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**CHANGES IN CORPORATE EDUCATION ENVIRONMENT IN
THE CONTEXT OF DIGITAL ECONOMY**

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Abstract

The article presents comparative analysis of changes taking place in corporate education environment in enterprises in the context of digital economy when the main emphasis in production switches from capital to human resources. Main trends in education in the context of digitalization of Russian economy are studied on the example of aircraft-engine-building corporation. The corporation establishes common resources for some professions/disciplines with options of online learning. Modern practices and trends of corporate education environment improvement and ways of raising the efficiency of staff training with the use of digital technologies are discussed. The pedagogical competency deficits are defined experimentally, and the results of monitoring of education environment in corporate training centers are discussed. The results of comparative study made in 2013, 2017 and 2019 based on three basic criteria – changes in logistics base, teachers' pedagogical competencies and teaching methods are presented. The system approach for the teacher training and competency model of their training are proposed. In such a learning process besides pedagogical competencies special professional environment is forming that allows sharing the experience and developing professional skills. The main trends in development of corporate education environment revealed are: evolution of teaching methods from classic approaches to establishing the classrooms allowing imitation of production processes, from lectures to webinars, electronic courses, distant learning. The methodology of developing an electronic interactive course oriented on individualized learning of engine construction and functioning has been created. These changes fit within world trends of education development.

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1. Introduction

Technological paradigm changes worldwide influence all social life sectors. Geopolitical, economic, technological trends nowadays affect the structure and the character of employment. Significant changes take place in the human resources sector. Thus, emphasis is placed on the nature of corporate education subsystems interaction, new methods of continuing staff education, and understanding of pedagogical education component in qualification requirements for mentors. As recent studies show these changes are global.

2. Problem Statement

Many call our time the fourth industrial revolution. The concept of “Industry 4.0” suggests to “switch to fully automated production managed by intelligent systems in real time in constant interaction with external environment that extends beyond one enterprise and creates a perspective of merging into global net of goods and services” (Fourth industrial revolution. Popularly about mail technological trend of XX century, 2017, section “Introduction”). Hence another term – digital revolution or digitalization. Digital revolution is characterized by fundamental transformation of business, economics and society (digital transformation).

Aircraft production as knowledge intensive industry needs digital transformation. Within “Seaplane Salon – 2018” in Gelendzhik the Consolidated engine building corporation organized panel discussion “Digitalization of aircraft industry. Basic practical purposes and steps”. The issues discussed were general approaches of information integration of aircraft industries; concept of digital technologies implementation efficiency; effectiveness of R&D development based on digital technologies; service and aftersales support development in the context of digital transformation. The participants noted that “digital technologies nowadays play key role in promotion of competitiveness of aircraft industry... they become its main driver” (ODK held a panel discussion at “Seaplane Salon” about digitalization in aircraft building, 2018). These issues are targeted in national program “Digital economy of Russian Federation” stating that “digital data are the key production factor in all socioeconomic sectors ... that raise country competitiveness and quality of life, support economic growth” (Government Programme of Russian Federation “Digital economics of Russian Federation”, 2017, p.1).

The main productive factor in implementation of digital economy development programs is “not the capital but staff capacity. Therefore, the qualified staff shortage will slow down innovations, competitiveness and growth” (Schwab, 2016, p.39). Innovations are impossible without system approach to staff growth and development of a competency model allowing a person to become sustainable and to function in the changing environment.

The study is devoted to the analysis of these changes, development of guidelines, models and methods of continuous staff growth in the context of effective cooperation of aircraft corporation enterprises and digitalization of education environment.

3. Research Questions

The study focuses on: comparative analysis of changes in corporate education environment of enterprises in new digital economy environment in the international context; experimental investigation of competency shortage of pedagogical staff of the aircraft-engine-enterprise training center; finding the directions of corporate education development in the context of digitalization of economics in aircraft-engine-building corporation.

4. Purpose of the Study

The purpose of the study is to develop guidelines for teaching staff training and educational technologies efficiency in corporate education system in the context of economy and education digitalization basing on the analysis of international trends in corporate education environment and monitoring data on practical work of aircraft-engine-building corporation training centers.

5. Research Methods

The research methods used are: comparative analysis of enterprise training centers, questionnaire for teaching staff, corporate education environment monitoring data analysis.

6. Findings

In the report of The Boston Consulting Group “Russia 2025: Resetting the talent balance” it is mentioned that “the list of skills that are essential in order to function in the new context: a focus on self-development, self-organization, decision-making and result delivery skills, non-standard task solution, entrepreneurial skills, adaptability, communication skills, interpersonal and intercultural competencies, emotional intelligence, digital skills, and others” (Russia 2025: Resetting the Talent Balance, 2017, p.20).

In this context the most important trend is usage of new approaches in developing the labor force, workplaces and work relationship. Special emphasis is put on education and personnel development. This makes companies utilize the concept of continuous personnel development when employees can easily get new knowledge and choose learning conditions (Rewriting the rules for the digital age. Deloitte Global Human Capital Trends, 2017).

