills, first of all, in hi-tech industries. For example, investments in hi-tech field in Finland amount to 3.5% of GDP, while in Russia to 1.04% of GDP ([?]Activity of Big Business, 2011). Information communication tech-

Table 1 Natives Redistribution by Vocational Education in Russia, 2011

Vocational education	Russian natives
Tertiary vocational education	55.5%
Secondary vocational education	24,0%
Primary vocational education	20.5%

Notes Adapted from Federal Service of State Statistics (2010).

nologies index (ICT) of Finland is the fifth in the world, while Russian is the 47th ([?]Measuring the Information Society, 2011). Currently, the Finnish economy is addressing both the eco-friendly technologies and renewable energy resources. It is clear that hi-tech Finnish economy is highly interested in employees possessing high-level skills and a high educational level.

Thus, vocational training programmes are the fundamental instrument for constant improvement of staff skills (i.e. 'lifelong learning' quintessence). It is a pity to claim that further vocational education is unpopular in Russia and involves only 15.8% of the population (Federal Service of State Statistics, 2009, p. 252), while skills development in the framework of vocational education (Table 1) is embracing 55.5% of Russian natives.

It is necessary to highlight that the percent of the population with tertiary vocational education exceeds the same percent in many countries of the European Union. Thus, compared to Russian 55.5%, Finland possess only 37% of tertiary vocational education graduates, Denmark – 34%, Norway – 37%, Sweden – 33%, Austria – 19%, etc. (European Union Strategy 2020, see http://ec.europa.eu/europe2020/index_en.htm). Nowadays, knowledge is increasingly changing. Education, if non-updated, isn't in demand. The solution could be found in life-long learning development, further vocational education, and perspective skills anticipation.

Labor Market Parameters Projection in Russia

The necessity to implement a competence-based approach is conditioned by the VET and labor market mismatch. As a result of this misbalance, both employees and state suffer huge losses. For employees such misbalance signifies lower salary and lower productivity, while for a state this would symbolize unemployment rate plummeting, unemployment compensations rocketing, inefficient public finances redistribution for VET. As a result, labor market misbalance can be resolved by both qualitative and quantitative projection methods.

When the USSR planning economy collapsed causing the chaos on the labor market, a new projection system for labor market parameters started developing. Today, the main focus is on the parameters of the overall economic development, as well as labor market and vocational education. The principal Russian actors engaged in quantitative projection today are: the In-

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Figure 1 Graduates Demand in Elementary, Secondary, Tertiary Vocational Education by 2015

stitute of macroeconomic projection (Moscow), Higher School of Economics (Moscow), and the Budget Monitoring Center at Petrozavodsk State University (Petrozavodsk). One of the principal methods widely applied by these actors is qualitative macroeconomic projection for both, economy sectors and the country as a whole (Gurtov, Pitukhin, & Serova, 2007; Gurtov, Pitukhin, Serova, & Sigova, 2010; Piutkhin & Semenov 2012).

These forecasts are widely implemented by both, the Ministry of Education and the Science of the Russian Federation with regional authorities for human resources development calculating the key enrollment figures for all levels of vocational education.

Despite these efforts, there is a misbalance in VET; thus, it is highly crucial to satisfy the demand and perspective graduation figures for three levels of vocational education. It is obvious that the demand in both elementary and secondary vocational education will be increasingly growing in Russia by 2015 compared to the demand for tertiary vocational education (Figure 1).

At the same time, it is obvious that this increasing demand for both elementary and secondary vocational education won't be satisfied with graduates. Thus, we observe a serious misbalance on the Russian labor market.

As a result, the quantitative methods, even if highly detailed, are not enough. Nowadays, skills anticipation is possible to solve by means of combining both qualitative and quantitative methods. Hence, a brand new skills anticipating methodology based on quantitative methods, as well as best foreign practice in qualitative projection was elaborated in Russia. Much attention is paid to the OECD experience.

Skills Anticipation in the OECD Member-States

Skills anticipation started its development consecutively both in the EU and the OECD member-states in the early 2000s. Nowadays, this issue is playing a highly crucial role in shaping the European future society.

