

# **Digital learning methods for the digital economy**

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**Abstract** — The transition of the economy to a digital basis requires a significant change in the structure of education. The country's economy will need personnel who are fluent in computer technology. Some specialists will need to retrain. The problem of employment of graduates is a pain point in higher education. The increase in the number of students receiving higher education is of great social importance, since world statistics show that a highly educated stratum of society is much less likely to commit violent crimes, has a higher duration and quality of life. However, higher education requires significant investment by both the state and students. The lack of demand for young professionals in the labor market leads to social tensions and the inefficiency of investing budget funds. Using the statistics of the Ministry of Education and the monitoring of graduates' careers conducted by the Higher School of Economics, the authors analyze the causes of career failures of young professionals. The demand for university graduates depends not only on the objective economic factors that shape the labor market but also on the preparedness of young professionals for independent work. The authors consider various measures taken by the interested parties of this problem - by the state, universities, employers and young professionals. The state is trying by legislative measures to reduce the number of budget places or to return the institution of compulsory distribution of graduates. Universities are trying to attract business to teaching in the basic departments. The employer is resigned to the fact that every young specialist hired will have to be retrained before being allowed to work. Students are trying to find a job during full-time study, reducing the quality of knowledge. In conclusion, the authors analyze the experience of combining work in a target enterprise and getting higher education in the framework of cooperation between the base enterprise and the higher education institution.

**Keywords** — *digital economy, higher education, employment of young specialists, quality of higher education, forms of study at a university, distance education*

## I. INTRODUCTION.

In the period of the digital transformation of society, there is a change in both the structure of the labor market [1] and the ways of obtaining knowledge [2, 3, 4]. The literature widely discusses innovations in conducting classes, methods of assessing the quality of a university, problems of employment of young specialists [5, 6, 7].

This article considers one of the painful problems of higher education — the problem of employment of university

graduates, as well as gives an analysis of existing approaches to its solution [8, 9].

## II. RESEARCH METHODOLOGY.

An analysis of various data groups was carried out to develop recommendations for solving the employment problems of university graduates. Were used:

1. Russian Statistics Committee data on the analysis of employment of different population groups.
2. Official statistics on employment of graduates, prepared by the Ministry of Higher Education together with the Pension Fund
3. Results of a questioning of graduates of the NRU HSE.
4. Data from international statistics on various indicators.

Let consider the quality of this data.

Since 2014. The Ministry of Higher Education, together with the Pension Fund of Russia (PFR), is monitoring the employment of university graduates. The data on the graduates are transmitted by the educational institutions themselves, which wished to participate in the collection of data, the PFR conducts data cleaning and, on the basis of INILA, checks their employment. The task of the project, according to the statement of their authors, is to inform applicants about the possibility of postgraduate employment. Information can be filtered by region, university, training profile. The shortcoming of these statistics is, firstly, the incompleteness of the provided information, and secondly, the lack of data on compliance of the found job with the qualification, obtained at the university.

The NRU HSE Career Development Center monitors graduates' careers annually since 2006. Since 2007, graduates from not only the Moscow HSE, but also from the branches of St. Petersburg, Perm, and Nizhny Novgorod have been participating in the research. Their data allow to consider the problem of employment in different planes: from the point of view of conformity of the field of activity, obtained qualification; from the point of view of job search time, etc. Unfortunately, these data are only estimative, because information was received from the graduates themselves, who wished to answer the questions of the inventory. Therefore, they cannot be called representative.

Data from international organizations on the number of certified specialists and other statistical indicators. In different countries, higher education refers to slightly different levels of education. Say, a Russian college differs little from the bachelors of many other countries.

### III. THE RESULTS OF THE EXAMINATIONS

#### 3.1. The problem of employment of young specialists

The problem of employment of young specialists exists for a long time and not only in Russia [10, 11, 12]. On the one hand, an increase in the number of citizens with higher education has a positive effect, because they have a higher life span and quality of life and commit significantly less violent crimes. In this regard, the countries of the European Union, for example, consider, that during the coming years the number of certified specialists should be raised up to 40% of the population [13].

