

Dual Education in Regions of Russia: Models, Best Practices, Growth Prospects

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Abstract. The paper analyzes the results of the systems project Training Workers to Comply with the Requirements of High-Tech Industries Using Dual Education, organized by the Agency for Strategic Initiatives in 13 subjects of the Russian Federation. Dual education implies “dual” institutional consolidation of knowledge obtained in vocational education programs: theory is normally learned at a vocational school, while an apprenticeship is taken within a company, in a real-life working environment. It is shown that the best prac-

tices of dual education can be found in the growing sectors. The most successful implementation of the dual model is observed in the regions of Russia that have seen their investment climates improved, their barriers for businesses reduced, and the quality of their public administration increased. Effectiveness of the dual model is largely contingent on the economic motivations of employers investing in a staff training system within the framework of large-scale investment and technology upgrade projects. As employers' associations are weak, the decisive role in the coordination of efforts between businesses and professional educational institutions is played by regional authorities and governor's councils, which have virtually grown into substitutes for German chambers of industry and commerce. Nationwide vocational education projects have promoted further development of the dual model due to organizational and financial support from study and career clusters. The best dual education practices should only be spread to regional industries that have the necessary economic and infrastructure premises for companies to invest in such a staff training system.

Keywords: vocational education, dual education, public-private partnership, quality of vocational education.

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Dual education is probably the most famous global brand in vocational education. Conceived in Germany, Austria and Switzerland, dual education implies “dual” institutional consolidation of vocational education programs: theory is normally learned at a vocational school, while an apprenticeship is taken within a company, in a real-life working environment [Solga et al. 2014]. By developing and improving the dual model, Germany has achieved universally acknowledged success in workforce education. The 2008 financial crisis, which Germany survived with minimal losses, confirmed once again the efficiency of this vocational education model. Many advanced and emerging economies have adopted the German experience, adjusting dual education principles to their national contexts. So far, the model has been applied in Greece, Italy, Spain, China, Sweden, Romania, South Korea, and some African countries [Eisenmann 2017].

At the end of the 2010s, dual education came to Russia, too. One of the first convincing examples of using the dual education model in the Russian context was provided in Kaluga Oblast. A mechatronics dual education program was launched by OOO Volkswagen Group Rus in September 2010. It was designed to train workers and process engineers for an automotive manufacturing plant that was being constructed near Kaluga. Similar projects were launched in the Republic of Tatarstan, Sverdlovsk Oblast, and other regions. All those initiatives were assigned the status of a national pilot project in 2013 thanks to the Agency for Strategic Initiatives. The project originally involved ten subjects of the Russian Federation, but their number increased to thirteen in 2015¹. The project’s main goals were to develop and integrate a dual education system, spread it around the pilot regions, elaborate advanced models and formats of network cooperation between educational institutions and businesses joining their efforts to train the workforce, and promote participation of employers in funding staff training programs².

As the systems project was underway, quite a few studies analyzed and tried to make sense of Russia’s dual education experience. Examining regions’ best practices, researchers interpreted dual education in its narrow and broad senses. Using the “narrow” interpretation, authors focused on analyzing the dual model as a way of organizing

¹ The systems project Training Workers to Comply with the Requirements of High-Tech Industries Using Dual Education was approved by the resolution of the Supervisory Council of the autonomous nonprofit organization Agency for Strategic Initiatives to Promote New Projects on November 14, 2013: <http://asi.ru/upload/medialibrary/1ba/%D0%94%D0%9F.pdf>

