

FEATURES OF COLLABORATION OF THE IT INDUSTRY AND THE EDUCATION SYSTEM IN THE DIGITAL ECONOMY AGE*

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Abstract

The article focuses on the current issues involved in training specialists for the digital transformation of the domestic economy via 1C technologies. The work covers the issues of vocational guidance for talented young people in the sphere of IT, including teaching schoolchildren and providing occupational integration. The authors analyse areas of cooperation between the education system, government and business, as well as the development of educational 1C technologies. The focus is on the WorldSkills best practices in the training and assessment of students as well as young professionals working in the field of developing business IT solutions. The issues of automating the management of an educational institution are considered.

Keywords: information technologies, programming, 1C:Enterprise, 1C Technologies, IT professionals, teaching programming schoolchildren, digital economy, WorldSkills.

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Giving a plenary talk at the St. Petersburg International Economic Forum in 2018, President Vladimir Putin noted “In order to achieve a technological breakthrough, to be competitive in the modern, dynamic world, we must be receptive to new ideas and technologies changing people’s lives, determining the future of the country and the world. We have adopted a big comprehensive programme for digital development. It will be one of our priorities for the coming years” [1].

The digital economy development is aimed at increasing the competitiveness of the country and the citizens’ quality of life, as well as ensuring economic growth and national sovereignty [2]. On the basis of the programme Digital Economy of the Russian Federation (approved by the order of the Government of the Russian Federation No. 1632-r of 28 July 2017) a national project Digital Economy and a federal project Personnel for the Digital Economy were developed in 2018.

The project involves an increase in the number of IT personnel and an improvement in the quality of their education; the development of population’s competencies important for the digital economy; as well as enhanced training of young people in the field of mathematics and computer science. The national pro-

ject stresses the importance of training personnel for the digital economy, including IT specialists. Speaking at a meeting of the Council for Science and Education of competitive advantages in various areas of Russian science development, Assistant to the President of Russia Andrey Fursenko [3] noted: “For example, we can speak about the development of the digital economy. One of our key advantages is human resources, as well as a high culture of studying mathematics. It’s no accident that in recent years Russian junior citizens have taken the lead in school and student Olympiads, international competitions in mathematics, robotics, computer science and programming”.

While the implementation of the Digital Economy project is supervised by an autonomous non-profit organisation called Data Economy, the Centre for Human Resources and Education Competencies works out action plans for the project. Originally created on the basis of the Agency for Strategic Initiatives, the Centre was subsequently transferred to the University 20.35. The head of the Centre for Human Resources and Education Competencies is a special representative of the President of the Russian Federation on digital development, Dmitry Peskov. Experts in education

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and business discuss and coordinate plans within the working group of the ANO Data Economy on Human Resources and Education. The founders of the Data Economy, specialized federal executive bodies of Russia, Information & Computer Technologies Industry Association (APKIT) and others are represented in the working group [4].

Within the federal project Personnel for the Digital Economy, it is planned to increase the number of graduates in various field of training having intermediate IT skills: up to 300 thousand people in 2020 and up to 800 thousand people by 2024, which will account for the majority of the envisaged number of graduates.

The number of IT students enrolled per year is to be increased up to 80 thousand people in 2020 and up to 120 thousand people by 2024, which will bring the country significantly closer to the required level of personnel training for the rapidly growing IT industry [5].

At the same time, it is planned to meet the government needs, to the extent necessary, in line with the list of specialties and areas of training in the higher education system, which is critical for the development of the digital economy.

In order to increase the number of IT specialists, it is necessary to solve a number of problems. One of them is the possibility for applicants to use the RSE (Russian State Exam) results in computer science and ICT when enrolling on any higher education program in computer science and computing. The current admission rules of the Russian Ministry of Education and Science admit the possibility of enrolling candidates for an IT specialty on the basis of RSE results in physics. Many universities use this rule, which significantly reduces the students' enthusiasm for studying computer science in the 10th and 11th grades.

Another important issue involves creating conditions conducive to attracting existing IT specialists for teaching IT in the system of professional education.

The fixed requirement of employers consists in employees having the knowledge and skills that meet the real needs of economy. The National System of Professional Qualifications being developed in Russia is designed to contribute to this. The System is based on the qualification requirements for specialists formulated by the employer community in professional standards. Its development is supervised in all sectors by the National Council for Professional Qualifications under the President of the Russian Federation [6]. In the field of IT-specialist training, the development and application of professional standards is overseen by APKIT, of which 1C Company is an active member. By the decision of the National Council, the Council for Professional Qualifications in the Field of Information Technologies was formed on the basis of APKIT [7]. Under the auspices of APKIT, a number of professional standards in the field of IT were developed, including a professional standard called a Specialist in Information Systems, which was created with the active participation of 1C Company specialists. The above-mentioned standard is most widely used by edu-

cators relying on APKIT professional standards when developing educational programmes [6, 7].

In 2018, six professional IT standards were revised with the participation of APKIT experts; new procedures for professional and public accreditation of educational programmes were implemented at the following institutions: Saint-Petersburg State University, Plekhanov Russian University of Economics, and Moscow Automobile and Road College n. a. A. A. Nikolaev. In connection with the approval of the Federal State Educational Standards 3++ (whose layout now always takes the link to specific professional standards into account), the drafts of relevant indicative educational programmes are currently being considered. An independent assessment of IT specialist qualifications of is being developed in accordance with the Federal Law of 3 July 2016 No. 238-FZ; the network of qualification assessment centres is being expanded; and a training program for experts is being prepared.

Domestic software products of the 1C:Enterprise 8 system built using an innovative technological platform are daily used to improve management efficiency and provide accounting functionality for more than five million jobs in organisations of various sizes and forms of ownership, in Russia and other countries. In this connection, studying 1C software is particularly in demand.

Widespread adoption of 1C solutions is an example of domestic high-tech developments competing successfully with the products of leading international corporations not only in the field of accounting automation but also in integrated ERP systems, which are most important for improving the efficiency of organisations in the country.

