

# Digitalization of the Housing and Communal Complex (HCS) in Russia as a Measure of Consumer Protection Utilities

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## ABSTRACT

The need to introduce digital technologies into the housing and communal services system is dictated by global trends in the development of IT technologies and artificial intelligence and has revealed the problem of insufficient legal regulation of these relations with the focus on protecting the rights of consumers of housing and communal services. Thus, it is necessary to study, analyze and compare the international experience of digitalization of relations and their legal regulation in the provision of public services with Russian experience and legislation.

As a result of the study, promising directions of digitalization of relations in the housing and communal services system of Russia were identified and conclusions were drawn about the need to adopt a set of legal norms regulating relations on the digitalization of the housing and communal services system, aimed at protecting the rights of consumers of communal services and introducing conditions for the digitalization of relations between housing and communal services in the provision of communal services in the content of the principle of social equality when regulating housing relations, making an appropriate addition to the Housing Code of the Russian Federation.

**Keywords:** *Digitalization, digital economy, accessibility and openness of information, digitalization of housing and communal services, consumer protection, digital protection measures.*

## 1. INTRODUCTION

The development of society and world scientific progress in the field of digital technologies has achieved the highest success to date. Digital technologies are part of the life of the majority of the world's population. In many countries, a person cannot imagine an everyday life without them.

We believe that the level of development of science and technology meets the modern needs of society. The use of digital technologies for the needs of the state, for control by public authorities over the activities of citizens, to simplify the interaction between the state and the person is a necessary condition at this stage, especially in the context of a pandemic and the need to isolate a person from society.

The "digital age" permeates all the main areas of activity of citizens and the state. It is impossible to single out a specific industry or sphere of life, with which digital technologies would not be associated. Education, economics, social security, courts, health care, etc.

At the moment, the issue of the implementation of digital technologies in the sphere of housing and communal services in Russia (hereinafter HUS) remains relevant. There are several reasons for this. First, the implementation of digital technologies at a higher level in the

Russian Federation is being implemented recently. Secondly, there is a need to use scientific digital advances to simplify and improve the efficiency of housing and communal services, increase the transparency of the activities of organizations in the field of housing and communal services, increase the legal literacy of the population on the protection of their rights in the implementation of housing relations, increase the availability of housing benefits and subsidies provided by the state.

It should be noted that in the Russian scientific literature there is no consensus on the concept of "digital technologies". The importance of the legal consolidation of this concept lies in the fact that for its legal regulation and use it is necessary to start from its definition in the law, and not in any other source.

"Digitalization in the original narrow sense is a simple transformation of information into digital form. Technically, this task has been fully implemented down to household appliances. In this sense, in the digitalization of housing and communal services we can only talk about the following areas: reliability of information; lack of digitization of some information; lack of correct collection of some information; fragmentation (inconsistency) of information in specific information systems; connectedness of information systems; unity of accepted units of measurement, codes, standards for digitization and data transmission.

A number of works contain definitions of the digital economy. Some authors suggest that the digital economy

is an activity directly related to the development of digital computer technologies, which includes services for the provision of online services, and electronic payments, and Internet commerce, and crowdfunding, etc. [1], [2].

Usually, the main elements of the digital economy are e-commerce, Internet banking, electronic payments, Internet advertising, and Internet games [3].

There are also points of view that the digital economy is an economic activity based on digital technologies. This also includes electronic (they came to be called digital) goods and services that are rendered using digital technologies [4].

According to a number of authors [5-7], the digital economy is an economy based on new methods of generating, processing, storing, transmitting data, as well as digital computer technologies. The core technologies of the digital economy are big data (data itself and methods of working with it), artificial intelligence, blockchain technology, fog computing, quantum technologies, robotics, virtual reality, etc.) [8].

In a broad sense, digitalization in the housing and communal services of Russia is understood as the implementation and implementation of digital technologies through the transfer of information into digital form, which will allow more efficient management of the housing and communal services system, which will increase the level of the economy and comfortable living conditions for the population, as well as provide free access to information on the benefits provided. and subsidies to more citizens.

Despite the difference in views and approaches, we believe that the most optimal, in relation to the digital economy of housing and communal services, is the concept given by Stelmakh "an economy that mainly functions due to digital technologies, especially electronic transactions carried out using the Internet" [9].