On the 12th of November 2002, the Council for Education, Youth and Culture of the EU adopted the 'Copenhagen Declaration' on enhanced cooperation in VET. This enhanced cooperation, known as the Copenhagen process, includes both employees' and graduates' perspective skills anticipation. Crucial skills and qualifications development involving actors such as state, educational institutions, and employers became the core of the ongoing Copenhagen process. Furthermore, in 2009, the EU mid-term forecast for anticipating occupational skills titled *Skills for Europe's Future: An-*

ticipating Occupational Skill Needs was successfully developed (CEDEFOP, 2013). This forecast is still widely used by the politicians, employers, VET, and other actors involved in the perspective educational trajectories development.

VET development also became one of the priorities in the education policy at the Meeting of Ministers of Education of the OECD member-states in Copenhagen on September 22–23, 2005. The meeting resulted in a program adoption aimed at the interaction development between VET and labor market. In two years, the OECD implemented a research project titled 'Vocational Education and Training' that focused on skills/competencies definition and skills development, which might be further applied on the labor market. The VET research project included education and training programs developed for a particular type of work (OECD, 2005, p. 52).

In 2010, the 'OECD Skills Strategy' was finally adopted. At that time, it was also recognized by the European Union. In accordance with this Strategy, 'skill' and 'competence' are perceived interchangeably. By skill (or competence) the OECD implies 'the bundle of knowledge, attributes and capacities that enables an individual to successfully and consistently perform an activity or task, whether broadly or narrowly conceived, and can be built upon and extended through learning' (OECD, 2011b, p. 35). There are *general cultural competences,* such as the ability to own a foreign language at a level no lower than conversational and *professional skills* such as: the ability to apply modern mathematical tools, the ability to collect, process, and interpret data of modern sciences etc.

Thus, the necessity to develop the crucial occupational skills in Europe in line with the employers demand has been developed recently.

VET integral part includes three parties' interaction: government, employers, and the educational system. Each level of interaction has its own particular function.

Table 2 reveals employers' involvement in VET in the OECD member-states.

From Table 2, it is obvious that employers' involvement in VET in the OECD member-states sufficient. Employers' active participation is conditioned by incorporated mechanisms in the educational system, which allows stakeholders active participation in the process. It is highly important to involve the employers in both crucial occupational skills determination and implementation on the labor market.

Competence-Based Approach Implementation in Russia

Nowadays, active work on both skills anticipation and implementation in the educational system and economy is actively performed in Russia. There are, however, challenges despite the attained success.

Table 2 Employers' Involvement in VET in the OECD Member-States

Field	Tasks and actions	Institutional setting	Country examples
Agenda setting	Analyzing evidence. Recognizing problems. Determining issues for reform.	Collectively through employer organizations, associations, chambers. Individually, using employer surveys and opinion polls.	Advisory Council for Initial Vocational Education and Training, Denmark. Employers' surveys e.g. in United Kingdom and Australia.
Policy formulation	Reforming the regulation, structure, and funding of the VET system. Developing/updating the qualifications framework. Developing curricula, content and duration of VET courses. Determining number of VET places.	Collectively through employer organizations, associations, chambers. School governing bodies, which include employers. Regional or sectoral bodies.	Advisory Council for Initial Vocational Education and Training, Denmark. VET partnership (federal government, cantons and social partners) in Switzerland. Sectoral employer organizations in Australia and United Kingdom. Regional VET centers in the Netherlands, Regional development and training committees in Hungary.
Policy implementation	Promoting VET e.g. by hosting interns. Delivering on-site training. Sponsoring training for employees. Examining student performance.	Individual employers offering workplace training (including sector-wide basic practical training), apprenticeships, or releasing staff to supply VET teachers to providers. Individual or collective financing, under voluntary or mandatory arrangements.	Apprenticeships in dual system countries. Industry courses in Switzerland. Training levies in Hungary. Final examination in the workplace, e.g. in Germany.
Policy evaluation	Assessing the quality of VET outputs. Assessing student outcomes.	National VET institutions. Collective employer bodies. Individual employers (e.g. through surveys).	KRIVET, BIBB, NCVER, etc. Surveys of employer satisfaction in Australia and United Kingdom.

Notes Adapted from Hoeckel, Cully, Field, Halász, and Kis (2009).

