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DIGITAL TRANSFORMATION OF HUMAN CAPITAL MANAGEMENT IN TRANSPORTATION INDUSTRY

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Abstract

The article aims to assess the opportunities for developing digital competencies of university graduates on the example of the transformation of educational technologies and the educational environment at Orenburg State University as part of the implementation of the Priority 2030 program. To solve this and generalize the existing experience, the following were used: a descriptive method (including the method of observation, interpretation, comparison, and generalization), general scientific research methods (such as comparative and logical analysis to assess the effectiveness of educational technologies), and a graphical interpretation method (to represent the components the educational information environment of the university and the model of interaction in the educational process). The article discusses modern approaches to the formation of digital competencies among students in the transport industry as one of the key factors in improving the quality of technical education on the example of the formation of a multicomponent electronic educational system of the Orenburg State University, including hardware, software and organizational and methodological support. Data for 2020–2021 are provided based on the results of participation in the program for the digital development of higher education. This ensured a significant increase in the material and technical base directly involved in the implementation of educational programs in the field of transport. The scientific novelty of the research lies in the substantiation of a set of measures, and educational technologies of a modern university with the aim of professional training future specialists for the digital economy.

Keywords: Digital competencies, education, educational program, educational process, participants in the educational process, student startup

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1. Introduction

As in any other industry, it is impossible to consider resource management in the transport complex excluding the basic competencies and skills of specialists, and the level and quality of education they received in a higher educational institution. The modern education system must meet the requirements of the social contract concluded between the employer, the state, the student (or his parents), and the university (Zhuravleva et al., 2020). Therefore, digital transformation with regard to the management of human capital inevitably affects the higher education system.

2. Problem Statement

The ongoing economic transformations seek to address global, socially significant, and meaningful tasks. The current economic situation in the country calls for the need to change the emphasis on management at the level of both the national economy and the industrial enterprise (Ostrowski & Maslowski, 2019). Humanity is on the verge of the fourth industrial revolution, which affects the demands of society for professional skills (Suhorukova, 2018). The formation of an effective educational environment in the university is one of the key factors in improving the quality of technical education (Davidson et al., 2018). The presence and functioning of the electronic educational environment acquired particular relevance in 2021, in the context of a general global pandemic.

3. Research Questions

In modern conditions, the higher education system is the interaction of four participants in the process: the state, the educational organization, employers, and the customer of the service, which can be the student himself or his parents (Ministry of Science and Higher…). The scheme of this interaction is shown in Figure 01.

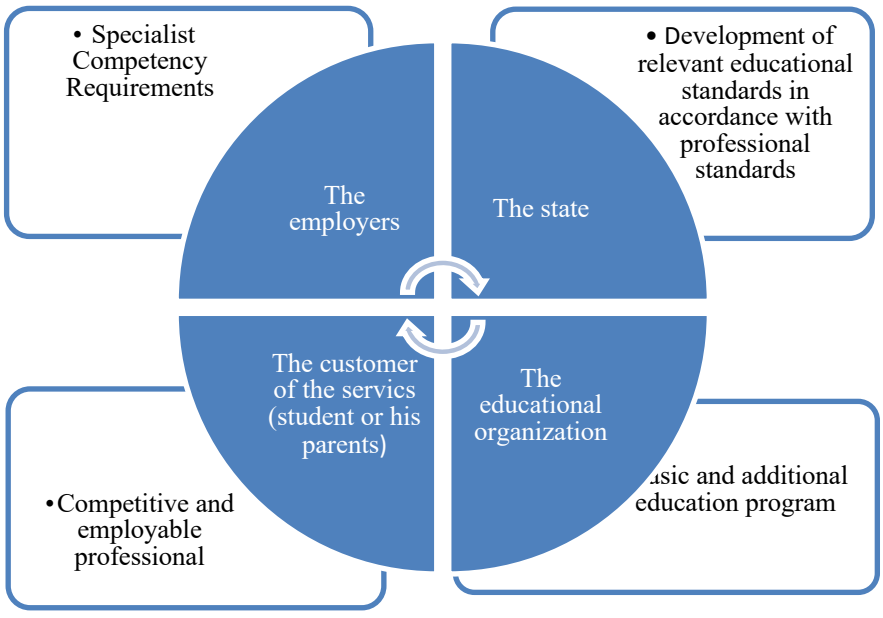

Figure 1. The major components of the educational information environment of the university

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For education, it is also logical to use the concepts of supply and demand used in economic theory (Hai-Jew, 2020). From this point of view, an educational service is a commodity. Figure 02 shows a possible model that, under these conditions, will provide the most effective interaction between the parties.

