

Developing Digital Competences for the New Industrialisation Model

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Abstract – The authors research the importance of higher education in solving issues arising in personnel training and development during the transition period of Russia's economy towards the new industrialisation model. Due to the digital economy development and the increasing role the digital technologies play in different human activities, new approaches to training competent employees are required. The article presents the analysis of the existing higher education standards and information technology courses and suggests a number of improvements to the higher education policies to ensure the digital competences development. The present study complies with the Digital Economy Program approved by the act of the Russian Federation Government on 28 July 2017 # 1632-p and announcing the personnel training quality as one of the key priorities.

Keywords – *digital economy, workforce, digital competences, undergraduate program, postgraduate program, educational standards, lifelong learning.*

I. INTRODUCTION

The new industrialisation process requires the use of new high-performance technologies to help increase the human technical capacity and labour productivity. The digital economy development being inextricably connected with the new industrialisation of the country should become the foundation for further improvements in management, entrepreneurship, social sphere, and education and training systems [1].

Advances in technology inevitably enhance the importance of digital technologies in all spheres of human activities and emphasise the need for the digital transformation practical implementation. New ways of accessing knowledge and information emerge. As a result, to remain competitive in a rapidly changing market, employers search for staff with well-developed Information and Communication Technology (ICT) skills. Currently, Russian government and businesses

report a shortage of IT specialists as well as employees with basic ICT skills.

Studying at university students are expected to obtain a range of skills necessary for the workplace, as in the digital economy there is an increasing need for new starters with better digital skills. The demand for IT competent employees exceeds the labour market supply, basic ITC skills being mostly important.

The survey conducted by the Organization for Economic Cooperation and Development revealed that about 40% of employees use text editing, multimedia presentations and spreadsheet applications software ineffectively. Strong digital skills can improve employee performance in their professional field and can make it possible to consider employment in different industries and move between jobs if necessary. In addition, basic skills can become the foundation for the digital skills development in continuous (lifelong) learning. It should be noted that continuous learning is not currently widespread in Russia as only about 17% of the country's adult population attend continuous learning programs (as compared to 40% in the European Union counties). Therefore ongoing training of older employees must become a priority. The Russian Federation benefits a very high level of education attainment and has been far ahead of many other countries comparable in terms of per capita income. Regrettably, this resource is not managed reasonably. According to the Global Human Capital data, the Russian Federation is among the top five countries in human capital. However, Russia ranks only forty-second in efficient skills application at work and involvement in continuous education, and only eighty-ninth in qualified employees availability.

II. LITERATURE REVIEW

Recently, a number of research papers have addressed the issues of the educational system development in the digital economy. Krioni, Maksimenko & Lakman [2] studied the universities of Bashkortostan Republic and

provided the analysis of the competencies marketable in the digital economy; other authors [3-5] focused on the issues of training employees for the digital economy, identified the key areas in education digitalization and approaches for obtaining necessary digital skills. As the researchers have noted, in addition to the knowledge of information technologies and the ability to apply them, employees should possess digital competences and should be able to use ITC confidently and effectively for work, rest, and communication, and the development of these digital competences should be carried out at all levels of the educational process, in professional activities and in daily life [6].

Ratzinger, Amess, & Greenman [7] analyzed the correlation between obtaining higher education by start-up founders and the probability of providing equity investment and the return for investors. Dang Nguyen [8] demonstrated the importance of higher education institutions in training personnel capable to adapt their skills to the changing nature of work. The research carried out by Rudenkol, Larionova, & Zaitseva [9] proved the necessity of applying new methods and using digital teaching material in building professional competences in higher education institutions. According to the researchers, the conceptual learning model is essential for training personnel for small business enterprises. This conceptual learning model should comprise aim, principles, methods, resources, content, assessment and result stages. Chetty, Aneja, & Mishra [10] examined the challenges of obtaining digital skills in the digital divide, with gender differences, unemployment rates and various socio-cultural norms taken into account.

Along with the analysis of the issues arising in education and training in the digital economy, many authors review higher education development trends in the context of globalization and their impact on the competitiveness of education. Khan, N., Khan, S., & Chen [11] focused on the development of the digital literacy framework that can be implemented in the higher education sector to identify the compulsory set of digital knowledge and skills. Some authors highlight the necessity of the systematic transformation of the higher education sector. New educational technologies that use the digital economy tools and are influenced by the global information society should be applied in this transformation [12]. When defining the digital economy as the system of economic relations based on digital information technologies, several researchers mention online education and development of accessible barrier-free educational environment among current educational trends [13].