In 1993, Bachelor and Master Degree levels were introduced in Russian high schools for the first time. Only starting in 2011, a two-level tertiary vocational education became wide spread. Meanwhile, these degrees are still not well reflected in the Russian labor market: these two educational qualifications do not correspond to the economic activities and are thus not transparent to the Russian employers.

This situation, facilitated by the Bologna and the Copenhagen processes, both employers' and government initiatives, resulted in some action. Nowadays, a so called national qualifications system is being shaped in Russia. The main elements of such system that would bridge the labor market and VET are both professional and educational standards.

The Russian Ministry of Science and Education has recently announced a new generation of federal state educational standards development. These standards are based on a competence-based approach where skills are subdivided into the following two groups: general skills (soft) and occupational skills (hard).

Additionally, professional standards are actively promoted by the Russian employers (small, medium, big business) who have been supporting a new paradigm of human resources upgrading in accordance with these standards in the past few years. These innovative standards are unique in their description requirements (Leibovich, 2011).

Professional standards:

- Reveal both the spectrum of actions in a technological process (research, engineering, design, manufacturing etc.) as well as tenure of different qualification levels (level of worker, engineer, and manager);
- Apply for a brand new design combining knowledge, skills and competencies, and professional expertise;
- Identify professional activities the employer is especially interested in, as well as independent qualifications certification.

Both professional standards and federal state educational standards are inter-related. Professional standards as a part of a national qualification system aimed at bridging VET and the labor market on different levels (political, organizational, and individual). Consequently, the labor market, which signals its generalized demand for human resources, is a reference to the educational system. In its turn, the education system shall elaborate effective educational trajectories emphasizing the competence-based approach (Kekkonen & Sigova, 2012).

Nowadays, the main national qualification system development challenge is mentioned in the Russian Strategy 2020. In accordance with this strategy, the national qualification system will result in increased competition in the labor force, professional development, bridging VET and labor market, and employees' rights recognition (see http://strategy2020.rian.ru/). **[Please note that the text of this paragraph has been changed]**

Russia is still lacking high quality human resources. Skilled workers are in high demand on the Russian labor market, especially in terms of innovative economy implementation.

Skills Anticipation in Russia

To overcome the above-mentioned challenges, the Ministry of Education and Science in Russia has recently announced a large-scale research. The project 'Hi-tech skills anticipation' implemented in Russia lasted for three years: 2011–2013. Elaborated methodology on skills anticipation embraced three strategic foresight-sessions, as well as three huge surveys of experts, employers, and employees who work in seven hi-tech industries in accordance with the President's decree No. 899 dated 7 July 2011 (IT; nano industry and new materials; energy and energy efficiency; transport and space systems; biotechnologies; medicine and healthcare; effective natural resources management).

It is also necessary to highlight that the above-mentioned priorities correlate with a list of 10 emerging technologies settled at the 2012 World Economic Forum meeting in Davos (Quick, 2012):

1. Informatics for adding value to information.
2. Synthetic biology and metabolic engineering.
3. Green Revolution 2.0 – technologies for increased food and biomass.
4. Nanoscale design of materials.
5. Systems biology and computational modelling/simulation of chemical and biological systems.
6. Utilization of carbon dioxide as a resource.
7. Wireless power.
8. High energy density power systems.
9. Personalized medicine, nutrition, and disease prevention.
10. Enhanced education technology.

There is a strong correlation of the Russian priorities with the International Standard Classification of Education (ISCED), a framework which allows for the standardized reporting of a wide range of policy relevant education statistics according to an internationally agreed set of common definitions and concepts, thus ensuring cross-national comparability of the resulting indicators. The International Standard Classification of Education (ISCED) was revised by UNESCO in 2011 (ISCED, 2012). There are 25 fields of education organized in 86 subgroups including:

- 42 Life sciences
- 44 Physical sciences
- 48 Computing
- 52 Engineering and engineering trades
- 54 Manufacturing and processing

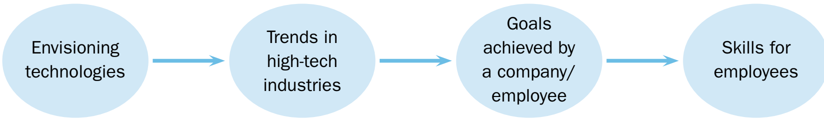

Figure 2 'Envisioning Technologies' is the Core of Skills Anticipation (adapted from Gurtov et al., 2012)