² Agency for Strategic Initiatives, Ministry of Education and Science of the Russian Federation, Federal Institute of Education Development (2015) *Metodicheskie rekomendatsii po realizatsii dual'noy modeli podgotovki vysokokvalifitsirovannykh rabochikh kadrov* [Methodological Recommendations on Applying the Dual Education Model in Training Highly Skilled Workers], Moscow: http://asi.ru/upload/0b6/Method_dualeducation_full.pdf

the educational process where learning theory in an educational institution is combined with an apprenticeship in a company. In particular, some zeroed in on the principles of dual education program design in German vocational schools and assessed the advantages of this model for students and employers [Solovyeva 2013; Tereshchenkova 2014; Polyakova 2016]. Following the same logic, others used sociological instruments to analyze student and teacher expectations associated with the introduction of dual education [Matveev 2015]. Still others discussed the opportunities for improving the quality of vocational training and developing the mechanism of professional and public accreditation associated with the implementation of the dual model [Faktorovich 2014]. Some researchers investigated the possibility of integrating components of dual education into higher education in Russia [Grigoryeva, Shvets 2016]. A number of authors examined the experience of dual education and the best practices adopted in particular subjects of the Russian Federation: the Republic of Tatarstan [Ovsienko, Zimina, Yesenina 2014], Omsk Oblast [Shumakova et al. 2016], Sverdlovsk Oblast [Islamgaliev 2016; Yugsfeld 2014], and Krasnoyarsk Krai [Kolga, Shuvalova 2015].

The “broad” interpretation of the problem of dual education and its integration into the Russian context implies analyzing the institutional environment in which human capital is reproduced in Germany and Russia. As Thomas F. Remington and Israel Marques point out, the German model of dual education exists in a “coordinated market economy”, where employers cooperate with trade unions and are willing to invest in personnel development. The authority of employer associations (chambers of industry and commerce) and some specific aspects of the labor laws in Germany reduce the risk of employee poaching, thus protecting investments in human capital made by German enterprises [Remington, Marques 2014].

However, Russia’s labor market is characterized by high turnover rates, which keeps employers from investing in the education of young workers, as employee loyalty cannot be guaranteed. Vladimir Gimpelson and Rostislav Kapelyushnikov emphasize that this institutional feature of the Russian labor market even prevents enterprises from investing in firm-specific human capital, let alone universal skills, which can be capitalized more effectively after quitting. Investment in them simply becomes economically unviable [Gimpelson, Kapelyushnikov 2011].

In assessing the situation regarding vocational education and training in Russia, researchers detect a classical collective action dilemma: all the participants—enterprises, employees, educational institutions, and the State—would benefit from creating an efficient system of personnel training that would balance the supply and demand in the market of contemporary skills. At the same time, none of the parties is ready to make the first step and assume the risks associated with investing in vocational education [Remington, Marques 2014].

Therefore, expansion of dual education is only possible if businesses, educational institutions and authorities can overcome their disagreements and join their efforts to promote vocational education and worker training.

In Russia, where employer associations and trade unions have little influence, regional authorities often act as coordinators in personnel training. Analyzing the successful experience of implementing the dual system in Perm Krai, Kaluga Oblast, Belgorod Oblast and Nizhny Novgorod Oblast, researchers stress the significance of the “subjective factor”, i. e. the role of individual governors who approached the development of regional vocational education systems not just as a duty but as their governance priority. In addition, dual education was actively supported through the initiatives launched by the Ministry of Education and Science and the Agency for Strategic Initiatives (ASI) [Remington 2016]. It does not make the Russian experience unique, however, as the decisive role of public institutions in building social partnerships in personnel training is typical of most economies in transition [Green et al. 1999].

“Introduction of a practice-oriented (dual) model of vocational education and worker training in trades consistent with the industrial and innovative development strategy of the subject of the Russian Federation” is one of the key measures stipulated in the Regional Standard for Industrial Growth Staffing, spearheaded by the ASI³. The respective resolution of the Government of the Russian Federation, published even before the ASI project was formally completed, also suggested “consistent integration of a practice-oriented (dual) education model in vocational education”⁴. Consequently, on the agenda today is the question about further promoting regions’ best dual education practices and making them ubiquitous in vocational education.