III. RESEARCH METHODOLOGY

The analysis and synthesis, comparison and summarizing of the findings were used for the present study; where the statistical analysis was performed with SPSS using Student’s t-test.

IV. THE SUMMARY OF THE RESEARCH FINDINGS

Researchers identify the following digital skills categories: basic ICT skills for non-professionals that involve the ability to use technology in everyday life (e.g. the use of text editing and spreadsheet applications, the use of the Internet); specialist digital skills for developing software (e.g.

programming, databases and information systems development); special skills that involve the ability to meet new challenges related to the ICT application at work (e.g. business planning, communication with customers and colleagues via online networks) [14].

Since 2010, digital skills proficiency of all first-year students of Volgograd Institute of Management, Branch of RANEPA has been assessed annually. The present study analyses the results of the entrance assessment of undergraduate students for the period from 2010 to 2017 (picture 1).

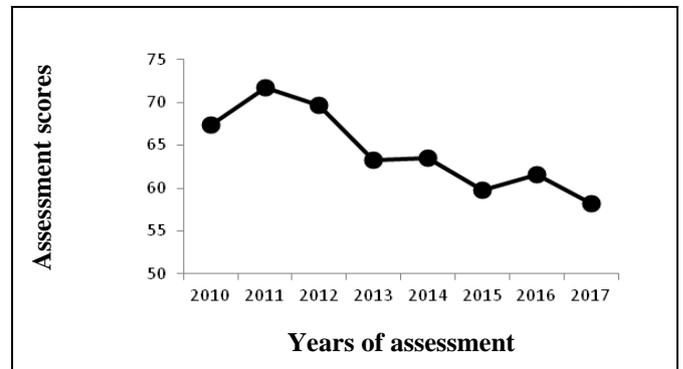


Fig. 1. The results of the entrance assessment in digital skills proficiency

The results obtained demonstrate the overall decrease in the digital skills proficiency in the recent years.

When examining the ICT courses taken by the students, majoring in Economics, and analyzing the students’ level of digital proficiency, we identified the following proficiency levels:

- *low* (the ability to apply the knowledge and skills of working with ICT in familiar settings)
- *intermediate* (the ability to apply the knowledge and skills of working with ICT in new, unfamiliar but typical settings)
- *high* (the ability to apply the knowledge and skills of working with ICT in new, unfamiliar settings)

The findings of the series of diagnostic tests are presented in Table 1.

TABLE I. THE CHANGES IN THE STUDENTS’ DIGITAL COMPETENCE PROFICIENCY LEVELS

The digital competence proficiency level	The entrance assessment	The final assessment
low	22%	17%
intermediate	59%	48%
high	19%	35%

The findings of the assessments demonstrate a 16% increase in the number of students with the high digital competence proficiency level and a 5% decrease in the number of students with the low level.

The analysis of the data obtained from the entrance and final assessments of the digital competence proficiency levels revealed that the average score at the final assessment was higher than the average score at the entrance assessment.

The analysis of the assessment data was performed with SPSS and the credibility of the findings were proved with Student's t-test. The 0,014 value obtained confirms the hypothesis that the difference in the entrance and final assessments scores is significant.

When evaluating the education quality level of the courses aimed at the digital competence development, one should take into account potential employers' needs and requirements. Generally, potential employers require a range of skills and expect university graduates to demonstrate their knowledge and intelligence; their creative approach to professional duties; their readiness for lifelong study and the independent management of their skills development; a solid level of ICT usage; the ability to collaborate, innovate, and share information and knowledge [15].

Annual surveys designed to measure the employers' level of satisfaction with our university graduates' level of ICT proficiency confirm adequate digital skills proficiency of our graduates.

V. RESULTS AND PROPOSALS

The educational standards for degrees in Economics at both undergraduate and postgraduate levels were analyzed, and the findings revealed the insufficient number of ICT competences. Currently, there are only two ICT competences in the curriculum: the ability to complete routine professional tasks by applying ICT and research skills with the information security requirements met (core professional competence-1); the ability to use ICT in communication (professional competence-10).

When studying the population digital literacy Regional Public Centre of Internet Technologies identified the following core digital competences: the ability to gain and evaluate information, the ability to use digital devices and social networks, the ability to do online banking and shopping, the ability to produce multimedia content, the ability to think critically, and the ability to sync devices.