- 62 Agriculture, forestry and fishery
- 72 Health
- 76 Social services
- 84 Transport services
- 85 Environmental protection

The very first fundamental step in skills anticipation includes 'envisioning technologies' determination (Gurtov, Kekkonen, & Sigova, 2012). Such technologies depict the main trends in hi-tech zones. The 'envisioning technologies' imply the fundamental strategic solutions that would influence the whole hi-tech field, as well as define the trends for critical technologies (Figure 2).

The 'envisioning technologies,' thus define the basic trends for hi-tech industries. Based on that, a number of concrete goals, which should be achieved on different levels in the future (company/employee/economy sector), are to be defined easily. This ultimately results in skills development necessary for the achievement of the above-mentioned goals.

This huge project is mutually performed by three actors – Petrozavodsk State University, Moscow Business School Skolkovo, and the Center for Testing and Development under the Moscow State University. As a result, the ideology of skills anticipation is based upon the projection of both soft and hard skills, which result in university curricula (i.e. vocational education) and special high skills for each concrete job placement (corresponds to further vocational education) (Figure 3).

Figure 3 demonstrates the elaborated skills model structure for each of the seven hi-tech industries (IT; new materials and nano industry; energy and energy efficiency; transport and space systems; biotechnologies; medicine and healthcare; effective natural resources management. This structure includes:

1. soft skills – common for each of the seven hi-tech industries;
2. hard skills – necessary for research, design, engineering and manufacturing and different for each of the seven hi-tech industries;
3. special high skills that correspond to hi-tech zones and link to a concrete job place, also different for each of the seven hi-tech industries.

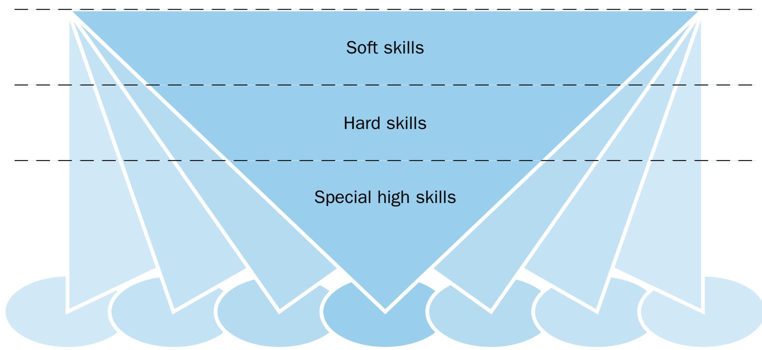

Figure 3 Skills Model Structure for Hi-Tech (adapted from Gurtov et al., 2012)

Table 3 Skills Classification in Hi-Tech Industries

Skills	Definition	Modes for skills development
Soft skills	Personal characteristics and values, cultural knowledge linked to effective job functioning.	Social-pedagogic activity, skills development programmes, additional courses, project management, public activity.
Hard skills	Ability to apply knowledge, competences, experience for successful activity in a particular realm.	Elementary, secondary, tertiary vocational education programmes, further vocational education, internships, Master programmes. Ph.D. programmes. Further vocational education programmes (advanced training). Corporate university programmes.
Special high skills	Knowledge and competences for the perspective goals achievement in hi-tech industries.	

Table 3 reveals not only a skills model structure, but also skills development modes. This might include social-pedagogic activity, project-management, public activity for soft skills, as well as Master programmes, and further vocational education programmes for the hi-tech zones.