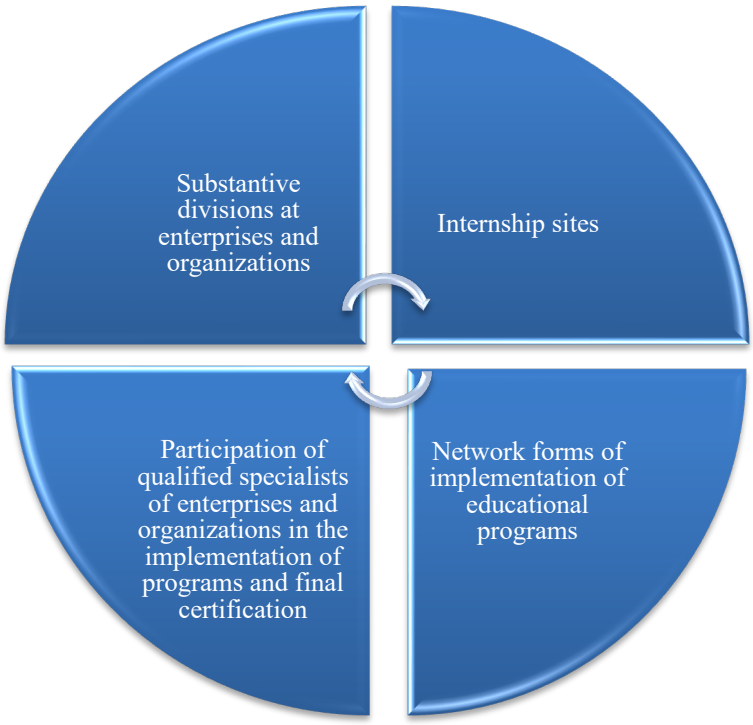

Figure 2. Assumed model of interaction in the educational process

Consider the management of human capital in the context of the digital transformation of the transport complex using the example of digitalization of education at the Orenburg State University (hereinafter referred to as OSU).

The directions of training for bachelors and masters with higher professional education for the transport complex are non-core for the IT sector (7, 8). They are expected to study under additional education programs, in particular, advanced training courses under the Digital Professions program implemented as part of a federal project. The following programs can be considered especially relevant for transport: Fundamentals of data analysis and machine learning, Digital marketing and media, Fundamentals of information security for users, and Modern applied programming technologies.

From 2021, it is planned to implement four professional retraining programs for digital professions (at least 28 credits, at least 250 classroom hours): Data Analyst, Web Application Developer, Program and Data Protection, Information Systems Administrator for students of technical and economic areas of study, and as well as external trainees. The programs are expected to be implemented jointly with specialized companies in the real sector of the digital economy, such as Intelligent Systems LLC, IC

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SIBINTEK LLC, Volga Macroregion Branch, Microimpulse LLC, PJSC Rostelecom, PJSC Sberbank, Yandex, 1C and others.

The final paper as part of professional retraining makes it possible to assess knowledge, skills, and abilities in digital competencies. The topics of the final paper for each of the planned programs will be formulated by the needs and objectives of companies in the real sector of the digital economy. As a final paper, a student startup implemented on the subject of the chosen direction of professional retraining can be accepted. It is discussed to defend the final paper at a session of the certification commission with the invitation of representatives of companies in the real sector of the digital economy, the Ministry of Digital Development and Communications of the Orenburg Region, as well as other regional ministries and departments acting as a functional customer, which will provide an independent assessment of students' digital competencies.

The admission plan for each of the stated professional retraining programs for 2021 was at least 50 people; in total for all stated programs at least 200 students. Starting from 2022, it is planned to recruit no less than 300 people with an annual increase of no less than 100–150 people per year. The recruitment plan for each program and the list of proposed professional retraining programs will be adjusted annually depending on the demand for professions and digital competencies in the regional labor market. The composition of the modules of the stated programs will need to be updated under the recommendations of the support educational center.

To increase the coverage of students, the programs will be implemented using distance learning technologies and massive online courses. At the same time, the defense of the projects of the final paper will be organized via videoconferencing.

Fixing the students' digital footprint is carried out using the means of information and communication technologies used in the educational process, including the capabilities of the electronic educational environment integrated with the OSU corporate information system. The attributes of the digital trail are data on academic performance, fixing the progress of the educational process, and including the student activity within the digital educational platform.

It is necessary to implement educational programs aimed at developing digital competencies in the field of creating algorithms, programs suitable for practical application, and skills in using and mastering new digital technologies with the participation of digital economy companies in the following areas:

i. practice-oriented Bachelor's programs Applied Programming and Corporate Information Systems together with 1C, Development and Administration of Information Systems together with Cinimex-Informatics, System Engineering and Digitalization of Information Processes, Data Analysis and Machine Learning, Digital Technologies;
ii. Master's programs in Deep Learning and Generative Artificial Intelligence, Artificial Intelligence in Industry commissioned by leading industrial enterprises and relevant ministries of the Orenburg region;
iii. introduction of the practice of accounting for student projects, including startups, as a final paper.

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4. Purpose of the Study

The article aims to assess the opportunities for developing digital competencies of university graduates on the example of the transformation of educational technologies and the educational environment at Orenburg State University as part of the implementation of the Priority 2030 program.

5. Research Methods

To solve this and generalize the existing experience, the following were used: a descriptive method (including the method of observation, interpretation, comparison, and generalization), general scientific research methods (such as comparative and logical analysis to assess the effectiveness of educational technologies), and a graphical interpretation method (to represent the components the educational information environment of the university and the model of interaction in the educational process).