If earlier large corporations and holdings rarely reported on the use of 1C solutions, at present the 1C:Enterprise system has become a modern digitalization trend. Among the major users of 1C:Enterprise are Russian Post (over 47 000 automated workstations), Transmashholding (more than 20 000 automated workstations), Moscow Government (unified cloud, over 18 000 users), Bashkirenergo (over 8600 automated workstations), KAMAZ (more than 7800 automated workstations). Strategic agreements and memoranda on cooperation with 1C were signed by Rosneft, Rostec, Russian Railways, Gazprom Neft, ROSSETI, AvtoVAZ, LokoTech, United Heavy Machinery Plants, Mechel, Rusagro, Business lines, URALCHEM, Zarubezhneft and a number of other economic flagships.

Under the conditions of digital transformation, modern domestic ERP-systems are becoming even more popular. The simplicity of their implementation and high speed of adaptation to rapidly changing conditions; compliance with the real needs of domestic organisations, low cost of ownership and other competitive advantages are coming to be even more significant.

This is confirmed by the success achieved in the last five years by a new generation system, 1C:ERP Enterprise Management 2 (1C:ERP 2). The system has been successfully implemented and used to improve efficiency and information security of over 3000 or-

ganisations including more than 200 enterprises of the defence industry.

According to the users of 1C solutions, automation with the use of ERP systems allows reduction of production costs by an average of 9 %, operating expenses by 16 %, labour costs in various departments to 29 %, while increasing production volumes up to 36 % and accelerating order execution by 26 %.

1C:ERP 2 has become an effective tool for preparing and organising the transition of enterprises to the Industry 4.0 concept. A three-level production management system of 1C:ERP allows you to prepare reliable engineering data, transfer them to production, generate an executable production plan and gradually proceed to the level of equipment integration using industrial monitoring systems. Such projects have already been implemented in a number of manufacturing enterprises. For example, Reductor plant (included in the Russian Helicopters holding) uses 1C:ERP to prepare a plan for production sites. With the help of mobile devices, shift tasks are generated, which are then automatically transmitted for execution to the specified processing centres. The progress of work is transferred from equipment to the ERP system and monitored in real time. At Ulyanovsk Automobile Plant, 1C solutions are used within the framework of the Industry 4.0 concept not only for production management but also for product quality management. For this reason, special defect registration workplaces were developed; integration with automated control systems was achieved.

The integration capabilities of 1C:ERP Enterprise Management 2 allow the use of the system as a data collection centre for preparing digital twins of products and enterprises. Digital models of products are prepared using specialized engineering software, then transferred to the ERP system and supplemented with the manufacturing process data and parameters for a particular product. At the same time, the model can store the entire history of maintenance and repairs of the product. Thus, a ready-made digital passport is formed in 1C:ERP. The system becomes the production core in managing the full life cycle of products. The elements of this complex task have already been implemented at BelGee, the production site of Geely Automobile Holdings.

The integration capabilities of 1C:ERP in the implementation of IoT technologies (Internet of Things) are manifested not only at industrial enterprises. Among the flagships applying new digital technologies in practice are agricultural enterprises. On the basis of 1C:ERP, a whole range of solutions for the agro-industrial sector has been developed, a number of innovative “digital field” projects have been implemented. For example, at the agricultural holding RAV Agro a field model is constructed using unmanned aerial vehicles, which allows an agronomist to plan work in an ERP solution taking specific features of a particular territory into account. The shift assignments formed on the basis of these plans are transferred from the 1C solution directly to the airborne systems of last-

generation agricultural equipment. Data for a plan-fact analysis and calculating the true costs returns to the ERP system.

In the construction industry, the tasks of managing the preparation of digital buildings and structures with the subsequent automation of the processes of their construction and maintenance are solved using 1C industry solutions integrated with BIM solutions of Renga Software, produced by the joint venture of 1C and ASCON [8].

In order to meet the growing corporate customer demand for joint implementation of such solutions as Corporate Performance Management (CPM), Enterprise Resource Planning (ERP), Human Resource Management (HRM) and Enterprise Content Management (ECM) using one technological platform (1C:Enterprise 8), integrated 1C:Corporation was released. 1C:Corporation includes the following systems: 1C:ERP Enterprise Management 2, 1C:Holding Management 8, 1C:Payroll and HR Management 8 CORP, 1C:Document Management 8 CORP, as well as functional models that describe the possibilities of solutions and recommended scenarios for automating end-to-end business processes.

1C Company actively continues to develop the technological innovative platform 1C:Enterprise 8. In December 2018, a new version (8.3.14) was released. The main areas of development implemented in the platform versions, which were released during the year, include developing a mechanism for expanding configurations required for customizing cloud solutions on the 1C platform; developing an interaction system; improving resource management, stability and resiliency of the server cluster; accelerating analytical request handling possibilities.

One of the innovative technologies implemented in the 8.3.14 platform is a mechanism for solving systems of linear equations. This mechanism significantly speeds up the cost calculation of complex production at large industrial enterprises using an effective algorithm on the basis of the graph theory and parallel use of computing resources.

Prospective tools and machine learning services are being developed. For example, a neural network, having analysed a huge array of data from the 1C:Accounting service, has already learned how to analyse bank statements according to the types of operations and cost items with about the same accuracy as an accountant of average qualification.

In parallel, the company is developing 1C:Enterprise Development Tools (EDT), a new, modern, extensible environment (supporting key principles of creating application solutions for the 1C:Enterprise system) for the development of business automation applications. Created on the basis of the popular Eclipse platform, 1C:EDT contains a large number of development automation tools that make programmers' work faster and more comfortable. In addition, plugin technology allows the functionality of development tools to be extended.

Much attention is paid to the development of cloud and mobile technologies. 1C and its partners have

already developed dozens of mass-market mobile solutions for digitising a wide range of tasks at enterprises of various industrial sectors.