Our study aims to analyze the opportunities and constraints in promoting the model of dual education in subjects of the Russian Federation. As numerous education projects have shown, spread of the best practices is one of the most challenging stages in the integration of any educational innovation. Educational technology implemented under experimental conditions may prove efficient very convincingly, but as soon as it has to be spread, entirely new circumstances emerge, for which no allowance is normally made at the initial stage. Such circumstances may impede proliferation of the innovation or reduce its implementation effects dramatically. On top of that, the risk of model distortion and emasculation is growing multifold as long as

³ Regional Standard for Industrial Growth Staffing, 2016: https://asi.ru/upload_docs/staffing/Standart_KPR_upd.pdf

⁴ Series of Measures to Improve the System of Vocational Education for 2015–2020, approved by the Resolution of the Government of the Russian Federation No. 349-r of March 3, 2015: <http://static.government.ru/media/files/cWukCnDBv5U.pdf>

the pilot project results are being spread, which can eventually discredit the original idea.

What does it mean in terms of analyzing the results of the systems project for introducing dual education in Russia?

The project implemented in 2013–2016 under the auspices of the Agency for Strategic Initiatives was designed to integrate the German model of dual education in worker training programs in 13 preselected subjects of the Russian Federation. As of today, the relevant practices have been developed; a few cohorts of vocational students participated in dual education programs; and the regions have elaborated the management, organization and financial mechanisms to sustain the model. It appears appropriate to ask *the first range of questions* about these regional practices with a view to analyzing and assessing the results of integrating the dual model in contrast to the borrowed German prototype. These are the questions that have to be answered by executives and experts in any country integrating the dual education system.

Which essential elements of dual education have been integrated successfully and which ones have not? What are the factors that promoted the successful integration of the model?

What is the “range of coverage” attained by the newly integrated model? Has the model been distributed ubiquitously yet or only at the local level?

Since we cannot borrow the institutional environment of Germany, Austria or Switzerland—the countries where the model was originally conceived—it is vital to understand what helps the new model take root and survive in a “hostile” institutional context.

The second range of questions seek to evaluate the prospects of further distribution of the dual model to other subjects of the Russian Federation. Obviously, this evaluation will be largely contingent on the results obtained at the first stage of analysis.

The article will be further structured in accordance with the logic presented above. Sections 1.1–1.3 are devoted to analysis and assessment of the factors that determined successful implementation and performance of the 2013–2016 pilot project in the regions which won the ASI’s grants for integrating the dual model. Section 2 seeks to assess the effects and application rates of dual education practices in the participating regions. The conclusion makes inferences about the opportunities and constraints of spreading the dual education practices to other subjects of the Russian Federation.

1. Factors that Determined the Success of the 2013–2016 Systems Project for Integration of the Dual Education Model

1.1. Participating Regions: Growing Economies and Conducive Investment Climates

Dual education in Germany is deeply integrated in the innovation-driven economy. “New industrialization”, which became the standard of the German economy during the crisis years, has been impregnated with the principles of dual education. A hypothetical German firm controlling 20% of the global silicon solar cell market invests in worker

training and engages in dual education because this is an integral part of its business strategy along with research and development and production technology upgrades. It was critical to consider this innovative context when borrowing dual education practices. The regions of Russia which responded to the ASI's initiative were ready to introduce the dual model. All of them complied with the requirements, i. e. had hi-tech enterprises, conducive investment climates, high-quality administration, and responsible expenditure policies.

The project for design, integration and distribution of a dual education system involved 13 subjects of the Russian Federation: the Republic of Tatarstan, Krasnoyarsk Krai, Perm Krai, Belgorod Oblast, Volgograd Oblast, Kaluga Oblast, Moscow Oblast, Nizhny Novgorod Oblast, Samara Oblast, Sverdlovsk Oblast, Tambov Oblast, Ulyanovsk Oblast, and Yaroslavl Oblast. All of the regions are characterized by diversified economies, diverse natural resources, and developed transport infrastructures. Most of them are favorably situated close to megalopolises. Their competitive advantages also include well-educated and relatively inexpensive workforces.