Thus, the study of the use of digital technologies in the field of housing and communal services and in matters of protecting the rights of consumers of housing and communal services is relevant. Various government developments in this area, as well as normative regulation in this area (adoption of regulatory legal acts, consideration of draft laws, etc.) allow us to note that the introduction of digital technologies is a priority, is of paramount importance.

The problem of the research consists in a comparative study of the functioning of digital technologies in the housing and communal services system: analysis of the regulatory framework, analysis of the technical means used and the possibility of their application (taking into account the possible application of the experience of foreign countries on the territory of the Russian Federation).

The purpose of the study is to apply the results of the analysis to improve the efficiency of legal regulation of the implementation of digital technologies in the field of protecting the rights of consumers of public services in the Russian Federation.

Therefore, the research objectives of this paper is to study the scientific and methodological literature on the research problem. In addition, it aims at analyzing the practical experience of foreign countries based on the results of the introduction of digital technologies in the housing sector. Finally, the paper would summarize the analysis of the legal regulation of the use of digital technologies in the field of protecting the rights of consumers of public services. Moreover, it would attempt to make suggestions for improving laws.

### ***1.1 Literature Review***

Theoretical issues of digitalization of social processes and their practical use in the economy were studied in the works of Abdrakhmanov et al. [10], Huseynov [11], Talapina [12], Konobeevskaya [13]. The development of digital law in the world is discussed in the works of Calo et al. [14], Maier [15], Katz [16], Meng [17].

In their works Demenko [18], Tikhomirov [19], Voevodkin [20], Meshcheryakova et al. [21], Negro-ponte [22], Brynjolfsson and Kahin [23], and Skilton [24] covered the issues of applying digital technologies in the sphere of housing and communal services, problems of such application, and features of protecting the rights of consumers of public services through digitalization.

### ***1.2 Method***

In preparing the material, formal legal, comparative legal research methods were used, as well as methods of theoretical research (abstraction, analysis and synthesis, idealization, induction and deduction, mental modeling, ascent from the abstract to the concrete).

### ***1.3 Regulatory Environment in Digitalization of Housing and Communal Services***

- OECD Ministerial Declaration on the Digital Economy: Innovation, Growth and Social Prosperity of 2016 [25].
- Regulation N 2016/679 of the European Parliament and of the Council of the European Union "On the protection of individuals in the processing of personal data and on the free circulation of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) [26].

- Civil code of the Russian Federation [27].
- Housing codes of the Russian Federation [28].
- Federal law No. 209-FZ of 21.07.2014 «On the state information system of housing and communal services» [29].
- Law of the Russian Federation of 07.02.1992 N 2300-1 (edited on 18.07.2019) "On protection of consumer rights" [30].
- Decree of the President of the Russian Federation No. 204 of may 7, 2018 "On national goals and strategic objectives for the development of the Russian Federation for the period up to 2024» [31].
- Order of the government of the Russian Federation No. 1632 of 28.07.2017-on approval of the program "Digital economy of the Russian Federation" [8].
- Resolution of the government of the Russian Federation of 06.05.2011 N 354 (edited on 13.07.2019) "On providing public services to owners and users of premises in apartment buildings and residential buildings" (together with the " Rules for providing utilities to owners and users of premises in apartment buildings and residential buildings") [32].

## 2. RESULTS AND ANALYSIS

In the European Union, key priorities for the development of the digital economy are considered within the framework of the Strategy for a Single Digital Market - "a market in which the free movement of people, services and capital is ensured, and where citizens and enterprises have unhindered access and the ability to operate online, in an environment of fair competition and high the level of protection of consumer rights and personal data, regardless of their citizenship and place of residence"[33].

The importance of supporting the digital economy was demonstrated at the OECD level in 2016, when the Ministerial Declaration on the Digital Economy: Innovation, Growth and Social Prosperity (Cancun Declaration) was adopted [25], [34]. According to the named ministerial declaration, countries strive to:

First, to ensure the free circulation of information while combining the openness of the Internet and information security, subject to the protection of personal data and privacy, as well as stimulate digital innovations and inventions, including improving the use of open data in the public sector and support for public services.