Higher education, on the other hand, requires serious investment. The state spends from 1 million to hundreds of thousands of rubles per student per year, depending on the specialty and quality of the university. Natural sciences and engineering specialties require expensive laboratory equipment and expendable materials. So, the most prestigious university — MIPT — spends 1.1 million rubles per student per year, and the provincial pedagogical university — 144 thousand rubles. 457 billion rubles are allocated in the budget of 2019 for higher and postgraduate education.

Students, studying on a paid basis, pay from 500 to 150 thousand rubles per year. But this is not the only investment. And all students invest their energy, time and opportunity to receive high salaries while studying. The dissatisfaction of educated young people, whose investment in education appeared to be ineffective, has serious consequences. The active force of the French Revolution of 1968 was just unemployed university graduates.

According to Russian Statistics Committee in 2016, only 77% of graduates managed to find jobs in the 1st year after graduation. Within 5 years, 91% of specialists with higher education are employed. According to the Ministry of Higher Education, this result is even lower — only 65%. This is significantly lower than employment in the European Union, where in 2016 in the first year 82.9% of graduates of higher educational institutions were employed. Russian Statistics Committee gives average statistics for the country, and in many regions, this number is even lower (Fig. 1).

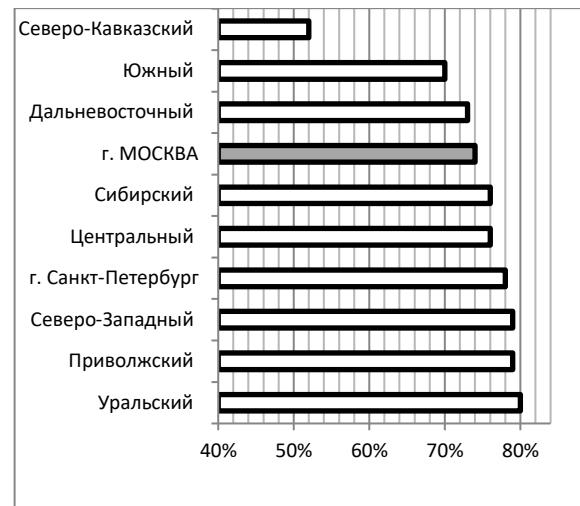


Fig. 1 Employment of graduates in the first year after graduation (2016). On the horizontal axis is the share of employed graduates from all graduates in 2015 in this region.

There are several reasons for the absence of demand for graduates [10].

#### 3.2. Career guidance of applicants

The choice of the direction of study by applicants is associated with fashion, family traditions, competitive examination, the cost of education, the ease of learning. Most applicants consider, that studying engineering is much more difficult. So, 20% of high school graduates want to get the specialties of economists and lawyers, although today 20% of the students cannot find work, and analysts expect a further decrease in vacancies in this area. And the unemployment rate is much lower in the engineering sector.

#### 3.3. Specialization of universities

About 200 thousand specialists of engineering and technical and natural science profiles are annually graduated in the Russian Federation, which is slightly less than a third of all issued diplomas. However, according to the Prime Minister, such specialists are sorely lacking. Despite the fact, that the Ministry of Higher Education claims, that technical universities are priority in financing, the distribution of graduate specialties suggests the opposite. For example, in the country's leading university, Moscow State University (Moscow State University named after Lomonosov), 21 new faculties have been created in recent years (there were 19 before). Only 5 faculties relate to the natural sciences of them.

Table 1 shows the number of university graduates in absolute numbers in various fields in 2015. As can be seen from the table, the social science in a broad sense (political science, sociology, economics, management, law) was chosen by more than 660 thousand people, and only 319 thousand people mastered engineering and technical and natural sciences specialties.

**TABLE I. THE NUMBER OF GRADUATES (ADMITTED TO PROCESSING) IN DIFFERENT AREAS OF TRAINING (2015)**

Field	Number of graduates, (thousand people)	The integral result, (thousand people)
Economics and Management	433	665
Social sciences	83	
Law	149	
Math and natural sciences	38	319
Engineering, technology and technics	281	
Others	255	255

Such a bias is related, firstly, with the market of applicants: not only private universities target only it, but state universities can accept students on a paid basis, and the share of paid students reaches 200% in top universities. In addition, learning in technical specialties requires special laboratories and, therefore, is more costly.