The regions mentioned above have attracted heavy investments over the last 15–20 years. The Republic of Tatarstan has seen a particularly rapid development in oil refining, petrochemistry, and the automotive industry. Aerospace engineering, instrument making, machine tool building and nuclear power have become centers of innovative development in Ulyanovsk Oblast. Tambov and Belgorod Oblasts have been traditionally focused on hi-tech agriculture and farming. The investment attractiveness of Moscow and Kaluga Oblasts has been determined by their proximity to Moscow, Russia's largest market, financial and transport hub. Metallurgy and mechanical engineering have been drivers of technology innovations in Krasnoyarsk Krai, Volgograd Oblast and Sverdlovsk Oblast; chemical and petrochemical industry, mechanical engineering and metalworking—in Perm Oblast. Yaroslavl and Nizhny Novgorod Oblasts have prioritized mechanical engineering and the military–industrial complex.

Most of the participating regions have managed to turn the political situation into an advantage and attract considerable funds allocated under federal assistance programs. Regions with developed agribusiness industries—Tambov, Belgorod and Moscow Oblasts—have ramped up agricultural production in the context of retaliatory sanctions. Tatarstan's economy was growing together with the demand for petrochemicals; in addition, the local authorities attracted large-scale investments during preparation for the Universiade and other international events. Since the program for rearmament of the Russian Army and Navy was adopted in 2011, investment in the military–industrial complex has become an important factor of regional economic development. The major beneficiaries to this investment program include Perm and Krasnoyarsk Krai, Sverdlovsk, Nizhny Novgorod and Yaroslavl Oblasts.

Table 1. Regions participating in the project for integration of dual education in investment climate rankings, 2012–2016

Subject of the Russian Federation	2012	2013	2014	2015	2016
Belgorod Oblast	2A	2A	2A	2A	2A
Volgograd Oblast	3B1	3B1	3B1	3B1	3B1
Kaluga Oblast	3B1	3B1	3B1	3B1	3B1
Krasnoyarsk Krai	2B	2B	2B	2B	2B
Moscow Oblast	1A	1A	1A	1A	1A
Nizhny Novgorod Oblast	2B	2B	2B	2B	2A
Perm Krai	2B	2B	2B	2B	2B
Republic of Tatarstan	1A	1A	2A	2A	2A
Samara Oblast	2B	2B	2B	2B	2B
Sverdlovsk Oblast	1B	1B	1B	1B	1B
Tambov Oblast	3A1	3A1	3A1	3A1	3A1
Ulyanovsk Oblast	3B1	3B1	3B1	3B1	3B1
Yaroslavl Oblast	3B1	3B1	3B1	3B1	3B1

1A—highest potential, minimum risk; 2A—average potential, minimum risk; 3A1—low potential, minimum risk; 1B—high potential, moderate risk

Source: Expert RA Investment Attractiveness Ranking of Regions, 2012–2016.

The funds attracted hit fertile ground, as most participating regions had pursued efficient investment policies. The authorities in the Republic of Tatarstan, Belgorod Oblast, Kaluga Oblast, Moscow Oblast and other regions have consistently invested in infrastructure development, improved transport accessibility, reduced bureaucratic barriers, established special economic zones, and granted tax preferences to SEZ residents. The regions' efforts have resulted in their high positions in investment climate rankings (Table 1).

As a result, the project involved the regions with the most conducive investment climates (Belgorod Oblast, Moscow Oblast, Nizhny Novgorod Oblast, Krasnoyarsk Krai, Perm Krai, the Republic of Tatarstan, Samara Oblast, and Sverdlovsk Oblast) and those with low investment risks (Volgograd Oblast, Kaluga Oblast, Tambov Oblast, Ulyanovsk Oblast, Yaroslavl Oblast). Despite all the socioeconomic differences among these subjects of the Russian Federation, it could be safely said that dual education was introduced in regions that had attracted investments successfully and laid solid foundations for the development of hi-tech manufacturing.