Global trends in the world market of corporate education confirm this tendency. The corporate education researchers point out that today companies more often need specific instruments than full cycle education service. Employers often organize individually planned staff development. Many training programs are being developed by enterprise itself which underlines the role of corporate internal structures responsible for staff education and development (Batheja, 2018; Bersin, 2018).

The knowledge transfer methods are changing. Modern technologies include development of training systems characterized by flexible content, mobility, one click information services, machine education, quick access to analytical databases, group interaction etc. Big international corporations using such systems report on the increased staff involvement in education – up to 80 % and cost savings. They also fix that about 50 % of personnel study on the way to and back from work, and 90 % of them use their

personal gadgets (Dudorova, 2017; Schleier, 2016). An important trend is an ability to get needed knowledge in convenient time in most convenient way. In this context the Charles Jennings' approach to corporate education "70-20-10" works: 10 % of knowledge you get from traditional resources, 20 % - from social education (colleagues, chief) and 70 % - analyzing your own experience (Jennings, 2015).

In most Russian organizations the education and staff development processes take place in corporate training centers and corporate universities. Thus the Consolidated engine building corporation which includes 14 aircraft-engine-building enterprises has a corporate university that unites and coordinates all training centers of the corporation.

Within the framework of corporate training centers action we make regular investigations of education system aspects including questionnaires for heads of personnel service. The results allow making conclusions on the systematic education processes in corporate enterprises, actual professions; availability of educational resources and teaching staff; logistics base; and education costs. The conclusions allow evaluating the changes in corporate education environment and making efforts in its development. We mean by education environment in this case full spectrum of learning conditions and staff development as "integrity of specially organized pedagogical conditions of personal development" (Tarasov, 2011, p.133).

Let's review the results of investigations made in 2013, 2017 and 2019 basing on three criteria – changes in logistics base, staff training methods, training centers teaching staff competencies.

In 2013 the corporation (founded in 2008) continued the integration of aircraft-engine-building assets. With regard to the provision of qualified personnel the corporation cooperated with higher and secondary professional education institutions. The corporate university organized the leadership training on project management, implementation of economical production tools, corporate HR-forums – for an exchange of best HR-practices and consolidation of resources. The personnel had been seen as a main resource ensuring breakthrough projects on developing new technologies and aircraft samples. Great attention was paid to formalization and retention of unique knowledge. New modern training platforms were developed in NPO "Saturn" (Rybinsk), "UMPO" (Ufa), "Aviadvigatel" (Perm). Training classrooms and working areas were equipped with modern machining facilities including computer-controlled machines, computers, multimedia equipment. That is to say that the conditions for implementation classic teaching methods were provided.

In 2017 there had been some specialization observed in corporate profession skills championship. It was noticed that different training centers had specific logistical support: in PAO "ODK-Saturn" and NPC "Salut" there were facilities for training machine tool operators (turnery, milling work), and in "ODK-Klimov" and "MMP im. V.V.Chernyshova" there were work-study sites for running the championship on "aircraft service" competency with simulators/models for engine assembling-disassembling. Thus, the processes of unification and optimization of resources of different enterprises training centers had started in order to create corporate staff learning and training system.

Computer classes became a required element of corporate education environment. Active assimilation of modern computer software allowing usage of new design practices, modelling processes running in engines, making engineering calculations much faster was in progress. Electronic document management was introduced, engineering documentation was digitalized.

Thereafter making stronger and updating logistic facilities of the training centers the corporate enterprises changed education environment and created conditions for continuous education and new competencies mastering (including digital competencies) for the personnel. Hence integrating and optimizing learning resources the enterprises became providers for others in certain programs. The spectra of teaching methods and education approaches had expanded (Figure 01).

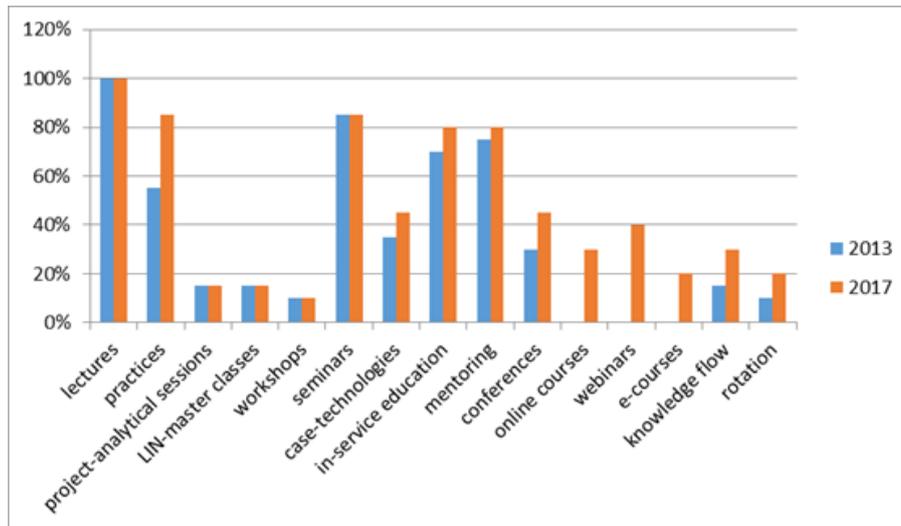


Figure 01. Comparison of educational forms and methods used in corporate training centers in 2013 and 2017

By 2017 the personnel of corporation started using online learning, taking part in webinars and distant learning courses. In 2018 the corporate knowledge management system with common platform, manuals, electronic libraries, and resources access was created. The facilities with integrated resources on specific professions/disciplines allowing theoretical online instruction were created. In 2019 it was planned to develop net learning programs, to make knowledge management system accessible for more people.