Thus, the first stage of the project 'Hi-tech skills anticipation' defined the content of the model (soft, hard, and special high skills) through the experts' survey in 2011. The second stage verified the model content through foresight-sessions and employers' surveys in 2012. The third stage included the verification results of the foresight-sessions and employees' surveys in 2013. Foresight sessions resulted in defined perspective skills clusters. The qualitative data received during the expanded sample of employers' survey, thanks to the Jobs &Competence Description method, resulted in *what* goal is to be solved by an employee and *how* an employee

[Please provide text for this figure in form of a table]

Figure 4 Skills Model Structure for Hi-Tech Industry 'Transport and Space Systems'

would achieve it. This method was elaborated by the Center for Testing and Development under the Moscow State University. It turned out that Russian employees don't possess the skills that employers are anticipating. It became highly necessary to link their skills with the professional goals. Thus, the skills clusters appeared which could bring in new solutions connected to new labor market possibilities and new threats for employers' companies. These skills clusters were defined for each of the seven hi-tech industries for short-term, mid-term, and long-term perspectives. As a result, an integrated skills model structure that would embrace the fundamental, occupational, and innovative skills appeared. These skills are highly linked to both technological and innovative policies of Russia.

The Russian skills model structure is in line with best foreign practice. Thus, the OECD member-states emphasize 'soft skills' much more than 'hard skills' (OECD, 2012). In Russia, soft skills and hard skills are still equally important. First of all, our skills model structure settled one soft skills list for all hi-tech industries:

- personal skills (leadership, administrative);
- communication skills;
- business skills;
- technological and specific occupational skills;
- cognitive skills;
- strategic skills (ability to anticipate and forecast).

The Russian hard skills list was developed taking into account the best foreign practice. For example, the European e-competence Framework, produced by various European IT organizations and commissions, is based upon four descriptors (European e-Competence Framework, 2011). These descriptors reflect various requirements linked to business processes and HR management etc. For example, one descriptor describes five different e-skills connected to 'planning,' 'building,' 'running,' 'enabling,' and 'managing.' As a result, the European e-Competence Framework outlines the principal e-skills.

If we turn to the Occupational Outlook Handbook, provided by the Bureau of Labor Statistics (United States Department of Labor, 2014), we'll find out that it contains a wide range of data on 700 occupations, including working conditions, skills, education and training, wage and perspectives. It is obvious that elaborated skills for the Russian 'IT' industry have a high level of coincidence with the American skills if we compare, for example, skills for the 'software developer' occupation from the Occupational Outlook

Handbook. Few distinctions are found and linked to a specific character of the IT industry of the two countries.

Thus, after having elaborated skills models for seven hi-tech industries, VET recommendations were elaborated aimed at skills anticipation and development in Russia. The project results are in high demand by the Ministry of Education and Science of the Russian Federation and aimed at both educational programmes re-design and vocational education updating.

Conclusion

In Russia, innovative economic implementation is impossible without efficient development of hi-tech industries and human resources management. A labor market which doesn't meet the present-day requirements due to a lack of effective human resources management leads to both modernization and technological renovation slowback.

It is necessary to claim, that research held in Russia and linked to the labor market and VET parameters projection is backed up with the European experience, in particular of Northern Europe where human capital is increasingly developing. The Northern Europe experience is considered to be progressive in terms of a 'lifelong learning' implementation, competence-based approach, and sustainable development. Particularly, in Russia, the combination of qualitative and quantitative projection methods including skills anticipation will lead to flexible steering. This approach will help to bridge the Russian labor market and VET, as well as resolve the challenge of the occupational-qualification structure. Short-term effect of the presented study implies that skills list shall be implemented in further training and retraining programmes. Also, it can be applied in HR selection. Particularly, the results on the perspective skills for hi-tech industries will help to articulate the requirements for VET taking into account the technological innovations development in hi-tech industries till 2030. Long-term effect of the presented study embraces the changes in Bachelor, Master, and Ph.D. Programmes that corresponds to 6–8 levels of the ISCED (2012).

The results will contribute to the occupational-qualification challenge resolution, graduates' employability guaranties, and vacancies filling. It is highly recommended to include the developed skills lists in both professional and educational standards. As a result, a competence-based approach is considered to be a real tool for sustainable development for society and economic growth on the Russian soil.