**1.2. Dual Education
“Injection Points”:
Large-Scale Invest-
ment Projects and
Efficient Public–Pri-
vate Partnerships**

Compliance with external requirements opened up every opportunity for full-fledged public–private partnership in the field of worker training. Implementation of large-scale projects necessitated heavy spending on the education of personnel and newly-employed workers. Having spent 60 bln rubles on the construction of modern metallurgical facilities in Sverdlovsk Oblast, the shareholders spent 1 bln more on worker training. This decision was based on good judgment: effective and safe operation of complex process systems is impossible without newly-trained workers, engineers, and engineering technologists. This was a situation where all the key components of dual education started making economic sense to employers: strategic planning of staffing needs and development of long-term recruiting strategies; update of the content of education programs as a response to new job requirements; on-the-job training and mentorship; independent assessment of competencies; investment in vocational education—all the elements of the dual model became integral parts of any investment project implemented in the participating regions.

A good example of how this strategy works is The Future of White Metallurgy project, implemented jointly by ChelPipe Group (Chelyabinsk Pipe-Rolling Plant), the government of Sverdlovsk Oblast, and Pervouralsk Metallurgical College. About 1,100 students annually enroll in dual education programs in 30 metallurgy and mechanical engineering majors. Total expenditure per student amounts to 1 mln rubles for three years of studies. The company has deployed about 100 units of expensive modern equipment in a specially constructed educational center. The overwhelming majority (over 80%) of program graduates are employed by ChelPipe Group enterprises⁵.

A similar initiative has been implemented in the Republic of Tatarstan since 2013. The College of the Future of Tatarstan educational project was launched by Rimera Group, the Ministry of Education and Science of Tatarstan, and Almetyevsk Vocational College. The company provided premises for the construction of study and laboratory facilities on the site of Alnas Plant, renovated the classrooms, and supplied necessary furniture and equipment. The Ministry procured laboratories for the CAD/CAM technology, mechatronics, hydraulic machines, pneumatic control, lathe and milling machines. Alnas Plant experts in cooperation with vocational school teachers designed practice-oriented education programs and organized a student apprenticeship. The project keeps evolving: the regional authorities intend to allocate 130 mln rubles for its further implementation in 2017–2019, and Rimera Group is going to invest over 100 mln rubles.⁶

Consortiums of enterprises and vocational schools providing joint dual education programs were formed in all the participating regions.

⁵ http://www.chelpipe.ru/about/investment_projects/college/

⁶ [http://kazan.bezformata.ru/listnews/tatarstan-i-gruppa-kompanij-rime-
ra/54191766/](http://kazan.bezformata.ru/listnews/tatarstan-i-gruppa-kompanij-rime-
ra/54191766/)

OOO Volkswagen Group Rus and Kalugaenergo in Kaluga Oblast, OOO Rusagro-Tambov in Tambov Oblast, ZAO Kapital-Agro in Belgorod Oblast, Titan Central Design Bureau in Volgograd, OAO Kras mash in Krasnoyarsk Krai, PAO NPO Saturn and ZAO R-Farm in Yaroslavl Oblast, OAO Pervouralsk New Pipe Plant in Sverdlovsk Oblast—every region had one or more “anchor companies” around which vocational education institutions were clustered. Regional governments coordinated the participants’ efforts and provided all the necessary organizational and financial assistance⁷.

In 2013–2016, the participating regions developed truly exemplary dual vocational education practices, approaching the original German prototype. Availability of all the economic prerequisites (growing regional economies, investment projects in hi-tech sectors), a system of incentives for business structures (economic feasibility of investing in personnel development), engagement of regional authorities, and the ability of vocational schools to reorganize their educational processes to comply with employers’ requirements—all the factors providing efficiency of dual education as a globally recognized model of vocational training were present when dual education programs were launched in the 13 subjects of the Russian Federation. Dual education was borrowed in its full-fledged version: purely educational and methodological elements of the model (revised education programs and curricula, mentorship, etc.) were integrated seamlessly into relevant economic and business contexts, being oriented towards training employees for hi-tech sectors of the Russian economy.

1.3. Government Support for Dual Education Programs

In the Russian context, the government is often the “third force” that makes efficient public–private partnership in vocational education possible. Participation in the ASI’s pilot project did not directly involve receiving additional funds from the federal budget by the participating regions. At the same time, the Ministry of Education and Science of Russia initiated a few parallel projects designed to foster public–private partnership in vocational education and motivate enterprises to engage in co-funding of vocational education infrastructure. Study and career clusters were used as an organizational model for public–private partnership and joined by vocational schools along with manufacturers and suppliers of products, services and equipment as well as research establishments [Perevertaylo 2015].