6. Findings

To implement digital competencies, it is discussed to introduce into the educational process the course Introduction to Artificial Intelligence for bachelor and specialist students of all areas of training as an elective, with the formation of digital competence: “The ability to apply modern methods and tools of artificial intelligence to solve applied problems”.

It is planned to train at least 300 people annually in non-core IT areas for bachelor and specialist studies. As a result of mastering the course, students implement a project in the field of application of artificial intelligence technologies. Projects can be formed in the form of startups. The result of the startup implementation can be accepted as the final paper if there is an appropriate conclusion of the commission with the participation of representatives of companies in the sector of the digital economy and the Ministry of Digital Development and Communications of the Orenburg Region. All of the listed disciplines (courses, modules) will be developed considering the recommendations of the supporting educational center.

To ensure the possibility of passing disciplines by students in non-core IT areas of training, it is expected to develop and introduce into the educational process at least 10 massive online courses on popular digital competencies.

As part of providing conditions for the accelerated formation of digital competencies, it is planned to hold at least three joint events with the Ministry of Digital Development and Communications of the Orenburg Region in the format of hackathons, as well as intensives, project sessions, modules, and competitions annually. Specific tasks will be formulated jointly with the business community of the region. They are aimed at developing software to solve region's business or social problems, including using artificial intelligence methods. Based on the competition's results, the most complete and high-quality solutions will be selected, which can be applied at the regional level by implementing solutions in the economic sector in the startup form.

Now the university is organizing and holding the University IT Spring competition, which promotes the development of skills and the formation of digital competencies. It is expected to organize

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no less than one CTF contest annually in conjunction with the Ministry of Digital Development and Communications. The topics of educational intensives will touch upon the current problems of the region, as well as focus on developing skills in the following areas of knowledge: machine learning, artificial intelligence, neural networks, mobile development, product management, investments, building and administering business processes, developing secure software and big data. Holding such events, competitions, and educational intensives contribute to the development of an accelerator of IT competencies based on the university.

In addition to the above activities, to form digital competencies and skills in the use of digital technologies among students, as well as within the framework of the university development program, the following activities can be implemented: organization and conduct of optional courses from leading IT companies (Yandex, Samsung, Intel) and eight short-term training programs for the competencies of the digital economy.

As part of the implementation of academic mobility programs for students in non-core IT directions, it is planned to carry out network interaction with leading universities in the formation of digital competencies. The digital development of OSU in terms of the state of the IT infrastructure is at the following levels by category:

i. in terms of data processing and storage systems, development allows maintaining the level of automation necessary for the implementation of individual digitalization products, in particular, document management and the provision of digital services;
ii. local area networks are at an acceptable level for providing digital services to users, however, structured cabling systems partially require replacement; for 2021, it is planned to expand the coverage and improve the signal quality for the wireless broadband access system;
iii. computer, multimedia, and presentation equipment used in the educational process provides students with access to digital services (video communication, interactive multimedia products, virtual reality systems, etc.);
iv. there is full accessibility of digital services, educational and general-purpose tools for all participants in the educational process through portals on the official website of the organization;
v. the available software meets modern requirements (operating systems, office programs, design systems, training programs), and software is regularly updated to the latest versions (Ostrowski & Maslowski, 2019).

7. Conclusion

This paper has clearly shown that the modernization of individual segments of the IT infrastructure of the university in terms of facilities with high-performance equipment for machine learning made it possible to bring the teaching of relevant IT disciplines to a qualitatively new level. In addition, an agreement has been concluded between the university and the Yandex cloud platform, under which students and teachers are provided with access to services for educational purposes.

The Priority 2030 program provides for the creation at the OSU of a training and practical center of the National Cyber Testing Ground for training specialists and experts with specific skills, managers in the field of information security and information technology in modern security practices, approved by

Decree of the Government of the Russian Federation dated October 12, 2019 No. 1320 for conducting cyber exercises, cyber training, software, and hardware testing, information security competitions on its basis.

The quality of education is often the subject of discussion, as it largely depends on the equipment of the educational process and the technical means used in it. The formation of an effective educational environment in the university is one of the main factors in improving the quality of engineering education. The availability and functioning of the electronic educational environment have become especially relevant in 2021, in the context of a global pandemic. All this once again emphasizes the need to develop the digital competencies of students (Frolova et al., 2021).

The development plans of the material base and IT infrastructure include a gradual increase in their computing power in the local data processing center, aimed at meeting their own needs in terms of using equipment for teaching modern IT disciplines. On the equipment, it is planned to deploy services for students and teachers, allowing them to study and put into practice the operation of complex systems aimed at machine learning, working with big data, and building data processing cycles for product systems. The opening of specialized laboratories (industrial Internet of things, 5G networks, and others) together with leading IT vendors (Samsung, Huawei) is being discussed, which will not only contribute to the educational process at the modern level but also allow conducting scientific research in new directions.

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