#### *3.4. Quality of learning*

Despite strict supervision over the quality of education by Rosobrnadzor, the average level of university graduates does not meet the needs of employers. The number of filed patents per 1000 certified specialists can be considered to be the criterion for the quality of higher education, according to the authors. This indicator characterizes both the effectiveness of the engineering and scientific personnel and the effectiveness of management. 1.38 million patents were filed from China; 0.61 million patents from the USA; 0.40 — from Russia; 0.32 million — from Japan; 0.20 million — from South Korea and 0.17 million — from EU countries of the 3.2 million patent applications, filed in 2017.

For a more correct comparison (the population of these countries differs by an order), we normalized these data by the number of certified specialists of working age. The maximum number of patent applications per 1,000 specialists with higher education was filed by South Korea 9.2; for China, this indicator is 3.2; for the US 4.0; for Russia — 0.5 (authors' calculations).

The insufficient quality of graduate training does not suit employers, and unclaimed vacancies remain in the labor market, and graduates are forced to go to work not in their specialty. As a result, education costs are ineffective. According to the Russian Statistics Committee, only 64.5% of university graduates in 2010–2015 received positions of managers or specialists of the highest level of qualification, the rest got positions, that did not require their level of education.

In fact, the qualifications, obtained at the university, are used by an even smaller number of graduates: 28% of polled workers with higher education do not work in the acquired profession, for men, this indicator is even higher — 32%.

Even graduates of the top Moscow university NRU HSE do not always work within their specialty. 45% of interviewed graduates of the Faculty of Economics said, that their activities are poorly connected with the specialty, received at the university.

#### *3.5. The number of specialists with higher education is too large*

According to OECD in Russia, among the working-age population (aged 25 to 64 years), 54% have higher or postgraduate education. Only employees of Canada have such a percentage of specialists, which is related with their immigration policy. In Japan, there are 49% of such specialists, but with the level of technology in Japan, a bachelor's diploma is also required for skilled workers. In China, there are only 21%, which is natural with a significant share of manual labor in industry. However, for China, the problem of employment of graduates is also relevant.

A redundancy of low-quality specialists distorts the labor market. On the job search portal hh.ru (Dec 2018) 31 thousand vacancies were posted for holders of higher education and 8 thousand for applicants with complete secondary education in Moscow. At the same time, a completed higher education was required for the sales manager and for the assistant manager. Most vacancies do not distinguish between higher and secondary professional education, which indicates the low prestige of a university diploma.

This is also evident by the statistics of employment in the context of universities. Even for Moscow universities, the distribution median of the percentage of employment is 65%, and 64 to 20% of half of all Moscow universities graduates are employed in the first year. Thus, there is a vicious circle: an excess of specialists increases the requirements for the applicant's diploma, which leads to further inflation of the bubble.

Pension reform will also contribute to the problem of employment of graduates, forcing employers to leave jobs for 60-year-olds instead of hiring young professionals.

## IV. DISCUSSION OF RESULTS

#### *4.1. Education does not create skills, that a graduate will need at a real workplace*

Despite the numerous reforms, university education is too far from the real tasks, that their graduates will solve at the workplace. Employers are forced to spend significant funds on retraining before a young specialist can start to work. Therefore, in most cases, work experience is required to get a job.

Industrial practice takes too little time for a future specialist to obtain the necessary skills, and university practical classes are only theoretically related to professional activities. The reform of education, so successfully carried out in South Korea, considered communication of the business community with universities as one of the most important tasks.

The most active students be concerned about the workplace in advance. According to a survey of graduates of the NRU HSE: 25% of full-time Bachelor's program graduates had a job before graduation. And there are more than half among students of postgraduate education.

Thus, the problem of employment affects young specialists, and employers, and the state, and society. It was the reform of education that allowed the countries of Southeast

Asia to make a significant breakthrough in the economy [Tierney W., Gekeler L.].