When compared, the list of the competences developed by higher education institutions and the list of the competences expected by Regional Public Centre of Internet Technologies appear to have little in common. From our point of view, they both lack competences related to the abilities to use government sites and study online.

The curriculum for the undergraduate degrees in Economics of Volgograd Institute of Management, Branch of RANEPA contains three compulsory ICT courses, namely Economic Informatics, Electronic Systems and Technologies and Introduction to Information Security in Economic Activities. At the same time, our institute offers a range of electives related to ICT. Students can choose to study Information Systems in Economics, Customized Software Packages for Economists, Accounting Information Systems, Professional Information Systems and Databases, Information Systems for Public Administration, and Information Systems in Business Management. As these courses are electives, students have to decide whether to apply for Accounting

Information Systems course or Professional Information Systems and Databases course. Although we believe that it is better for future professionals to study both.

The analysis of the ICT courses offered by our institute demonstrated the necessity for the introduction of new courses on programming and professional information systems.

Moreover, with new educational standards classroom hours are reduced and students are expected to self-study more. For proper self-study students should be provided with extensive and well-developed study material; the key principles, the overview of the subjects and the knowledge base of the topics should be given at lectures; multimedia materials and textbooks should be available for students to use independently; small-group tutorials and practicals should be organised to provide opportunities for students to discuss new material and explore topics in depth. This kind of training in undergraduate education can allow a smooth transition from the traditional education system, which is customary for secondary schools, to a mixed one that incorporates both traditional and long-distance (online) learning. Psychologically speaking, this approach is more comfortable for students. Postgraduate students can be recommended books and textbooks to study the material independently and invited to participate in class to discuss research issues.

The digital competences required by the digital economy from higher education graduates are not included in the list of state standards. Thus, graduates have to be prepared to gain new knowledge by studying best practices in the economic development [16]. Therefore, we consider it necessary to utilize the teaching potential of third parties. One example of the successful third party involvement is our institute's participation in the joint project of Sberbank and Google named Business-class and carried out in Volgograd region. The online course offers practicals with experienced professionals to undergraduate students. Another example is a successful long-standing collaboration with Kontur Specialized Design Bureau engaged in business software development. Initial collaboration involved master classes and competitions for students. At present students are offered a range of online courses, such as Accounting School, Online Trade School, and the credits received are transferable to our institute's degree programs. To search for talents and identify capable senior students our institute participated in a tripartite project partnership that involved Kontur Specialized Design Bureau and the local Tax Authority. The main objective of the project was to teach companies and individuals to submit tax returns electronically. The students of our institute were trained to provide the information and assistance and received payment from Kontur Specialized Design Bureau. The most successful students were invited to participate in the research carried out by our institute and supported by grants.

The current economic environment requires new digital competences, therefore higher education institutions need to design and introduce new continuing education programs aimed at digital competences development. Continuing education programs provide opportunities for acquiring competences in shorter periods of time and without disrupting the employment [17,18].

Major changes should be introduced in those higher education institutions that offer continuing education programs in professional development courses. The Centre for Retraining and Advanced Training is a constituent part of our institute. It offers Public Administration and Local Self-government professional development programs; manages and promotes talent; ensures that the qualifications obtained meet the requirements of the changing employment environment and social sphere. This academic year the Centre for Retraining and Advanced Training is running two new continuing education programs related to the digital skills development; they are “State Policy on Access to the Information on State Bodies Activities” and “Open Data and Improving the Efficiency of Public Services”.

The Centre for Retraining and Advanced Training is one of the most flexible units of our university. To help employees adjust to changes at work the Centre can adapt existing courses or develop new ones at very short notice.

VI. CONCLUSION

At the new stage of Russia's economy industrialization the issue of training professionals is still highly relevant.

Our research findings allow us to suggest the following:

- new competencies for the digital economy should be developed for degrees at undergraduate and postgraduate levels to ensure that employers receive skilled and highly productive workforce and when developing the competencies, particular occupation-specific skills should be taken into account;
- new competencies should be developed for continuing education programs to allow workers to keep their skills up to date for more productive work in technology-rich environments;
- educational programs should be adapted to meet the current requirements of the digital economy;
- a motivation system should be developed to strengthen initial learning and offer incentives for further learning to university students.

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