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# Problems and prospects of digitalization and informatization of forest education in Russia

M Lobovikov<sup>1</sup>, N Pryadilina<sup>2</sup>

<sup>1</sup> *Saint-Petersburg State Forest Technical University, 5 Institutskiy Lane, St. Petersburg 194021, Russian Federation*

<sup>2</sup> *Department of Economics and Economic Security, Socio-Economic Faculty, Ural State Forestry Technical University, Siberian tract 37, Yekaterinburg 620100, Russian Federation*

\*Corresponding email: [maxim.lobovikov@mail.ru](mailto:maxim.lobovikov@mail.ru)

**Abstract.** Digital technologies are rapidly invading all spheres of life of modern society. Education is no exception. On the contrary, education is becoming one of the main subjects and beneficiaries of digitalization in the broad sense of the word, often in the most unexpected areas of knowledge obtaining, mastering and applying.

## 1. Introduction

The current Russian educational system has evolved and is developing under market conditions. These conditions are fundamentally different from those that existed in the former administrative economy. In those conditions, there was no market. More precisely, the market and market incentives have always been in place, but they experienced constant pressure from the administrative-planning levers of management, which constantly conflicted with supply and demand, private initiative, entrepreneurship, and other well-known market mechanisms. The forestry education system built in Russia (as a part of the former Soviet Union) during the era of the planned economy was, of course, well adapted to the previous conditions and produced good results in that conditions. However, at that time there was no labor market, modern digitalization and modern informatization of society. Their appearance required a change in the approach to education.

## 2. Methods and Materials

Digitalization is rapidly changing labor markets. Previous economic specializations are quickly dying off. The traditional accounting profession quickly fades due to the new capabilities of artificial intelligence, digitalization of taxation, analytical programs and outsourcing. Instead, new opportunities emerge for training specialists in the field of market analysis, marketing and management [1].

### 2.1. Supply and demand for education

Integration of the Bologna process into Russian education was natural and expected process. The Bologna system, modular and network learning (peer-to-peer learning) are clear manifestation of the market in education. Not everyone agrees with this thesis. The previous five or six year forestry education system (engineers, specialists) has many supporters and followers.

The main advantage of the Bologna system is its multi-stage nature, which allows to have several steps in professional career and better suit education to modern and rapidly changing labor market



conditions. The more steps in a professional career, the more steps there should be in the professional education: secondary professional (vocational) education, undergraduate, graduate, postgraduate studies and then continuous professional retraining and additional education system - this is the horizon of the necessary and sufficient education system in the forest sector today.

A specialty that is closer and more understandable to the previous administrative economic system is more suitable today for the training of teaching staff of primary and secondary schools and colleges, historians, teachers, engineers, that is, to those areas that are relatively less affected by market changes in the relevant fields of knowledge [2]. The introduction of the Bologna system in these areas of education was undoubtedly not always justified and often led to negative consequences, including a drop in the level of education and outflow of national qualified personnel from the country in order to obtain a more complete education and occupation abroad.

The quantity and quality of education in market economy, as well as in its other sectors, is determined primarily by supply and demand. Demand is determined by the buyer. Supply is generated by the seller based on customer demand. Forest sector serves as a buyer or customer of the forest education. There are two main counterparts in the forest sector - the public and private sectors.

In the private sector, governmental influence is manifested only indirectly. The private employer decides about the required level of qualification of the personnel involved. In the public sector, the situation is opposite. It must stick to legal educational standards. It should use certain standards, competencies, qualifications and diplomas to employ staff. In most cases, alas, they are absent in Russia, unlike in many other developed economies. This situation did not actually change over the past almost 30 years since the start of the transition of the Russian economy on the market rails. As a result, public positions are often held by the staff that does not have sufficient competencies and qualifications, since there are no elementary standards for occupying these positions. This obstacle negatively affects forest education, which currently continues to train personnel with an arbitrary set of competencies and qualifications for non-defined job position requirements.

Digitalization requires not only the application of job standards, but also their constant revision for the dynamically changing conditions caused by digitalization. It requires not only a strong basic education at individual educational levels, but also continuous education, transition from one level to another, cross-education, second and third education, additional education and continuous retraining, education of the "third age", etc. In these metamorphoses, digitalization plays an important role [3]. On the one hand, digitalization is one of the main reasons for improving the qualifications and competencies of personnel. On the other hand, it greatly simplifies and shortens studies compared to the pre-digital era.

The Russian education system is currently significantly constrained by the deficit of job professional standards. These standards are generally applicable not only in the public, but also in the private sector of economy. In many foreign countries, private sector follows the public sector example and also uses its qualification standards. This is especially true for medium and large businesses, in which the majority of the labor force is employed.