The state and universities are involved in solving this problem.

#### *4.2. Reducing the number of universities*

Over the past 3 years, the number of universities and their branches in Russia decreased by almost half — by 1,097 organizations. In addition, the government proposed introducing a quota for the number of budget places, depending on the needs of the region. Such a decision will not be able to fundamentally change the situation, since the prestige of higher education in the bulk of secondary school graduates is still quite high, and the market of educational services will not decrease due to such measures. This measure will transfer the cost of education to the population even more.

#### *4.3 Mandatory postgraduate distribution*

One of the legislators, a deputy of "United Russia", had even more radical approach to this issue, who came out with a bill on the mandatory completion by a graduate of a budget university at a state enterprise. Refusal of distribution entails an obligation to fully compensate the state for the cost of education and social benefits during the learning. The bill has not received support yet, because its adoption will entail a fundamental change in the structure of higher education in the country.

#### *4.4 Target students*

Another project is targeted students. The applicant signs an agreement with the enterprise to work there for at least three years after graduation. Preferential access is carried out for target students, as a result, their USE passing score is noticeably lower than for non-target ones. And there are few untargeted places.

This system has several advantages:

- a region or organization can guarantee planned employment;
- less prestigious universities may not worry about admission;
- the student is additionally motivated to study: in case of failure, the organization terminate a contract with him with a requirement to compensate for learning costs.

An applicant is guaranteed to work immediately after receiving a diploma, in addition, he has the opportunity to enter a university with a lower USE passing score than in the absence of a sponsoring organization.

Unfortunately, it still has even more shortcomings:

- more trained applicants cannot enter, which causes natural dissatisfaction;
- making the contract, the applicant is obliged to choose not only the faculty, but also a niche specialization, the difference in which he will be able to understand only in senior courses;

- the interaction of the enterprise-customer with the university consists only in reserving places for target students; it have any influence on the educational process neither in relation to training programs nor from the point of conducting classes by its employees;
- the problem of re-training young specialists at the workplace is not removed, since the student does not have any connection with the enterprise-customer, and he does not have time to learn anything during the practice;
- the employees of the enterprise-customer have no connection with the university and they have no incentive to participate in the educational process.

#### *4.5 Switchover to more flexible distance computer education*

It allows to minimize learning costs, listen to lectures of leading experts around the world, combine education with work [11, 12, 13]. The first Coursera distance education platform could be an example. Thanks to it, any person anywhere in the world, regardless of wealth, can take courses at the best universities: Stanford, Princeton, Columbia University. Created in 2012, Coursera in 2017 has already gained 24 million users. However, then the number of users began to fall. The thing is, that registering for a course is too simple, and no one controls further learning. In addition, virtual laboratories do not develop practical skills.

The main advantage of electronic educational resources is multimedia content. Videos, animation, the ability to enlarge maps and active forms make the electronic textbook to be a convenient, universal and interesting learning tool. Other advantages include low cost, mobility and variability [9]. It was proved by modern practice, that the body of knowledge to be assimilated in the learning process is better structured and systematized in electronic educational resources, which facilitates the assimilation of this knowledge. Such a form of learning can completely replace only the process of knowledge transfer, while the consolidation of skills and abilities remains questionable, and the formation of a systematic way of thinking remains in questionable too.

The development of a student's creative thinking requires the implementation of complex artificial intelligence algorithms, so it is necessary to develop "integration" scenarios for modern educational resources, which include methods and techniques, that develop creative approaches and stimulate the formation of personal qualities of the desired level. In digital learning, knowledge control often comes to analyzing the results of certain tests, since it is easy to be algorithmized. The thinking style, inherent in a digital learning program or a remote process, is mechanistic, sketchy, pragmatic, that is, digital learning formulates the pragmatism of thinking. In addition, computer technologies are inconvenient for taking into account the individual characteristics of the student's intelligence and temperament. When using the digital educational resource, the educational effect of communicating with the teacher disappears, which would ultimately make it possible to speak not only about learning but about education [5].