Using the resources of the Federal State Target Program for Education Development, the federal Ministry funded study and career clusters in petrochemistry (the Republics of Komi and Tatarstan), life sciences and the pharmaceutical industry (Yaroslavl Oblast, Penza Oblast, Kaluga Oblast, and the Republic of Mordovia), aerospace

⁷ Regional Standard for Industrial Growth Staffing, 2016: https://asi.ru/upload/docs/staffing/Standart_KPR_upd.pdf

engineering (Irkutsk Oblast, Novosibirsk Oblast, Tambov Oblast, Khabarovsk Krai, and Udmurtia), the energy industry (Krasnodar and Primorsky Krai), mining (Zabaykalsky Krai, Sakhalin Oblast, Belgorod Oblast, Sakha Republic (Yakutia), and Jewish Autonomous Oblast), the nuclear–industrial complex (Ulyanovsk Oblast), nanotechnology (Vladimir Oblast), metallurgy (Lipetsk Oblast, Sverdlovsk Oblast, Vologda Oblast, and Krasnoyarsk Krai), mechanical engineering (Republic of Khakassia, Voronezh Oblast, Kaluga Oblast, Smolensk Oblast, Nizhny Novgorod Oblast, and Kurgan Oblast), and other industries. The key significant components of the dual education model—planning of staffing needs, update of the content of education programs, independent assessment of competencies, and funding of vocational education infrastructure by employers—were integral parts of the study and career cluster development programs.

Those programs obtained a total funding of 18,622 mln rubles, including 1,918.4 mln from the federal budget, 11,143.1 mln from regional budgets, 4,054.1 mln from employers, and 1,506.6 mln from vocational education institutions. As a result, 57 subjects of the Russian Federation became beneficiaries of federal government grants. The competition for federal grants was not selective. The program little involved the most well-off regions and the federal cities of Moscow and Saint Petersburg, which possess enough resources of their own to promote personnel development; it also left out the republics of the Northern Caucasus, whose budgets are largely formed by federal grants. However, most of Russia's regions gained access to the federal program funds, including all the dual education pilot project participants. This was in line with the federal government's priority of ensuring maximum possible distribution of the public–private partnership model in vocational education.

2. Dual Education Model: Provisional Results of Integration in Subjects of the Russian Federation

Integration of dual education in subjects of the Russian Federation has yielded promising results. While summarizing the results of implementing the pilot project in 13 regions in 2016, international experts cheered on the prospects of further implementation of the dual model in Russia: “Most participants gave positive answers to the question about the future of the dual education system, which indicates a high level of support for this initiative and confidence in its ability to “survive” in the Russian context”⁸.

⁸ Agency for Strategic Initiatives, Ministry of Education and Science of the Russian Federation, Federal Institute for Education Development (2016) *Metodicheskie rekomendatsii po realizatsii dual'noy modeli podgotovki vysokokvalifitsirovannykh rabochikh kadrov. Versiya 2.0* [Methodological Recommendations on Applying the Dual Education Model in Training Highly Skilled Workers. Version 2.0], Moscow: http://asi.ru/staffing/dualeducation/docs/Metod_Recommendation_2.0.pdf

Table 2. The percentage of vocational education institutions applying dual education in the subjects of the Russian Federation involved in the experiment

Subject of the Russian Federation	The percentage of vocational education institutions applying dual education (%)
Belgorod Oblast	85.7
Nizhny Novgorod Oblast	63.0
Tambov Oblast	51.3
Samara Oblast	50.0
Moscow Oblast	23.2
Volgograd Oblast	18.9
Kaluga Oblast	17.1
Republic of Tatarstan	16.9
Perm Krai	16.2
Krasnoyarsk Krai	15.4
Yaroslavl Oblast	11.1
Ulyanovsk Oblast	10.8
Sverdlovsk Oblast	7.1

Source: Monitoring of Staff Training Quality in the Russian Federation, 2016.