In 2018, as in previous years, the number of fee-paying users of the cloud service 1CFresh.com (1C:Enterprise via the Internet) roughly doubled. This service allows you to work comfortably using 1C solutions from anywhere in the world at any time, as well as helps to reduce the cost of your IT infrastructure and system administration. The main features and benefits of the service include: high level of security and reliability; availability 24/7; round-the-clock technical and consulting support; automatic updating of applications and reporting forms; reporting to the controlling authorities via the Internet; support of data exchange between applications; the possibility of saving data on the user's computer; access to educational materials and to the forum with the participation of developers and methodologists.

On the basis of the 1CFresh cloud technology, a number of large projects on automating state institutions have been implemented. The most ambitious project is the implementation of the Universal Automated Budgetary Accounting System for the Moscow City Government. Currently, this system covers more than 2300 city institutions (18 000 users). It calculates salaries, manages personnel records of 350 thousand employees, as well as performs budgetary accounting and online management analysis. The biggest advantage of making a transition to all-in-one cloud accounting is data centralization. There is no longer need to solicit reports from subordinate institutions; regional administration has complete and relevant information for making decisions. Other results of implementing the 1C cloud system include a 62 % reduction of paper workflow, along with a reduction in the cost of maintenance by 6.6 times. According to the calculations of the Department of Information Technologies of Moscow (DIT), cost savings amount to more than 1 billion roubles per year. The experience of Moscow in cloud automation has already been successfully applied in other regions of the country. In 2018, a number of new agreements on cooperation in IT were signed between 1C and the governments of St. Petersburg, Bashkiria, Mordovia, Udmurtia, Perm Territory, Arkhangelsk Region, and Khanty-Mansi Autonomous Area. Under these agreements, the processes of public administration are to be improved through effective automation using 1C solutions. Pilot projects have already been implemented in Perm Territory, Sakhalin and Ulyanovsk Regions. In the Republic of Chuvashia and Sakhalin Region, centralized cloud systems are being replicated.

At the federal level, a large-scale project is being launched to centralize the functions of accounting, salary calculation and reporting. In order to ensure centralized accounting, subsystems for managing non-financial assets and personnel were created in 2018, along with an accounting module for the subsystem of GIIS Electronic budget of the Russian Federation* us-

ing 1CFresh technologies and 1C solutions for automating the administrative processes of state institutions.

By the end of 2019, fifteen federal executive bodies, their territorial bodies and subordinate state institutions will have transferred accounting functions to the centralized accounting department of the Federal Treasury.

More than 800 educational organisations use 1C:Enterprise 8 for educational institutions via the Internet (edu.1cfresh.com), which allows the utilisation of the latest 1C programs in the educational process. This has reduced the need in computing resources for storing programs and student information databases, as well as the workload of IT support staff by decreasing the amount of work needed to maintain the system.

Using the edu.1cfresh.com service, teachers can control and monitor their students' activity without interrupting them from anywhere there is Internet access. The users of the above-mentioned service can exit with saving current results at any time to subsequently continue the task starting where they left off. Also, teachers and students can utilize teaching aids designed by 1C:Training Centre No. 1. They contain a cross-section of examples of accounting and tax bookkeeping, from the input of the first document to getting a report on the results of organisation's activity. More than 25 000 students have completed training using this service.

The service in question is being continuously developed. In 2017/2018 academic year a CORP version of the 1C:Payroll and HR Management configuration was added. In addition, complete access to the information system of 1C:ITS (its.1c.ru) was opened, thus making recommendations on accounting and tax bookkeeping along with the news, commentaries and professional consultations on accounting, tax bookkeeping and HR management available to all users.

1C Company invites educational institutions to make active use of the edu.1cfresh.com service. In order to connect to the service, one can fill in an application on the website or send it at edu@1cfresh.com.

1C continues to expand the range of IT services built into 1C:Enterprise, which help reduce the costs for organisations, increase productivity and reduce risks. For example, the function of automatically filling the counterparts' details in 1C programs (1C:Counterparty service) considerably simplifies the work of users. In the same service, the Counterparty Record report displays information on the counterparty from the national register of companies, its accounting statements for the last three years, along with information from the unified register of inspections. The 1C:SPARK Risks, a joint service of 1C and the Interfax news agency, allows management of tax risks, as well as a comprehensive assessment of the reliability of counterparties on the basis of indices from the SPARK** system, one of the most authoritative databases on Russian enterprises. Directly from 1C programs, the service monitors important changes regarding counterparties such as liquidation, reorganisation, change of

* GIIS — State Integrated IT System.

** Professional Market and Company Analysis System.

director, address, founders, etc. A business statement signed by the Interfax e-signature helps taxpayers in the event of tax disputes regarding due diligence.

The transition from the paper-based document flow to the electronic, legally relevant exchange of documents (both with counterparties via the 1C-Electronic Document Management service and with the inspection bodies via 1C-Reporting) continues. From October 2017 to October 2018, the number of 1C-Electronic Document Management users increased by 1.43 times and of 1C-Reporting by almost 1.23 times.

In 2018, a new service 1C:Nomenclature was released. It is a common catalogue of product descriptions in 1C:Enterprise 8, which contains more than two million product cards and is constantly updated. A product card contains the following information: product name, barcode, name and identifying code of the manufacturer, measurement unit, description, product characteristics. Using the service, one can automatically fill in the nomenclature directory, simplify the processes of its identification, as well as organise the directories of enterprise accounting systems owing to correct division of goods into groups.

1C services are used by hundreds of thousands of users: specialists from finance, accounting, treasury, procurement, logistics, and IT department, as well as customer service managers and management.

In total, the 1C service portfolio on the portal for information and technological support (1c.ru portal) currently includes more than 25 services. Many of them are available to users who have signed an 1C:ITS contract of the PROF level, including educational organisations that have signed a contract for higher educational establishments ITS PROF VUZ.

Under the conditions of digital transformation and a dynamically changing economic situation, it is crucial for enterprises to ensure rapid (and not always one-time) changes in core business processes — production, customer service, assortment formation, etc. Accordingly, there is a growing demand for qualified services rendered by 1C:Franchising companies in real automation: customisation, implementation and maintenance of information systems on the basis of 1C:Enterprise 8. The analysis conducted by the 1C Company in September 2018 showed that the sales of software products and 1C:Enterprise-based services, provided by a typical 1C Franchise partner company, increased on average by almost 11 % over the year, the number of clients served grew by 8 %.