There is a danger, that the widespread occurrence of modern-style learning programs and the substitution of a teacher by them can lead to the loss of living thinking since digital learning tools perform only a part of the learning functions, that can be algorithmized. Interactive communication with the teacher is present only to the extent that the program developers could provide it. At the same time, there is no emotional communication, group communication, the competitiveness of the learning process and mastery of competencies.

Very specific thinking is formed with such an approach. At the same time, it is difficult to develop such important qualities as

- ability to think systemically,
- ability to think strategically (a few steps forward),
- the ability to see not only as wide as the poles apart options ("yes" and "no"), but also intermediate options, moreover, taken in interrelation with additional factors.

Therefore, despite the obvious advantages, learning with the help of educational information systems and applications is not able to replace the full personal communication of the teacher with the student. A student can obtain specific knowledge with the help of electronic educational resources, and even put it into a certain system, but he will not establish informal associative connections (which, in fact, mastery of the subject) precisely because it requires the technical intermediary to be able to think informally [2].

#### *4.6. Creation of basic departments*

Basic departments are created at universities by partner organizations. This was especially widespread in the IT field when partner organizations provide universities with the opportunity to use their products on preferential terms [14, 15, 16]. This is an interesting undertaking, in which there are many unsolved problems. In particular, who can be an employee of the basic department, what financial agreements can connect the basic organization and the university. What agreements can connect students of the department and the basic organization (analog of distribution)?

#### *4.7. Targeted Learning*

The most successful example of immersion of students in the professional environment of the creative team of the enterprise is the activity of the plant - technical college, created in the early 80s, MSTU named after N.E. Bauman attached to the Research Institute of Radiophysics named after academician A.A. Raspletin.

The implementation of this approach has undeniable advantages.

- Students have the opportunity not only to obtain theoretical knowledge, but also to apply them in practice, participating in the implementation of production plans and assignments.
- The enterprise receives promising employees, gradually increasing their knowledge and qualifications, adapted to the production process.

- The university creates attractive terms for the admission of students, masters a new approach to the training of engineering personnel and ensures the employment of students — from the first course of study.

Thus, students, using this model of targeted training, by graduation from the university are guaranteed to receive high qualifications, corresponding to the receive diplomas, and prospects for further professional growth.

The rapid saturation of vacancies with new specialists may be one of the shortcomings of such a model. Perhaps it makes sense to combine the enterprises of one department, preparing students for different enterprises according to this model. Then, only special subjects can be adapted to the requirements of the employer of a particular company.

The cooperation of the Higher School of Service of the Russian State University with the enterprises of Roscosmos in the field of geographic information services is also interesting [14, 15, 17].

The Russian State University of Tourism and Service (RSUTS) provides learning under the program of higher education of the academic bachelor's program, the direction of training is the service, the directivity is the geographic information service. The program provides students with knowledge and skills in the field of information and operating systems, software, computer equipment, practical work with various geographic information resources [17, 18].

In railway transport, specialists in the geographic information service [19] when monitoring railway rolling stocks, controlling the time of visits to control points (zones), monitoring the location and condition of freight, assessing and forecasting exogenous geological processes, monitoring emergencies in areas of responsibility of railway infrastructure, for creating large-scale photographic plans of sections of the railway, when controlling the condition of railway junctions and stations, monitoring vegetation cover along the railroad tracks.

#### V. CONCLUSIONS.

Modern technologies provide a variety of forms of learning: demonstration lectures by leading professors, open university courses, tutorials on programming training and using application programs, webinars, and masterclasses. However, school graduates are not ready to qualify in this way: most of them do not see an alternative to classical higher education.

Despite the huge number of university graduates, whose share in working age is much higher than in all European countries, many employers cannot fulfill vacancies. On the other hand, many university graduates are left without work or do not work in their specialty.

The measures, taken by the state, solve this problem only partially. The authors consider new directions of cooperation between business and the university to be the most promising approach: basic departments and targeted learning.

