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Methodology of professional transformation of housing and utility services

The article presents prerequisites for the transformation of the personnel potential at housing and utility service providing enterprises due to organizational, technical and technological changes in the industry associated with the saturation of capital construction facilities with modern high-tech equipment and intelligent systems.
The author emphasizes that the evolution of professions is much faster against this background. The requirements for an employee are shifted from the field of performance of functional duties to achieving the final result that the person seeks to achieve.
The present-day labour market will require employees to be guided by a new concept based on the principles of "lifelong learning". There will no longer be one profession for the lifetime – one will have to constantly adapt to changes in the labour market. The ability of an employee to adapt to the needs of the labour market and expand one's competencies becomes more important than the specialty.
Advanced technologies, equipment and methods of control and management become the property of housing and utilities service provision facilities in the process of their creation or renovation (modernization, reconstruction, capital repair), implemented and financed in accordance with federal, regional, municipal or corporate plans and programmes based on approved projects.
In turn, the introduction of intelligent technologies in housing and utility services leads not only to the emergence of new and the loss of unclaimed industry professions, but also to the emergence of "hybrid" professions, which may entail a combination of diverse, traditionally "incompatible" skills and abilities.
The "key" to solving the problem of adapting current qualifications in the labour market to the requirements dictated by the technological revolution is the implementation of the directions of the National Qualifications System, the main elements of which are the introduction of professional standards in the field of labour and education.
Keywords: *automation of housing and utility facilities and systems, updating of educational programmes and professional standards, intelligent technologies and equipment, qualifications, training areas, education modules, employers, educational institutions, educational trajectories, qualification levels, education levels*

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Today, only a lazy person does not talk about the use of digital technologies in everyday life and production, as well as the necessary personnel transformation at an enterprise in this regard. Indeed, since the 1990s, the Internet has changed our world much more noticeably than any other phenomenon.

Nevertheless, most people have a vague idea (if at all) how artificial intelligence is developing and what impact it can have on their lives. However the fact that the technological revolution can oust individual professions from the labour market and form a class of "superfluous" people does not leave anyone indifferent.

The growing pace of technological progress is so intense that it does not allow us to predict what the labour market will be in the next 15–20 years. During this period, not only the concept of "lifetime employment" may become obsolete, but also the concept of "profession for life", which we were previously guided by. It's no secret that the choice of profession was one of the most important decisions for a person until recently. This is no longer the case today.

In the past, machines competed with humans in brute physical strength, whereas in the intellectual sphere, humans had a huge advantage. In the process of manual labour automation:

- in agriculture, the peasant found work at the factory;
- in industry, the worker found work at enterprises in the sphere of urban economy or trade.

Such a change of professions was possible because it required minimal retraining.

An employee dealing with digital, information and communication technologies and artificial intelligence requires not only higher qualifications, but also software and business skills: the ability to analyze and communicate with colleagues, clients and, most importantly, to understand human emotions.

Thus, professions have always evolved one way or another, but now it happens faster and faster. The requirements for an employee are shifted from the field of performance of functional duties to achieving the final result that a person shows or seeks to achieve [1].

Although technological progress is associated with changes in the content of professions in the field of housing and utility services, many of them are boring and monotonous and it does not make sense to save them in the near future. Hardly anyone dreams of becoming a janitor, stoker or passport officer.

It is generally believed that machine learning and artificial intelligence systems will change literally everything from driving a car and treating patients to creating "smart" cities and works of art. This will lead to the disappearance of traditional professions and the emergence of new and hybrid (mixed) professions, that will urge an employee to acquire new knowledge, skills and abilities.

Thus, the modern labour market will require employees to be guided by a new concept based

on the principles of "lifelong learning". There will no longer be one profession for life — you will have to constantly adapt to changes in the labour market. The ability of an employee to adapt to the needs of the labour market and expand their competencies becomes more important than the specialty [2].

How realistic is this scenario for the municipal economy, which is traditionally associated with housing and utility services?

The first question that we should answer is: "What ais the scale of application of digital, information, communication and intelligent technologies in the housing and utility industry and what are their consequences for workers involved in this activity?"

The draft "Strategies for the development of the construction complex, housing and utility services until 2030" emphasizes that "…the market of housing and utility services is gradually turning into a high-tech field of activity, thanks to the saturation of capital construction facilities with automated systems, technologies and equipment…" [3].