References

Activity of Big Business. (2011). **[Please provide complete title, authors (if applicable), and facts of publication]**

CEDEFOP. (2009). *Skills for Europe's future: Anticipating occupational skill* *needs.* Luxembourg, Luxembourg: Office for Official Publications of the European Communities. Retrieved from http://www.cedefop.europa.eu/EN/Files/5194_en.pdf

European e-Competence Framework. (2010). *European e-competence framework 2.0: A common European framework for ICT Professionals in all industry sectors.* Retrieved from http://www.ecompetences.eu/site/objects/download/5983_EUeCF2.0framework.pdf

European Qualifications Framework. (2008). *The European qualifications framework for lifelong learning (EQF).* Luxembourg, Luxembourg: Office for Official Publications of the European Communities. Retrieved from http://relaunch.ecompetences.eu/wp-content/uploads/2013/11/EQF_broch_2008_en.pdf

Federal Service of State Statistics of Russia. (2009). *Form '1-staff.'* Moscow, Russia: Author. **[Is this a book in Russian or in English? If it's in Russian, please provide the name of institution and the title in Russian (in roman transliteration, e.g. Federal'naya sluzhba gosudarstvennoi statistiki) and in English]**

Federal Service of State Statistics of Russia. (2010). *Russian Federation regions: Socio-economic indicators.* Moscow, Russia: Author. **[Is this a book in Russian or in English? If it's in Russian, please provide the name of institution and the title in Russian (in roman transliteration, e.g. Federal'naya sluzhba gosudarstvennoi statistiki) and in English]**

Gurtov, V., Kekkonen A., & Sigova S. (2012). Crucial occupational skills forecasting: The experience of russia and european countries. *Journal of International Scientific Publications: Educational Alternatives, 10*(1), 16–23.

Gurtov, V., Pitukhin E., & Serova L. (2007). Modeling the economy's need for professionally trained personnel. *Studies on Russian Economic Development, 18*(6), 622–633.

Gurtov, V., Pitukhin E., Serova L., & Sigova S. (2010). Forecasting of labor market demand dynamics on different stages of crisis in Russian economics. *Studies on Russian Economic Development, 21*(2), 169–179.

Hoeckel, K., Cully M., Field S. , Halász G., & Kis V. (2009). *Learning for jobs: OECD reviews of vocational education and training; England and Wales.* Paris, France: OECD.

ISCED. (2012). *The International Standard Classification of Education 2011.* Montreal, Canada: UNESCO Institute for Statistics. Retrieved from http://www.uis.unesco.org/Education/Documents/isced-2011-en.pdf

Kekkonen, A., & Sigova, S. (2012, June). *Competency building approach as the basis of lifelong education in the context of an innovation-driven economy.* Paper presented at the annual conference Lifelong Learning: Continious Education for Sustainable Development, Sankt Petersburg, Russia.

Leibovich, A. (2011). Methodology and policy of national qualifications systems development and implementation. Proceedings of the National Portal of the Federal Agency of qualifications of the Russian Union of Industrialists and Entrepreneurs. **[What kind of publication is this? In English or in Russian? Please provide more information]** Retrieved from http://www.nark-rspp.ru/index.php/lang-ru/library/last-publications.html **[web page not available]**

Measuring the Information Society. (2011). **[Please provide complete title, authors (if applicable), and facts of publication]**

OECD. (2012). *Better skills, better jobs, better lives: A strategic approach to skills policies.* Paris, France: OECD Publishing. Retrieved from http://www.oecd-ilibrary.org/education/better-skills-better-jobs-better-lives_9789264177338-en

OECD. (2005). *Chair's summary: Meeting of the Education Chief Executives; Copenhagen, 22 to 23 September* (Unclassified EDU(2005)13). Paris, France: OECD. Retrieved from http://www.oecd.org/edu/35557211.pdf

OECD. (2010). *Education at a glance 2010: OECD indicators.* Paris, France: OECD Publishing. Retrieved from http://www.oecd.org/education/skills-beyond-school/45926093.pdf

OECD. (2011a). *Education at a glance 2011: OECD indicators.* Paris, France: OECD Publishing. Retrieved from http://www.oecd.org/education/skills-beyond-school/48631582.pdf

OECD. (2011b). *The OECD skills strategy.* Retrieved from http://www.oecd.org/edu/47769132.pdf **[Is this correct?]**

Quick, D. (2012, February 15). World Economic Forum lists top 10 emerging technologies for 2012. Retrieved from http://www.gizmag.com/world-economic-forum-new-technology-2012/21484/

United States Department of Labor. (2014). Occupational outlook handbook. Retrieved from http://www.bls.gov/ooh/

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