Accordingly, the demand for qualified specialists proficient in modern solutions on the 1C:Enterprise 8 platform continues to grow. 1C application developers is the most demanded category of IT specialists in the labour market. According to the data of a famous recruitment portal HeadHunter for the first half of 2018, the 1C programming language leads in the number of mentions in the names of programmer vacancies. Moreover, the number of vacancies requiring the knowledge of the 1C language has increased by 131 % and exceeds the number of vacancies for PHP and Java programmers combined [9].

1C partners of are employers of first choice, however, they continue to experience a shortage of qualified professionals and consider this problem to be a major obstacle to business development. The 1C Company always pays great attention to the interaction with the education system. The interest in such cooperation is mutual.

The main product for use in the educational process is 1C:Enterprise 8 — Education Package for Higher and Secondary Educational Institutions. Currently, the Russian Federation package includes the following solutions: 1C:ERP Enterprise Management 2, 1C:Accounting 8, 1C:Trade Management 8, 1C:Payroll and HR management 8, 1C:Company Management 8, 1C:State Enterprise Accounting 8, 1C:Payroll and State Enterprise Personnel 8, software licenses for 50 users, a server licence, as well as software documentation and methodical literature. The package costs RUB 14 400.

Similar packages are available for a number of near abroad countries.

In addition to this package, the 1C Company offers a range of industry-specific package solutions for use in the educational process. Currently, there are packages available for higher and secondary educational institutions of the following industry sectors: agriculture and food, construction, real estate, printing; as well as for technical educational institutions and for the catering and hospitality industry. Specialized products are also offered for use in the educational process for logistics, insurance, customer relationship management (CRM). The packages include not only software products but also teaching materials that will help teachers quickly master the programs and develop teaching aids on the basis of them.

The packages are procured by educational institutions once and are updated free of charge in the future under the ITS PROF VUZ contract. In addition to the possibility of continuous software updating, educational institutions have access to the 1C:ITS information system (<http://its.1c.ru>), which includes methodical materials on accounting, technological support of application solutions, development and administration. At the same time, all 1C:ITS services are available for educational institutions that have signed the ITS PROF VUZ contract. The 1C Company offers a wide range of methodical literature on its software products (for details, see the website: books.1c.ru). Literature is supplied both in printed and in electronic forms, for reading on computers, tablets and smartphones. Users of the 1C:ITS PROF system get access to e-books at no extra charge. There are books on software development using 1C:Enterprise 8, as well as on working with basic application solutions.

At the conferences of previous years, much attention was paid to the importance of methodological support for teaching modern ERP systems, as well as the need to create 1C:ERP Academy (course package on ERP functional systems with a systematic presentation of the methods and algorithms of automated enterprise management). The following books have already been released in this series: Production management.

Planning and Dispatching; Financial Planning and Budgeting; HR Management, books on the execution of the State Defence Order. Books on management accounting, customer relationship management (CRM), etc. are being prepared for release. Students and graduate students can use these publications to expand and consolidate their knowledge in the field of enterprise management processes and their automation.

In 2018, following the development of the 1C:Enterprise 8 platform, two important books on development were revised. One of them is called *Configuration Expansions. Adaptation of Application Solutions while Maintaining Support in the cloud and on premises*. Development using the system of 1C:Enterprise 8.3. Configuration Extensions allows the functionality of application solutions to be refined during implementation without introducing changes to the application solutions themselves. This greatly simplifies further program maintenance. In addition, extensions can be applied when working in cloud services (for example, 1C:Fresh). In this case, extensions allow application solution functionality to be modified only for users within one organisation. Moreover, other organisations working in the same service with the same solution will not see these modifications. The book covers, among other things, the new features of this mechanism, which was added to the platform 8.3.13 in 2018, for example, the possibility of expanding data. Now it is allowed not only to change solution algorithms but also to add your own data. For example, you can add a new requisite to the Products directory (if the requisites required by the standard delivery are not enough) or your own register in which additional data for the developed algorithms will be stored.

The book *Development of an Application Solutions Interface in the 1C:Enterprise 8 System* (the first edition of which was published in 2010) was also significantly revised and reissued. Now it covers the development in the “Taxi” interface; takes all the features of the latest version of the mechanism for automatically placing elements in a form into account; as well as contains a new chapter on how to adapt forms to work in a mobile client.

For a comprehensive study of the 1C:ITS services, teachers of economic specialties can use a detailed methodical manual, 1C Services, including both theory (where and when it is necessary to apply the service capabilities, work procedures) and practical tasks. Teachers can get the book in question for free on the opening-day of software products at the conference or in electronic format at the link http://konkurs.1c.ru/metod_posobie. The manual is recommended for use in the framework of mastering academic disciplines of economic specialties.

Since 2015, free master classes (Information System and Services, 1C:ITS — New Learning Aids) have become one of the most popular forms of familiarising students with the information and technological services of 1C:ITS. Master classes are conducted on the premises of educational organisations by professional 1C:ITS methodologists from regional 1C distributors.

In addition to practical knowledge, the participants of master classes — students and teachers — receive free access to the 1C:ITS information system for the whole academic year (<http://konkurs.1c.ru/mkITS>). From 2015 to 2018, Regional distributors conducted over 320 master classes. During this period, more than 2500 students got free access to the 1C:ITS information system. For educational institutions, organisation of these master classes is free.

For educational organisations that have entered into an agreement on certified teaching of students, the 1C Company provides a wide range of ready-made certified courses for use in the educational process.

The practice-oriented training of young IT specialists is of particular importance for the future of the IT industry. For teachers who cover in their courses development, administration, implementation, maintenance of corporate information systems and application solutions on their basis, recommendations for integrating 1C certified courses into educational programs of universities were developed [10]. More than 2000 instructors from 480 educational organisations have already used these recommendations.

1C:Competitions for students play a big role in professional orientation and training of young specialists. Competition are held annually by the 1C Company jointly with the Financial University under the government of the Russian Federation, 1C-Bitrix Company and the partners of 1C.