## References

- [1] V.P. Kulagin Rynok obrazovatel'nykh uslug: osobennosti, sostoyanie // Slavyanskiy forum. - 2012. - No. 2 (2). - p. 18-21.
- [2] V.M. Markelov, V.Ya. Tsvetkov Modeli poluchenie znaniy v geoinformatike // Slavyanskiy forum. - 2015. - No. 1 (7). - p. 177-182.
- [3] V.V. Gavrilova, S.V. Shaytura Informatsionnye modeli dannykh i baz znaniy v geoinformatsionnykh sistemakh // Slavyanskiy forum. – 2016 -No. 2 (12) - p. 71-85.
- [4] S.V. Shaytura Informatsionnye modeli dannykh i baz znaniy v geoinformatike // Slavyanskiy forum. - 2012.- No. 2 (2). - p. 69-79.
- [5] S.V. Shaytura Distantsionnoe obrazovanie kak povyshenie kachestva zhizni // Nauchnye trudy Vol'nogo ekonomicheskogo obshchestva Rossii. - 2012. - T. 164. - p. 99-103.
- [6] D. Walker The Problem of Graduate Employment //European Journal of Education. DOI: 10.2307/1502569
- [7] D. Xiaohao, C. Changjun A Study on the Employment of Graduates of Higher Education in the Context of the Financial Crisis // Procedia - Social and Behavioral Sciences. Vol. 77, 2013, pp 164-168.
- [8] L. El Bardiy, A. Louhmadi Professional Integration of Young Graduates // International Journal of Scientific Research and Innovative Technology. Vol. 2 No. 9, 2015
- [9] Y. Hwang What Is the Cause of Graduates' Unemployment? Focus on Individual Concerns and Perspectives. Journal of Educational Issues, Vol. 3, No. 2, 2017, pp. 1-10
- [10] J. Kong Factors Affecting Employment and Unemployment for Fresh Graduates in China. DOI: 10.5772/intechopen.69809 in: Unemployment. Perspective and Solutions, ed. Liu Yang. 2017. DOI: 10.5772/65157
- [11] S.V. Shaytura Distantsionnoe vysshee obrazovanie na russkom yazyke dlya Bolgarii // Slavyanskiy forum. - 2012.- No. 1 (1). - s. 52-57.
- [12] S.V. Shaytura Mezhdunarodnoe sotrudnistvo po standartizatsii uchebnogo kontenta v oblasti elektronnoy kommersii // Distantsionnoe i virtual'noe obuchenie. - 2016.- No. 2 (104). - p. 63-68
- [13] S.V. Shaytura Problemy i perspektivy mezhdunarodnogo distantsionnogo obrazovaniya // Distantsionnoe i virtual'noe obuchenie. - 2016.- No. 6 (108). - p. 36-41.
- [14] L.V. Sumzina, S.V. Shaytura Geoinformatsionny servis kak sostavnaya chast' obucheniya konstruktorov // Konstruktorskoe byuro - 2018.- No. 1 (132).- P. 64 - 74.
- [15] L.V. Sumzina, S.V. Shaytura Podgotovka kadrov po geoinformatsionnomu servisu // Otkhody i resursy – 2017 – T.4. No. 3. p. 9
- [16] A.A. Fedulin O geoinformatsionnom servise // Slavyanskiy forum.- 2017.- No. 3 (17).- P. 7–13.
- [17] S.V. Shaitura, Yu.P. Kozhaev, K.V. Ordov, T.A. Vintova, A.M. Minitaeva, V.M. Feoktistova Geoinformation services in a spatial economy // International Journal of Civil Engineering and Technology. 2018. V. 9. No. 2. P. 829-841.
- [18] S.V. Shaitura, Yu.P. Kozhaev, K.V. Ordov, A.V. Antonenkova, N.A. Zhenova Performance evaluation of the electronic commerce systems // Espacios.- 2017.- V. 38.- No. 62.- P. 11.
- [19] K.V. Danilov, N.I. Kapustin Tekhnologii Big Data v zheleznodorozhnoy otrassli infrastruktury // Nauka i tekhnologii zheleznykh dorog. – 2017. – 4(4). – p.25-33