In turn, the professional expert community believes it is unlikely that artificial intelligence and robots will "capture" the sphere of maintenance and repair of civil buildings, municipal engineering infrastructure and landscaping. It will be difficult, at least, in the near future, to get a robot to replace a plumber or an electrician servicing engineering systems inside buildings, specialists who must have a wide range of technical knowledge, skills and abilities and act in unpredictable situations.

At the same time, employees engaged in managing people and processes (collecting and processing various information about the condition of the enclosing structures of buildings and structures, their engineering systems, forming plans and tasks for maintenance and repair works) can be replaced by artificial intelligence elements installedon the computer of a management company [4].

At the same time, it should be understood that the structure of the housing stock and the engineering infrastructure in each of the 24 thousand municipalities is different in terms of the technical condition and level of engineering improvement.

The reality is that people still live in houses with stove heating and amenities in the yard, boiler rooms are serviced by a stoker who feeds coal into the furnace with a shovel, and water is distributed through the street network to the water column, from which the population collects it in buckets. These housing and utilities facilities will continue to need workers whose level of professionalism does not require special knowledge, skills or abilities. Unlike specialists servicing buildings, structures and engineering systems equipped with digital technologies.

Hence, the second question arises: "What is the reaction of the professional community to the challenges that the technological revolution dictates to us and what exactly is it expressed in?"

The question is complex and there is no unambiguous answer to it, but the understanding is that this is a double-way traffic system.

Modern technologies, equipment and methods of control and management become the property of housing and communal services facilities in the process of their creation or renovation (modernization, reconstruction, capital repairs), which is carried out and financed in accordance with federal, regional, municipal or corporate plans and programs based on approved projects.

As a rule, construction, modernization or reconstruction projects are developed on the basis of relevant technical specifications and undergo an appropriate examination, which is a guarantee that the most advanced, highly efficient and energy-saving materials, equipment and technologies will be used in the project (otherwise why engage in modernization and reconstruction).

In turn, organizations and employees who will maintain "updated" housing and utility facilities must have the necessary competencies (knowledge, skills and abilities), which are the subject of industry-wide professional standards (PS) in accordance with the legislation.

Taking into account that a single organization is not able to develop, coordinate with the professional community and ensure the approval of the PS, these tasks are usually solved by industry-wide associations (associations) — Roskommunenergo, the Russian Association of Water Supply and Sanitation (RAW), the National Association of Organizations Managing Apartment Buildings and others [5].

These entities, acting as the founders of the Council for Professional Qualifications in Housing and Utility Services (CPQ Housing and Utility Services), form and update "their" industry-wide framework of qualifications, taking into account the emergence of new specialties and changes in qualification requirements for the most popular professions in connection with the emergence of new materials, equipment and technologies.

Thus, the Association of Water Supply Enterprises, based on the results of the monitoring of the industrial labour market, is actively updating the current and developing new professional standards and qualifications, taking into account a transition to digital models of management of water supply and sanitation enterprises.

In 2019–2020, the PS "Specialist in water supply and sanitation technologies (aquatronics)" was developed and the PS "Specialist in the organization of operation of water supply and sewerage networks" and "Specialist in the operation of wastewater treatment facilities" were updated. PS are documents that represent the labour functions of modern specialists necessary to ensure the staffing requirements of a modern water supply and sanitation enterprise. The standard consolidates labour functions that take into account:

- automation of technological processes taking into account digital technologies and production optimization tasks;
- he possibility of updating federal state educational standards (FSES) and basic professional educational programmes (BPEP) for educational institutions;
- the possibility of developing current professions without a radical revision of the staffing of enterprises [6–8].

In accordance with these PS, new, modern types of qualifications have been approved, including:

- a technician, or an operator of automation equipment for water supply and sanitation systems (level 5 qualification);
- a water engineer (level 6 qualification);
- a process engineer in charge of automated and automatic water supply and sanitation systems (level 6 qualification);
- a data analyst in charge of operation of water supply and sewerage networks (level 6 qualification);
- a system engineer of water supply and sewerage infrastructure of municipalities (level 6 qualification).

In 2021 and 2022, this work continued. Digital technologies used at the agricultural facilities are reflected in the updated and developed PS:

- a specialist in the operation of water pumping stations;
- an operator of the ozonator plant;

- a specialist of the automated control panel of the water supply and sanitation system of the Ministry of Defense;
- a specialist in the operation of urban colour and music fountains [9, 10].

A similar work is performed by associations of organizations managing residential buildings that collect, sort, process and dispose of municipal solid waste, municipal energy enterprises.