In education, there must be not only consumers, but also producers. The producers of the educational system are numerous institutions of primary, secondary, university and additional vocational education. In a market economy, they can be both public and private entities, which compete with each other. For a market economy, this is natural situation. Unnatural is inconsistency of the individual elements of the system. Additional professional education should complement the basic education, but not replace it, as is often happens in practice. In the future, it is necessary to have a closer, more understandable and harmonious symbiosis of primary, secondary, secondary vocational (professional), university and additional education, as well as the "third age" education.

## *2.2. Requirements for employed personnel in the system of state forest management*

The forest sector requires mandatory regulation of competencies and qualifications on the basis of regulatory documents - educational standards and administrative regulations. Educational institutions should know for what job positions, with what qualifications and competencies, they train specialists,

masters and bachelors. However, this list of posts is currently almost absent. In the absence of these standards, employers (by virtue of the Soviet tradition) often see bachelors as "incomplete and under-trained specialists". We cannot agree with this. It is impossible to agree that students cannot obtain quality education in just 4 years. In the USA, for example, bachelors study for 3 years - a year less than in Russia. Masters study 2 years, same as in Russia. For 4 years of study, a university is able and should give a brilliant education if the target standards are known and capabilities of digital and information technologies in education are fully utilized.

In the last 2-3 decades, with the advent of new digital technologies, the general requirements for graduate education have steadily increased. Technical equipment of a modern student and teacher immensely grew up as well. In the digital era modern learning technologies are far superior to those that were in place two or three decades ago. New digital technologies allow for more efficient and economical use of study time and greater production of larger numbers of more competent and trained specialists, who are ready and capable of self-education and additional education.

Current legislation establishes mandatory availability of higher professional education for public servants. All managers in the state forest management system are required to have university education - a bachelor or master degree.

A graduate degree for the managerial positions is not enough. The law requires them to undergo mandatory training and retraining throughout the managerial careers. In the field of secondary education in schools and in medicine, continuing education is an established norm. Until now, in these areas, persons who have not completed advanced training courses at certain times cannot be allowed to work. The situation in the forest sector is different. In practice, this requirement is not always fulfilled, or it is only formally fulfilled. The share of foresters undergoing the advanced training barely accounts for 5-10% of the level established by law. Moreover, the quality of this education, carried out at the domestic level by insufficiently trained teachers with semi-artisanal methods, also raises up many questions and doubts.

This responsibility on continuing education in the forest sector has been granted to the regions. Educational budgets for this training are often allocated on a residual basis and are mainly spent in the regions. Governors and regional budgets are not interested in spending educational funds outside the regions. However, not all of the regions have necessary conditions for the high-quality training and retraining of personnel. On the other hand, advanced training and retraining of personnel outside of the regions require significant costs and long separation of managers from their production activities. In many cases, it is not affordable. Digitalization of education with using distance learning methods can successfully solve this dilemma. Modern remote interactive technologies are able to create the effect of teacher presence and significantly reduce the time and cost of continuing education. These technologies do not completely replace the direct communication with teachers, but they can significantly reduce time and costs of basic and additional education.

### 2.3. *The level of specialized forest education*

Unfortunately, statistics do not keep records of managers with specialized professional (vocational) education in the forest sector. Empirical evidence shows an extremely unfavorable picture [4].

**Table 1.** The share of employees in forestry authorities with graduate degree (university diploma), % [4].

Categories	Percent, %
Heads of structural divisions in the public authorities of the subjects of the Russian Federation and in the forest districts (lesnichestvo)	85
Forest specialists in general	32
Forest specialists in the forest districts (lesnichestvo)	12
Forest protection specialists	53

Forest reproduction specialists	60
Forest managers	44
Forest supervision specialists	40
Specialists in forest fire protection	20

Data in the table above shows an extremely unsatisfactory state in the management of the forestry branch of economy. Only 85% of the heads of structural units (*lesnichestva*) have the necessary level of specialized education. In the lower-level units, the situation is much worse. On the whole, only about half of managers at different levels in the industry have specialized education, knowledge and skills necessary for the modern forest management. This state of personnel is causing tremendous damage to the Russian forestry. Russia has enormous forest resources, but the resources of forest specialists are extremely limited and only half of the managers has an appropriate profile education. The absence of quality specialists or their insufficient educational level, the inept and unprofessional forest management at all management levels (from the lowest to the highest forest administration units) brings about irreparable harm to the Russian forests, economy and nature. These managers with non-appropriate and inadequate levels of education make core decisions, which greatly affect the forest economy and ecology. Unreasonable and unqualified decisions lead to extraordinary damage and losses [5]. These losses are much greater than losses from fires, pests and diseases.