Analyzing the experience of the pilot project participants, the experts agree that each of the regions has integrated the cluster model with varying degrees of completeness and created effective employer–educational institution links, which have ensured considerable progress in integrating practice-oriented, including dual, vocational education. As for the reach and the rate of distribution of the dual model within the regional vocational education systems, the experts find the process to be rather slow and protracted: “In most cases, the best interaction practices are translated to the whole cluster very slowly, if at all”⁹. The same follows on from the Monitoring of Staff Training Quality: only four of the regions that took part in the dual education pilot project spread their practices to more than half of their vocational education institutions (Table 2).

The difference in the rate of distribution of the dual education model between the regions is determined, first of all, by different capacities. The subjects of the Russian Federation ranking at the top of Ta-

⁹ Ibid.

ble 2 provided all the necessary conditions for introducing the dual system long before the pilot project was launched: they reorganized their own networks of vocational education institutions, including vocational schools into industrial clusters, fostering their cooperation with enterprises in every possible way. For instance, Tambov Oblast has established resource centers, competency assessment centers, industry- and region-specific vocational schools since 2007. The strategy for developing the regional system of vocational education relied upon the cluster-based approach, which implied creating clusters in the secondary sector, agriculture, construction, transport, information technology, and social services. Every cluster had a coordination council responsible for managing physical, financial, and staff resources, adding new trades and majors, approving and integrating vocational education programs, and assessing the quality of training in compliance with employers' requirements. The governor's supervisory board undertook to determine the strategy for developing the staff training system, review and approve forecasts on the regional economy's demand for workforce, develop a list of promising trades, and finance the clusters' activities associated with implementing the dual education model. Similar complex models were created in Belgorod Oblast, Nizhny Novgorod Oblast, Samara Oblast, the Republic of Tatarstan, and Perm Krai. Accumulated experience and the rich traditions of public-private partnership allow for smoother integration of the dual model in some of the regions.

Another reason why the dual education distribution rates in the participating regions are far below 100% lies in the economic plane. A number of external conditions are required to ensure full-scale cooperation between companies and vocational schools, including a conducive business environment and a stable demand for the workforce, sustained by long-term public contracts and investment projects. However, few industrial partners of vocational education institutions operate under such conditions. Along with the rapidly growing sectors of the regional economies, there are industries in a systemic crisis. Some enterprises find resources to update their technology, others find themselves unable to solve this problem. All of these factors affect the motivation of company leaders to engage in dual education programs and their willingness to invest in vocational education at all.

Nowadays, the regional systems of vocational education feature three distinct categories of educational institutions that differ greatly in their involvement in the context of regional economy staffing as well as in the ways they normally interact with employers. *The first category* is represented by vocational education institutions that are part of hi-tech clusters in metallurgy, oil and gas, petrochemistry, the defense industry, transport, and agriculture. Vocational schools that share clusters with the top companies engage in implementing the long-term recruiting strategies of those companies. Employers are in-

volved in the process of school management, exerting immediate influence on the structure and content of education programs as well as on assessment of the quality of graduates. Businesses' investments in vocational schools' resource base exceed dramatically the relevant expenditure of the founders. This is where the model of dual education is implemented in its full-fledged form, in line with the original German paradigm, where training expenditure per employee amounts to EUR4,000–6,000, the ratio of government and employer funding being 50:50. Such educational institutions have become the “display window” of the vocational education system in Russia, and every subject of the Russian Federation has a few exemplary vocational schools.

Vocational schools of *the second category*, which are part of territorial clusters, have more constrained resource opportunities. Their partner enterprises usually have to plan their staffing needs in the medium term. Cooperation between companies and educational institutions is active and includes the organization of student apprenticeships, in particular under the dual education model, participation in final examinations, and various forms of employer-sponsored education. At the same time, employers in this category rarely initiate large-scale investment projects and have limited opportunities for investing in vocational education infrastructure, their contribution to the revenues of vocational education institutions being as low as 10–20%.