The role of teaching methods allowing more fast and efficient learning and digital skills development was growing. One of the experimental results gave rise to development of new educational program on engine VK-2500. In cooperation with Baltic State Technological University “Voenmekh” there was developed a computer-aided study course consisted of several modules (engine construction, exploitation, production and maintenance). The course is oriented toward vast audience – from student to aircraft operator. The uniqueness of the course is in its modularity and interactive nature. It might be used as a visual addition to the lecture and as an instrument of self-development. The content of the course is clearly structured, describes all engine mounts and accessories, and includes 3D-models, audio, video, photo maintenance, and flash-animation. Every topic ends up with self-evaluation quiz. At the end of study every learner must pass a test on all the content studied. To be able to answer all questions of the test the learner must have worked with 3D-model of the engine (extend, draw near) and use this information in answers.

The piloting showed that the course formalizes cognitive and digital skills. When starting the course the learner must already be active computer user. After brief introduction and theoretical part the

learner starts self-learning or learning with minimum teacher' control. Hence the responsibility for own knowledge and self-development skill are being developed.

The course as a new wave education trend had initiated the process of virtual aircraft engine laboratory development allowing studying construction and operating procedures without major investment. In 2018 the course was included in education program and practice program for students of technical high school "Primorskiy" and "Voenmekh" on the basis of "ODK-Klimov" and is regularly used in professional development programs for aircraft operators. The instruments of control developed within the course allow the teacher to evaluate learner's efforts in studying (time spent, self-evaluation frequency, etc.), to analyze typical mistakes, to give recommendations on difficult topics. The course has been registered in Federal service on intellectual property.

Thus digital technologies development extends the range of education forms and methods making accent on interactive methods involving active learners' participation and better results for them. Such courses also build a culture of functioning in digital environment.

Teachers', masters', mentors' readiness for solving new pedagogical tasks is an important part of staff training system. Significant difference in putting together teaching staff of corporate training centers in 2017 compared to 2013 was made through understanding that specialists-knowledge keepers must be identified and taught to formalize their knowledge, develop pedagogical competencies that are different from their everyday professional competencies. Teachers and mentors from most professionally competent workers traditionally take part in corporate education activities. Often they are artists of the profession but do not have pedagogical knowledge and skills. Earlier the most important thing for the teacher was his/her knowledge of specific production functions, but now the prerequisite for the candidate is basic pedagogical education or presence of certain pedagogical competencies. However, some competencies are still a problem for current teachers.

Thus, the analysis of skills of training center teachers at "ODK-Klimov" in 2017 showed that some teachers are not sufficient computer users, use limited number of teaching methods, and do not take into account that their audience is adults. Therefore, as a part of experiment on education environment improvement in "ODK-Klimov" a program was created and tested that allowed to form and develop pedagogical competencies among workers who teach but do not have basic pedagogical education. At the end of the course the learners must pass an exam where they should present their new competencies – conduct a lesson, defend learning program they have developed and plan of the lesson, etc. In such a learning process besides pedagogical competencies special professional environment is forming that allows sharing the experience and developing professional skills.

7. Conclusion

The analysis of corporate staff education system in 2013, 2017 and 2019 revealed some trends in changing educational environment:

The logistics base of training centers is being developed – from creation of conditions for learning using classic methods in 2013 to setting up classrooms and work-study areas allowing imitation of production processes during education activities and practice important professional skills in 2017 and 2019.

As a result of logistics base development educational technologies are also being developed. In 2013 main teaching methods used were lectures, practices and in-service training, but in 2017 and 2019 new forms were introduced – webinars, electronic courses, distant learning. The methodology of development of complex electronic interactive course oriented to learner' individual needs was created to study the engine produced in “ODK-Klimov”. These changes fit within world trends of education development (SHL Russia & CIS, 2018; Leaman, 2016; Monitoring globalnyh trendov, 2018; Farashahi & Tajeddin, 2018).

More attention is paid to teacher pedagogical competencies. If in 2013 the investigation fixed only presence of teachers in training centers and the programs created and implemented by them, in 2017 there has become necessary to identify specific pedagogical competencies they lack, and by 2019 the training program on developing pedagogical competencies was developed and implemented on the base of “ODK-Klimov” training center.

Hence, digitalization in economics and social life of modern society influences the education environment at enterprises and requires not only implementation of new ICT technologies but new pedagogical competencies of teaching staff at training centers, sophistication of pedagogical functions of corporations and hierarchy structure of education environment. This helps achieving qualitative mastering of new design technologies and aircraft-engine-production, creating new materials, operational exchange of best practices, making a breakthrough in industrial development.

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