The profile diploma is not the only measure of the personnel managerial quality. In addition to a specialized diploma, it is also necessary to have knowledge, skills, qualifications and experience corresponding to the diploma. These qualitative categories are not always amenable to accurate quantification, but they can be assessed using appropriate testing during continuing education, retraining or in the process of assessing residual knowledge during a professional career. Here, digital technologies greatly simplify and shorten the path of obtaining the desired results on the basis of periodic and objective testing of knowledge and evaluating the performance of a particular leader.

#### 2.4. *Practical vs academic knowledge*

With the transition of the Russian education to the Bologna system, the most acute and urgent question faced by the forest education was - what kind of personnel is needed and in what proportion it is required? Russian universities, including forestry universities, are now preparing both "academic" and "practice-oriented" graduates. The whole difference between them is a certain proportion between technical and fundamental knowledge. Academic graduates have a relatively higher proportion of academic knowledge. Professionally oriented personnel, on the contrary, should be "closer to the ground" and possess the necessary set of qualifications and competencies sufficient to start the "work in the field".

The labor market in the forest sector mainly requires practice-oriented graduates. They should replenish the staff of forest managers, forest leaseholders, and leaders at the higher echelons of forest management. These cadres are in high demand today. Most of the positions that a graduate takes after the graduation from a forestry university do not require in-depth academic knowledge. These initial positions require working with forms, papers, manuals, handbooks, instructions, reports, regulatory documents. They also presume an ability to solve operational production issues. Academic knowledge for such positions is considered needless and excessive [6]. Academic graduates are considered over qualified to take up routine production jobs in the forest sector. The attitude towards them from the production side is skeptical.

On the other hand, academic staff is needed in many other areas. These are people with deep fundamental training. They should be ready to undergo graduate studies, doctoral studies, higher educational and enter research organizations and senior management positions in the industry.

In the academic community, there is another point of view that entire higher education should be based on the fundamental knowledge. Fundamental scientific knowledge, allows for faster and easier mastering of practical qualifications and competences during the educational or working processes after graduation.

On the other hand, not all students are capable of and ready to receive deeper academic fundamental knowledge. The economic factor also plays an important role, because the economic situation does not always allow hiring costly personnel to the lower job positions, which, in principle, do not require fundamental training.

### 3. Results and discussion

Modern university education should be based on modular programs and networking form of education in accordance with Articles 13 and 15 of the Federal Law on Education of the year 2012 [7]. According to the Article 13 "General requirements for the implementation of educational programs" (Part 1), "Educational programs are implemented by an organization engaged in educational activities, both independently and through network forms of their implementation." Article 13 is supplemented by the Article 15 "Network form for the implementation of educational programs": "The network form for implementing educational programs (hereinafter referred to as the network form) provides the opportunity for students to master the educational program using the resources of several organizations engaged in educational activities, including foreign ones, and also, if necessary, using the resources of other organizations."

The modular network form of training is a universal concept. It is not directly related to the Bologna process. It can be used in undergraduate, graduate, specialty, graduate and doctoral studies, both in basic and in additional education. This system is dictated by life and the rapidly changing social and economic conditions. The modular education similar to modular housing construction. A house is built of bricks, blocks and modules. Modularity gives education the necessary flexibility, mobility, and the ability to quickly respond to market conditions [8].

Education requires not only modules, but also a network that allows students to purchase and acquire these modules on the free education market. Different universities have different competitive advantages. Perhaps there is no a single university where all the modules of education would be at the same highest level. The advanced Western and Eastern education is built on the networking forms of training. Students at these universities have the opportunity to study at the best modules at the other universities and in the other countries.

In Russia, this modular network form of training is declared in the law. In practice, however, it is not yet properly developed. There are two main reasons - inertness and lack of budgets of the universities and of the population. However, these obstacles are easier to overcome using the modern digitalization of education. Digitalization allows for students not only to find and get all the information, materials and textbooks for the individual modules, but also to master these modules on the basis of distance learning and also contact training and testing.

### 4. Conclusion

Laws of the Russian Federation provide stable basis for the modern forestry education in the country. The law defines the main functions and services of the forest management. These functions and services require certain professional standards and administrative regulations for their implementation. They require well performing personnel with relevant competencies and qualifications. The modern educational environment needs to be built on modular programs and networking forms of university education. They should be based on the modern digitalization in both stationary and distance education. Modern digitalization of education allows for to reduce the cost, accelerate, intensify, improve the quality and terms of education, and increase the rate of graduation of specialized professionals. They are in high demand by the Russian forest sector.

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