In the 2018/2019 academic year, competitions were held from December 2018 to March 2019. In the framework of 1C:Competitions the following events were organised:

- International Olympiad in programming on the 1C:Enterprise 8 platform for students of IT specialties with programming skills in 1C technologies. Within the framework of the Olympiad, participants were to solve tasks in the field of developing business applications and creating algorithms.
- International Web Programming Contest for IT students specializing in PHP, HTML and JavaScript.
- Professional programming contest on the mobile 1C:Enterprise 8 platform. Participants were to develop an application using 1C technologies, which are great for creating mobile applications for both business and personal users.
- International professional competition in 1C:Accounting 8, whose national championships were held in Russia and Kazakhstan. For the second consecutive season, the competition was held in a new format: participants were offered tasks requiring them to analyse the economic situation and, guided by certain accounting principles (for example, the principle of prudence meaning readiness to recognize costs and liabilities rather than possible income and assets), knowledge of the regulatory framework, their expert judgment, to develop relevant provisions for the accounting policy; and only then reflect it

in the 1C:Accounting 8 program. This approach is directed at training specialists capable of in-depth analysis of situations, which is much more relevant now that programs are able to perform more and more of routine accounting work.

- All-Russian professional competition in the use of 1C:ITS information system and its services. This competition is for students of economic specialties: future accountants, auditors, tax consultants. As part of the competition, participants were to solve real accounting and tax book-keeping problems, using the 1C:ITS information system, as the source of professional knowledge, and the 1C:ITS portal of services.

The Olympiad movement is actively growing both due to increased involvement in the project of educational organisations and 1C partners, and to the initiative of students, who understand the prospects of participating in professional competitions for an objective assessment of their knowledge and successful employment. More than 6300 students from 300 Russian cities, as well as from Belarus, Kazakhstan, Georgia, the Czech Republic and other countries took part in the 1C:Competitions in the 2017/2018 academic year.

1C Company asks universities, colleges and technical schools to support the participation of their students in these events and to organise the regional rounds of the competitions. This will allow educational institutions not only to assess the quality of teaching vocation-related disciplines, increase students' motivation to study modern information technologies in management and accounting but also to lay the foundation for strong cooperation with the 1C community, as well as to become more attractive for applicants. Detailed information on 1C:Competitions for students is available on the website konkurs.1c.ru. It contains information on competitions, their regulations, news and announcements, tasks from previous years and useful links that will help to prepare for competitions.

Since the 2007/2008 academic year, a Competition of Graduation Projects using the 1C software products has been held annually. Currently, it is one of the most important forms of work of the 1C community with young people. The competition annually attracts a large number of participants both in Russia and in foreign countries. The competition is aimed at drawing attention to modern information technologies, encouraging promising graduates and their supervisors (<http://konkurs.1c.ru/diplom>).

As part of the competition, the 1C Company encourages not only students and teachers but also organisations that provide students with the opportunity for a pre-diploma practice.

In the 2017/2018 academic year, the name of the competition was changed to the Competition of Graduation Theses. For the first time this year, in order to encourage individual employees of 1C partner companies who supervised pre-diploma practice and made significant contributions to a high-quality graduation thesis, a special nomination was established — Supervisor of pre-diploma practice. The amount of remuneration

depends on the student's placing in this competition, and is equal to the award received by the student and the graduation thesis supervisor.

In total, 373 projects were submitted for the competition of the 2017/2018 academic year. The presented graduation theses demonstrated a great creative potential of students and a variety of project. In completing their graduation theses, students used current versions of software products, modern opportunities for creating mobile and web-based applications. A sufficiently large number of submitted projects were completed using 1C:ERP. The presented projects involve automation of various sectors of the economy, including such new areas as satellite monitoring of road transport and online ticket offices. For the first time, works using 1C services were submitted for the competition: 1C-Electronic Document Management, 1C:ITS (IT support).

The process of creating specialized departments in institutions of higher or secondary vocational education continues.

Holding regional conferences has a favourable impact educational organisations. This academic year alone, such conferences have been held in Yekaterinburg, Almaty, Samara, Veliky Novgorod, Irkutsk, Naberezhnye Chelny.

A practice of holding round tables has been established this year. Round tables were organised in Nizhny Novgorod, Samara, Yoshkar-Ola, Ufa, Ulan-Ude, Chita and St. Petersburg. In terms of format, they are simpler than conferences and easier to organise, to establish contacts between educational organisations and representatives of the IT industry.

Cooperation between the education system and 1C partners in the field of vocational guidance for students is also successfully developing in the format of 1C:Career Days. Important practical values of 1C:Career Days for educational institutions and students include the opportunity to work with leading regional 1C partners as part of completing pre-diploma practice and to gain work experience. In the 2017/2018 academic year, these events took place in 88 cities of Russia, Belarus, Kazakhstan, Kyrgyzstan. More than 8600 students of higher and secondary vocational education, as well as about 250 1C partner firms took part in them. In Moscow, the event was held in a new format. It included a presentation of internship programs: the leading specialists of 1C and partner companies outlined intern projects, presented a 1C master class in application development on the 1C:Enterprise 8 platform and held a management workshop *How to build a career in management*. The new format was highly appreciated by Moscow students and 1C partners. In 2019, it is planned to be repeated in other cities.

Since 2011, the Centre for Young Specialists (CYS) has been successfully operating at the 1C Company. The Centre was created specifically for university students to attract those young professionals who, while studying at university, want to gain experience in the development of modern information systems. At CYS, students can acquire skills of working in a team with professional developers; to study technologies for

creating complex software products and apply them in practice. During the period of its existence, several dozen trainees has joined the 1C staff at the department for developing business programs. A number CYS interns have contributed to the operational versions of the 1C:Enterprise 8 platform, 1C:Subsystems Library, 1C:EDT, 1C:ERP Enterprise Management, 1C:Document Management, 1C:Trade Management, 1C:Retail.