The third category includes multidisciplinary vocational schools preparing workers for the secondary sector as well as small and medium-sized businesses. Their partner companies are often commercially unfeasible, ineffective, technologically backward, and extremely volatile. Partnerships are steady and consistent by virtue of long-standing cooperation, yet the ability of businesses to influence the design and quality of education programs is too low. Their investment in the infrastructure of vocational schools is insignificant, too.

In assessing the effects of the systems project for the integration of dual vocational education, it is vital to make allowance for the inhomogeneity of the partnerships adopting the model. Vocational schools that are part of hi-tech clusters have received a chance to further extend their resource bases. Their interaction with employers is consistent and easy to predict, regardless of whether they will obtain additional government funding in the future or not. Vocational schools of the second category could only take advantage of dual interaction partially. Those which were granted additional funds from the federal government managed to renovate their infrastructure and expand their partnerships with employers. Institutions of the third category, which make up a considerable proportion, have not yet derived any benefit from the dual education integration project. Involvement of such educational institutions in industrial growth staffing programs and renovation of their infrastructures require taking additional measures at the national and regional levels.

3. Conclusion The systems project Training Workers to Comply with the Requirements of High-Tech Industries Using Dual Education promoted institutional consolidation of dual education practices in the Russian Federation. Introduction of dual education prompted changes in the vocational education system, bringing together the interests of employers, authorities and educational institutions in workforce training. Analysis of dual education practices in the participating regions allows for identifying the opportunities for and constraints of spreading the model to other subjects of the Russian Federation.

When integrating dual education, it is important to consider the transparency of this model and its involvement in the context of technological development. Only secondarily is it a teaching method, the primary characteristic of dual education being orientation towards staffing of investment projects and qualitative growth of regional economies. That is why the best practices of dual education, conformant to the German prototype, have been developed in the industries that attracted heavy investment. The sectors with poor investment climates and no technology upgrade programs cannot motivate employers to engage in dual education. The dual model only works well with the “areas of growth”, so dual education distribution plans should be coordinated with projects for providing conducive business and investment environments in the subjects of the Russian Federation and improving the quality of public administration. Attempts to introduce dual education in stagnating and underinvested regions and industries inevitably hollow out the very concept of dual education.

The 2013–2016 experience of integrating the dual model revealed a number of limitations. In particular, the model cannot be spread as-is to education in the social sector. Interaction with employers is equally necessary to train nurses, kindergarten teachers, musicians, etc., yet the economic rules in this industry are different from those adopted in the production sector and agriculture. It is important to define clearly the scope of application and avoid spreading the model to industries where dual education principles are impossible to implement.

Dual education has not yet been duly formalized by Russia’s educational laws. The experience of the pilot project participants was documented as methodological recommendations, guidelines on workplace education, sample partnership agreements and agreements on network organization of education programs, etc. Such methods of regulating the relations among the organizations concerned were warranted at the stage of the pilot project. At the next stage, however, when faced with the need to distribute the dual model as widely as possible, a number of issues related to licensing the institutions involved in dual education, defining the status of mentors as participants of the educational process, etc. have to be solved. Dual education practices can hardly spread widely if no relevant changes and amendments are made to the existing laws.

Availability of a coordination center ensuring the cooperation among all the parties to workforce training is a key prerequisite for successful implementation of the dual education model. In Germany and other countries with “coordinated economies”, this function is performed by chambers of industry and commerce. In Russia, however, the experience of Perm Chamber of Industry and Commerce remains unique, whereas most federal subjects delegate alignment of parties’ interests and coordination of their efforts to regional executive authorities or governors’ coordination councils. These are substitutes to promote the dual model in a situation where cooperative relations among employers are weak.

The integration of dual education under the 2013–2016 systems project relied upon methodological assistance provided by German experts, Germany’s experience being regarded as the main methodological guidance for implementing the dual model. However, it appears vital that the next stage of integrating the dual model in Russia involves analysis of not only the “exemplary” German experience but also practices adopted in other countries trying to integrate the dual education model with varying degrees of success.

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