It is no secret that the management and maintenance of residential and public buildings is determined, among other things, by the growth rate of their automation.

The number of automated products and systems is a key factor ensuring the efficient, safe, convenient and environmentally friendly operation of buildings. In addition, automation has a significant impact on all elements of a building, especially with regard to heating, ventilation and air conditioning systems, as well as the process of interaction with users.

Building automation products include special hardware and software tools and services for the development and implementation of building automation and management systems.

Hardware includes sensors; actuators and devices (control valves, regulators, etc.); controllers that perform local control functions; communication controllers (routers, gateways, etc.), cables and cable fittings designed to build networks of the required topology, compatibility and performance; as well as computers for system workflow management, monitoring and dispatching building management systems.

The above-mentioned intelligent systems, installed at residential and public buildings during their construction, reconstruction or major repairs, are taken into account by associations of employers in the housing sector in the process of updating current and developing new PS as of 2019:

- a specialist in apartment building management;
- a specialist in the operation of civil buildings;
- a locksmith of household sanitary systems and equipment;
- an electrician of electrical systems and equipment;
- a specialist in charge of operation of intelligent systems of residential and public buildings;
- a specialist in commercial real estate management [11, 12].

In accordance with these PS, new qualifications have also been developed to consolidate the labour functions related to the use of digital technology elements and reflect current trends in changing the names of professions aimed at increasing the prestige of this type of activity: a service manager, an auditor of the technical condition of buildings, an operator of automated building systems, a data analyst in charge of maintenance and others [13].

By responding to new modern sector-wide qualifications, the professional community timely responds to the emergence of new high-tech technologies and equipment, which saturate buildings and their engineering systems, but also creates the conditions for updating relevant educational programmes of institutions of higher, secondary vocational and supplementary education to train specialists necessary for the modern labour market, enabling industry enterprises to increase the level of professionalism of the personnel capable of effective maintenance and repair.

In turn, the introduction of intelligent technologies into housing and utility services leads not only to the emergence of new and the loss of unnecessary industry professions, but also to the emergence of "hybrid" professions, which may include a combination of diverse, traditionally "incompatible" skills and abilities.

According to the official research, "hybridization" has already reformatted more than 250 professions in various sectors of the economy, and in the next 10 years the number of "hybrid" types of work should double.

The "hybrid" method of labour organization has several significant advantages. It is economically profitable. It is much cheaper for an enterprise to pay for the work of "hybrid" specialists than to re-recruit workers with the necessary qualifications, which becomes prohibitively expensive. Hybrid specialists are able to "grow" and master new skills directly at the enterprise.

To work in a hybrid specialty, a specialist requires not one or two skills, but a whole set, and it is these people who will be the most popular ones on the labour market.

Burning Glass analysts analyzed about a billion vacancies. According to their data, a trend towards hybridization of professions is increasing, a demand for versatile specialists is growing rapidly, as so is the difference between salaries in hybrid and simple positions. Hybridized professions pay 20–40 % higher than the corresponding traditional professions [14].

In addition, hybrid professions that are difficult to automate are a big plus for an employee who has mastered such a profession. If specialists of "simple" professions can be replaced with artificial intelligence, the machine will not cope with "hybrid" ones.

At the same time, hybrid professions are not a new trend.

Thus, in the field of municipal energy, the emergence of hybrid professions was due to a sufficiently large number of small enterprises: small boiler houses, including those with thermal networks departing from them, small electric grid enterprises, diesel power plants (DPP) with outgoing electric networks (located, as a rule, in the areas that have no centralized power supply). The service staff of such enterprises is scarce and is focused on combining professions. For example, an electrician maintains both overhead and cable electrical networks, other equipment, including substation equipment. The driver of the DPP also maintains metering devices on outgoing power lines, and the power lines themselves.

In addition, in this area of housing and utility services, high-tech devices and equipment are being intensively inntroduced, hence, employees of industrial enterprises are to improve and update their qualifications that meet modern labour market requirements.

By monitoring the industry-wide labour market, the experts of the Russian "Municipal Energy" Association, have been updating professional standards since 2019:

- a maintenance worker in charge of pumping and compressor installations of the engineering infrastructure;
- a specialist in the operation of heating network equipment;
- a specialist in the organization of the operation of overhead and cable municipal power lines, the maintenance of automated systems and equipment used by the enterprises in charge of municipal heat and power supply to consumers.