Research and graduate theses of the interns got an excellent mark at the Moscow Institute of Physics and Technology, Lomonosov Moscow State University, National Research Nuclear University MEPhI, Bauman Moscow State Technical University, Higher School of Economics — National Research University, Moscow Aviation Institute, Russian University of Transport (MIIT), Moscow Power Engineering Institute.

Since 2015, 1C Company cooperates with the Union of Young Professionals (WorldSkills Russia), an official agency of the international non-profit movement WorldSkills International, whose aim is to improve the status and standards of professional training and qualification of specialists all around the world. The importance of this trend is noted at the highest level. Receiving the national WorldSkills team in Kremlin, Russian President Vladimir Putin noted that further training programs in the country would be built on the basis of the training experience and performances of the national team members [11].

The complex of WorldSkills international requirements for the Developer of IT Software Solutions for Business is well in line with what the real business needs form young employees. In 2018, 1C and APKIT, along with businesses from other countries, took part in the industrial review of international vocational standards (WorldSkills Standard Specifications. WSSS). The Russian-proposed recommendations were integrated in the revised vocational standard: now experts have the right to use a DBMS and development environment of their choice, which should be based, first of all, on the interests of the client and the effectiveness of the tools.

Assessment of the participants' work in the revised standard is carried out according to the following main competencies:

- work organisation and management — 10 %;
- communication and interpersonal skills — 5 %;
- issues, innovation, creativity — 10 %;
- analysis and design of software solutions — 25 %;
- software development — 50 %.

In August 2019, the WorldSkills Competition will be held in Russia (Kazan) for the first time. Young professionals and experts from more than 60 countries will take part in the competition in 56 competencies. The 1C Company will be an official sponsor of the world competition for the entire block of IT competencies, which includes web development, network and system administration, information security, cloud computing, development of IT software solutions for businesses, etc. The corresponding agreement was signed between the 1C Company and the organisers of the championship.

In December 2018, competitions on the revised competence standards *IT (Software) Solutions for Business* were held for the first time at the Finals of WorldSkills Kazakhstan Championship. The same standards will be applied at the WorldSkills Competition in Kazan on 22–27 August 2019.

After the revision of WorldSkills standards, the competence *IT Solutions for Business on the 1C:Enterprise 8 platform* is perfectly consistent with the international competence 09 *IT (Software) Solutions for Business*.

In 2018, the following events related to the competence *IT Solutions for Business on the 1C:Enterprise 8 platform* were organised:

- championships (secondary vocational education) in 19 regions, which culminated in a final in Yuzhno-Sakhalinsk;
- qualifying championships in 18 universities, culminating in a final in Moscow;
- a competition in the field of high-tech IT professions — DigitalSkills.

The experience of these competitions continues to confirm that when using the 1C:Enterprise 8 platform for solving competitive tasks participants get 15–25 % higher scores for their developments than when using another environment.

The procedures for testing the level of practical training in line with WorldSkills standards lies at the heart of the demonstration exam, introduced as a form of final state certification of graduates in secondary vocational education programs of educational institutions of higher and secondary vocational education. The demonstration exam includes:

- simulation of real production conditions for graduates to demonstrate professional skills;
- an independent expert assessment of fulfilling the tasks of the demonstration exam, including by experts from enterprises;
- determining the level of knowledge and skills of graduates in accordance with international requirements.

In 2018, demonstration exams on the competence *IT Solutions for Business on the 1C:Enterprise 8 platform* were held in 12 universities and colleges. The leading methodologists of 1C, supported by education specialists, have already prepared exam tasks for 2019. They provide an opportunity for all responsible students, who successfully completed the academic programme and independently developed at least 4–5 projects on the 1C:Enterprise 8 platform, to pass the demonstration exam. For those who are seriously interested in the development of IT solutions for business, this exam will demonstrate the full extent of their skills to choose and apply the platform mechanisms quickly, effectively and methodically competently. According to the results of the demonstration exam, such students, in addition to high marks, will be automatically assigned the qualification 1C:Junior. The agreement on the recognition of the WorldSkills demonstration exam as an independent assessment of the level of skills of college and university graduates was signed between

1C and the Union of Young Professionals (WorldSkills Russia) in 2017.

For seven years, the club format, developed by 1C Company within the project 1C:Club of Programmers (<http://club.1c.ru>), has been demonstrating its effectiveness in shaping youth's interest in IT professions since school. The most important result of training in 1C Programming clubs consists in the students' growing interest in computer science, pride in the development of "adult" tools and programming methods. Thus, there is a good chance that as adults they will work in the IT industry. The 1C Company continues to develop the project so that every schoolchild in Russia has the opportunity to get acquainted with IT professions, get a modern education, enrol in leading IT universities and build a career strategy. In 2018, the number of branches of 1C Programming clubs increased by 15 %; the preparation course for the RSE in mathematics (advanced level) was improved using e-learning materials; a new preparation course for the RSE in Russian was designed. In addition, a distance learning school was opened within the 1C:Club of Programmers, providing training for most popular courses. It allowed children from those regions where there are no 1C club branches to acquire knowledge of IT technologies. Currently, children from 166 Russian cities are studying at the distance learning school.

In 2018, a new educational program *Digital Future of Russia*, prepared jointly by 1C and the Orlyonok Children's Centre, was successfully launched. 150 schoolchildren (12–16 years old) from 1C Programming clubs who created their own software products and won the competition became the programme participants. The program is designed to enlarge their knowledge of achievements in the field of modern digital technologies. Its participants, with the help of leading teachers of the 1C Company, systematised their knowledge, got acquainted with the basics of Olympiad programming on the Black Sea Coast, while not forgetting to relax and swim.

The 1C Company continues to support the school Olympiad movement. Since 2013, 1C Company has been an annual sponsor and co-organiser of competitions from the list of Russian Council for School Olympiads: regional round of All-Russian Olympiad in Informatics, Moscow Olympiad in Informatics (6th–9th and 10th–11th grades), Open Programming Olympiad. The events are held on the premises of the Centre for the Development and Training of the 1C Company. The 1C Programming Club takes part in the implementation of a large-scale educational project *Technograd* of the Moscow Government.

For organising electronic and distance education in secondary schools in accordance with the requirements of current regulatory documents, the 1C Company offers a line of solutions united by the common system of programs 1C:Education 5.School.

The main advantages of the proposed solutions include: the 1C:Education software platform for e-learning debugged over the years of development and use; support of global and national industry standards

for the development of electronic educational resources and training courses (SCORM, IMS, Digital Educational Resources, Electronic Educational Resources); ample opportunities and specialized tools for creating copyright electronic educational resources and courses; data exchange with solutions for automating school administration processes.

Both in the 1C:Education 5. School system and in other systems managing educational processes, a significant amount of ready-made 1C:School e-learning materials for general education programs can be used. In 2018, educational resources of 1C:School were added to the following collections of educational online services: *Mobile e-Learning* and *Yaklass*, Moscow e-school, portal of electronic educational resources of the Moscow region. Online access to the 1C:School resources is also organised within the project 1C:Online School (<http://obr.1c.ru/online>).

Models of mathematical, biological, as well as map constructors are being added to online services. A common characteristic of these creative environments is that users can create interactive models, educational games, tasks, as well as conduct virtual experiments in mathematics (covering the whole school course), physics, biology, history, geography, etc., without the help of programmers and specialists in computer graphics. Models are saved in the current HTML5 format, which allows you to run them using a browser on any desktop computer or mobile device. All creative environments are accompanied by methodical materials and are regularly used in the process of professional development of teachers.

For developing mathematical skills of schoolchildren (5th–6th grades), *Maths Stepping Stone* project was designed, which helps identify students who are mathematically gifted and motivated to study this subject [12].

The development of 1C:E-learning software products continues. The Corporate University configuration is now integrated with the 1C:University and 1C:College automation systems, from which the educational organisation structure and student lists are loaded. Students and teachers, whose data is in the system, can quickly set up access to the program, automatically set a random password and send it by e-mail. The rules of automatic enrolment on the basis of the results of prior studies have been established. Personalized e-certificates are automatically issued for graduates using customizable templates with multiple variables. Automatic sending out of personal messages was implemented with the possibility of using different templates for students, teachers, supervisors, and even parents paying tuition fees. It will allow you to pinpoint academic problems and respond to them in a timely manner, instead of identifying a problem only when a student fails an exam or does not get a credit. The load capacity of configurations involved in working with student and teacher accounts has been significantly improved, allowing simultaneous online training of up to 6000 students in one course. The experience of improving

the account performance will be presented at the *University Automation* section.

The implementation of the electronic information and educational environment (EIEE) has become a necessity for modern universities. Requirements for its implementation are specified in the federal standards of higher education. To-be-accredited universities are checked to conform to them by the Federal Service for Supervision in Education and Science. These requirements relate to e-services being offered by universities to students. The provision of such services requires automated management of university activities and only in this case the provided services are most effective. Given this factor, the 1C Company continues to develop a line of products for automating the activities of educational organisations.

Within the software product 1C:University PROF, a subsystem for calculating the load distribution has been further developed in terms of setting the parameters for the calculation of academic hours and teacher workload norms, coordinating and synchronizing the workload calculation, as well as taking elective courses into account. In addition, the possibility for students to take courses of their choice and add extra activities to the schedule was implemented. What is more, regulated reports and the mechanisms of integration with the Federal Information System for State Final Examination and Admission, the Federal Register of Educational Documents, the Moscow Social Register were updated.

The company released new editions, 1C:College 2.0 and 1C:College PROF 2.0, whose functionality was significantly expanded and aligned with the Federal State Educational Standards 3++ of secondary vocational education and the Top-50 (50 most popular and promising professions and specialties of secondary vocational education). New subsystems were implemented: Administrative and Economic Department, Preventive Accounting, Electronic Queue, as well as the functionality for accounting teachers' professional development.

Within the system 1C:Automated Scheduling. University the following changes were introduced: an improved mechanism for lesson replacement; expanded capabilities for accounting various semester durations for groups; the possibility of customizing the way schedule looks when printing it out, as well as accelerated selection processes.

Added functionality of the new editions of 1C:Automated Scheduling. School is intended for scheduling further education classes, including without reference to the planned number of school periods.

In connection with the launch of national educational projects, in particular, *the Modern School (2018–2024)*, *Digital Education Environment (2018–2024)*, it is important to create an information and educational environment at the modern school that contributes to the formation of individual educational trajectories of students willing to learn and work in the digital economy.

In 2017, the Digital School information system was approved and launched at Secondary School No. 36

n. a. G. R. Derzhavin (Veliky Novgorod). The system includes all modern means of managing the educational process and consists of seven modules formed on the basis of 1C standard solutions designed for educational institutions. The solutions ensure effective automation of the following jobs:

- headmaster, his deputies, secretary (on the basis of 1C:General Educational Institution, 1C:School Certificate, 1C:Automated Scheduling. School);
- teachers, students and parents (on the basis of 1C:Education 5. School, educational e-resources of 1C:School, a free web application Electronic School Diary);
- psychologist (on the basis of 1C:Psychodiagnostics of an Educational Institution);
- librarian (on the basis of 1C:Library);
- accountants (on the basis of 1C:State Enterprise Accounting, 1C:Payroll and State Enterprise Personnel);
- security officer (on the basis of 1C:School Checkpoint);
- head of the canteen and buffet employee (on the basis of 1C:School Meals and 1C:School Buffet).

The modules of the Digital School information system were integrated both among themselves and with regional information systems, which allowed for one-time data entry, unification of information and reduction of labour costs. As a result, a safe and open digital environment for educational organisations for managing the educational process and economic activity has been created.

Currently, 1C solutions for building the Digital School information system are used by educational organisations of Vladimir Region, the Republic of Sakha (Yakutia), Moscow Region, Tula Region, the Republic of Udmurtia, the Republic of Bashkortostan, Novgorod Region, Chukotka Autonomous Area, Stavropol Territory, Sverdlov Region, Chelyabinsk Region, etc.