In the housing sector, for example, a "House master" can become such a profession, which will include two types of professional activities: a plumber and an electrician. To master a hybrid profession, it will be necessary not just to study, but to purposefully plan what knowledge, skills and abilities you need to master to get the appropriate profession. As for the "house master", there

is already a FSES "Master of housing and utility services" for his training, within which students today choose a qualification of a plumber or electrician[1].

A similar practice will be implemented for mid-level workers, such as foremen, technicians, engineers engaged in the organization of housing and utility services. The basic competencies of such a specialist assume that he must possess the necessary skills and abilities that allow him to analyze information at all elements and systems of buildings, structures and the surrounding area, based on the use of digital technologies to predict the required amount of maintenance and repair.

The emerging waste-processing industry is characterized by extensive automation and artificial intelligence elements at all stages of the production process, starting from collection, when automated accounting of accumulation of fractions and volume (mass) is carried out; transportation is controlled by the Glonass system; and waste is sorted using robotics.

Experience shows that in this sector of housing and utility services workers with high qualifications will also be required to perform the work in the "manual" mode, and using high-tech equipment and technologies. Today, traditional industry professions are already "closed" by the description of qualification requirements in the relevant professional standards. In accordance with the recommendations of the public law company "Russian Environmental Operator" (PLC "REO"), the Ministry of Natural Resources of the Russian Federation approved a list of professional standards to be developed in 2020–2021, which should describe the requirements of professional qualifications for more than 60 professions that are actually functioning today in the industrial labour market: a specialist in solid municipal waste management; a specialist in waste processing; a specialist in chemical and biological treatment of water effluents, processing and disposal of municipal solid waste; a specialist in digitalization in the field of solid municipal waste management; an employee of robotic installations for thermal neutralization of municipal solid waste (MSW); a specialist in the procurement of secondary material resources; a specialist of an incinerator; a worker in charge of composting MSW fractions; a worker in charge of processing MSW fractions into energy-efficient fuel; a specialist in sorting MSW [15].

In the process of updating current and developing new PS, industry associations of employers "give life" to new and most popular hybrid professions in housing and utility services.

At the same time, experts involved in the development and updating of PS proceed from the fact that most hybrid professions require:

- a technical component;
- an ability to collect, interpret and visualize data;
- an ability to master the tools for the maintenance of innovative systems and equipment;
- awareness of industry laws, standards and regulations;
- awareness of communications and an ability to forecast the behaviour of consumers of services.

In addition, the leadership abilities of an employee who is able to convey his thoughts to colleagues, users and providers of housing and utility services will find a place in the new PS.

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Методология профессиональной трансформации сферы жилищно-коммунального хозяйства

В статье представлены предпосылки трансформации кадрового потенциала предприятий ЖКХ, обусловленные организационно-техническими и технологическими изменениями в отрасли, связанными с насыщением объектов капитального строительства современным высокотехнологичным оборудованием и интеллектуальными системами.

В этих условиях эволюция профессий происходит значительно быстрее. Требования к работнику смещаются из области исполнения функциональных обязанностей на достижение конечного результата, который показывает человек или которого он стремится достичь.

Современный рынок труда потребует от работников руководствоваться новой концепцией, основанной на принципах «образование на протяжении всей жизни». Одной профессии на всю жизнь больше не будет — придется постоянно адаптироваться к изменениям на рынке труда. Умение работника предприятия адаптироваться под потребности рынка труда и расширять свои компетенции становится важнее специальности.

Современные технологии, оборудование и методы контроля и управления становятся достоянием объектов ЖКХ в процессе их создания или обновления (модернизации, реконструкции, капитального ремонта), которые осуществляются и финансируются в соответствии с федеральными, региональными, муниципальными или корпоративными планами и программами на основании утвержденных проектов.

В свою очередь, внедрение интеллектуальных технологий в ЖКХ приводит не только к появлению новых и утрате невостребованных отраслевых профессий, но и к появлению «гибридных» профессий, которые могут включать сочетание разнообразных, традиционно «не сочетающихся» умений и навыков.

«Ключом» к решению проблемы адаптации существующих квалификаций на рынке труда к требованиям, которые диктует технологическая революция, является реализация направлений Национальной системы квалификаций, основные элементы которой, — это внедрение профессиональных стандартов в сферу труда и образования.

Ключевые слова: *автоматизация объектов и систем ЖКХ, актуализация образовательных программ и профессиональных стандартов, интеллектуальные технологии и оборудование, квалификации, направления подготовки, модули образования, работодатели, учреждения образования, образовательные траектории, уровни квалификации, уровни образования*

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