The share and importance of electronic information resources in the libraries of educational organisations are significantly increasing. The issues of providing prompt, regulated and accounted access to electronic content are successfully solved using the 1C:Library and 1C:Library PROF system. The functionality of these systems is constantly being developed. In the latest editions of the programs, it has been expanded with new forms of e-document accounting in accordance with the revised standards of the System of Standards on Information, Library Management and Publishing.

Currently, more than 1300 libraries of educational organisations use 1C systems in their work.

Partner organisations having the status of Educational Competence Centres (ECC) of the 1C Company (<http://1c.ru/cko>) play a special role in supporting and developing regional education systems in the sphere of IT. Their primary task consists in implementing projects for the automation of educational organisations of all levels (from universities to pre-school organisations); as well as in developing regional platforms for testing new educational solutions of 1C. In 2017, the ECCs of the 1C Company took part in organising

and holding a number of regional conferences for the representatives of the education system at all levels.

Along with the annual international conference *New Information Technologies in Education* (Moscow), 1C in conjunction with its partners organises similar regional conferences on the premises of leading universities in the regions and near-abroad countries. For example, in 2017, conferences were held in Vladivostok (1C-Forus, Far Eastern Federal University), Cheboksary (1C-Volga Region, Chuvash State University n. a. I. N. Ulyanov), Saratov (Technoserv-Saratov, Saratov State University), Kazan (1C-Volga Region, Kazan Federal University).

In 2019, the conference *New Information Technologies in Education* was held for the nineteenth time. Many of the solutions found during the preparation and holding of these professional events, discussions, opinions expressed at the conferences (from the 1st to the 18th) became the foundation for large-scale projects and initiatives. The results of the 19th conference have also contributed to the development of cooperation between the IT industry, educational organisations, government institutions, as well as improved the performance of the participating specialists.

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ОСОБЕННОСТИ ВЗАИМОДЕЙСТВИЯ ИНДУСТРИИ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ С СИСТЕМОЙ ОБРАЗОВАНИЯ В ЭПОХУ ЦИФРОВОЙ ЭКОНОМИКИ

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Аннотация

Статья посвящена актуальным вопросам подготовки специалистов для решения задач цифровой трансформации отечественной экономики с помощью технологий «1С». Освещаются вопросы профориентации талантливой молодежи в области ИТ, включая вовлечение в профессию и обучение школьников. Анализируются направления взаимодействия системы образования,

государства и бизнеса, а также развитие технологий фирмы «1С» для образования. Значительное внимание уделяется опыту применения мировых стандартов WorldSkills в подготовке и оценке учащихся и молодых специалистов в области разработки ИТ-решений для бизнеса. Рассмотрены вопросы автоматизации управления образовательной организацией.

Ключевые слова: информационные технологии, программирование, «1С:Предприятие», технологии «1С», ИТ-кадры, обучение школьников программированию, цифровая экономика, WorldSkills.

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НОВОСТИ

Подготовлены новые проекты федеральных государственных образовательных стандартов

29 марта 2019 года на сайте www.preobra.ru стартовало обсуждение проектов обновленных Федеральных государственных образовательных стандартов начального общего и основного общего образования. Документ также внесен на рассмотрение в Минпросвещения России ведущими педвузами страны: Российским государственным педагогическим университетом (РГПУ имени А. И. Герцена), Московским педагогическим государственным университетом (МПГУ), Московским городским педагогическим университетом (МГПУ).

Задача обновить ФГОС и примерные основные образовательные программы, в том числе с учетом приоритетов научно-технологического развития Российской Федерации, поставлена президентом страны и закреплена в поручениях по реализации послания президента Федеральному Собранию.

Главное направление обновления — конкретизация требований к предметным результатам по каждому учебному предмету. В предыдущей редакции стандарт включал только общие установки на формирование определенных компетенций, задавал рамку требований, а что именно изучается, в каком классе — на все эти вопросы должна была самостоятельно отвечать каждая школа. Поэтому образовательная программа одной школы порой кардинально отличалась от программы, принятой в соседней.

Новые требования сохраняют фундаментальный характер образования, укрепляют межпредметные и внутрипредметные связи. Они разработаны с учетом возрастных и психологических особенностей учащихся и необходимости предотвращения их перегрузки. Уточнено минимальное и максимальное количество часов, необходимых для полноценной реализации основных образовательных программ начального общего и основного общего образования.

Отметим, что обновленная редакция ФГОС сохраняет принципы вариативности в формировании школами основных образовательных программ начального общего и основного общего образования, а также учета интере-

сов и возможностей как образовательных организаций, так и их учеников.

Также уточнение требований к структуре основной образовательной программы, содержащихся в проектах ФГОС, позволит снизить бюрократическую нагрузку на учителей.

Учитывая значимость ФГОС, Минпросвещения России считает, что вносимые изменения должны пройти всестороннее профессиональное и общественное обсуждение, в ходе которого могут быть высказаны и учтены конструктивные предложения со стороны всех заинтересованных лиц, организаций, общественности. Для обеспечения широкого доступа профессионального сообщества и общественности к обсуждению проекта обновленных стандартов начального общего и основного общего образования текст проекта ФГОС размещен на ресурсе: <https://www.preobra.ru>. Ресурс предоставляет возможность дать оценку как документу в целом, так и отдельным его разделам, а также вносить предложения.

В стандартах четко отражены государственные обязательства школы перед учениками и родителями. Детально сформулированные требования стандарта помогают достичь определенного общественного консенсуса. Любой российский гражданин может ознакомиться с содержанием предмета и соотнести его с практикой изучения предмета в конкретной школе или с проверочными материалами, контрольными измерительными материалами ОГЭ или ЕГЭ.

По словам С. И. Богданова, ректора РГПУ имени А. И. Герцена, в проектах ФГОС изменена последовательность основных разделов: раздел «Требования к результатам освоения основной образовательной программы начального общего образования» является завершающим. В нем наряду с предметными результатами определено базовое содержание программы воспитания, уточнены задачи и условия реализации программы коррекционной работы.

Как отметил ректор МПГУ А. В. Лубков, обозначенные подходы позволят России войти в десятку ведущих стран мира по качеству общего образования.

(По материалам, предоставленным пресс-службой Минпросвещения России)