Second, to leverage the use of high-speed Internet by harnessing the potential of interoperable digital services. At the same time, use the technological capabilities of Internet objects (things), cloud technologies, digital transformation of industry and data analysis, assessing the compliance of the policy with regulatory limits, including international norms.

Third, pay special attention to security, for this it is necessary to develop digital security risk management and privacy protection (at the highest level) in order to strengthen trust, freedom of speech and ensure compliance with the needs of small and medium-sized enterprises, in line with the general policy of responsibility and transparency.

Fourth, to use the potential of digital platforms in production, consumption, cooperation, assessing compliance with legal regulation. Every citizen should have the opportunity to participate in the digital economy and digital society (education and training).

In 2017, in preparation for the German presidency in the G20, the OECD prepared key recommendations for the development of the digital economy in the G20 countries. These recommendations were aimed at developing national strategies for the development of the digital economy to overcome inequalities in the access and use of Internet technologies, ensuring access to the Internet for everyone. Improving government policies to support digital infrastructure (including data) financing and new innovative business models. Attention is paid to the development of national risk management strategies related to the protection of personal data and other security issues in the digital economy [34].

An analysis of the provisions of the Cancun Declaration and OECD Recommendations shows that states, in addition to efforts to develop digital governments, take on a wide range of obligations to support and stimulate the development of digital technologies, both in terms of improving regulation, creating an enabling environment conducive to the development and adoption of digital technologies. and protecting the rights of citizens in the digital economy, and in terms of infrastructure development and investment in human capital, capable of adequately using and developing the digital economy.

The agenda of the digital economy is much broader than the traditional "basic approaches" to removing barriers to electronic interaction, the use of electronic signatures or the consolidation of the status of an electronic document.

Within the digital economy, the level of autonomy of information systems is an order of magnitude higher, making decisions affecting the rights of citizens can be carried out at the level of interaction "machine" - "machine" without direct human participation, which implies both broad opportunities for growth in labor productivity and new risks. That is why issues of cybersecurity, consumer protection and personal data protection play an important role in the development of the digital economy.

It should be noted that the development of "Electronic government" in the European Union began in

2000. With the increasing demoraction of society, the concept of "e-government" was inextricably linked with the concept of "digital democracy".

Systems operating in Europe, both in individual European states and in the European Union as a whole, can rightly be considered an illustrative example of the introduction of e-government technologies.

E-government in Europe has become an indispensable tool in reforming political and public administration and the work of local self-government, as well as creating a more flexible, transparent and public administration. According to the definition given by the European Commission, e-government means the use of various information technologies and applications, as well as organizational changes in practical approaches to management. The main goal is to improve the quality of public services, strengthen the democratic process and support civil society.

It should be noted that the activities of the "Electronic Government" in the EU influenced the development of digital systems throughout the world, including in Russia. We believe that one should take into account the experience of European countries in improving the efficiency of digital technologies, also in the housing sector in particular.

In Russia, the formation of individual elements of the digital economy began long before this term was officially adopted. But, unlike foreign countries, the digitalization process in our country is characterized by significant unevenness and not even consistency.

To ensure regulatory control, the Decree of the President of the Russian Federation "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024" was adopted on May 7, 2018, which provided a threefold increase in the cost of digitalization development until 2024, while increasing funding science should be accompanied by the growth of qualified scientific personnel [31].

According to the well-known specialist in the field of telecommunications development, professor at Columbia University Katz [16], there are 3 waves of development of digital technologies. The first stage is characterized by total computerization and automation of processes, the spread of mobile communications, as well as the development of wired and wireless broadband Internet access. The features of the second wave are the development of online platforms (such as search engines, marketplaces, distance learning, social networks) and cloud computing. The third wave is predictive analytics for big data, internet of things, robotics, additive technologies (including 3D printing), artificial intelligence (including machine learning).

These waves of technological innovations are successively replacing each other, for some time, coexisting in the same time period. Katz [16] notes that in most of the leading countries of the world, the second wave has been completed (or practically completed) and digital technologies of the third wave are actively developing. In Russia, processes that are characteristic of all three waves simultaneously coexist, and in some regions even the processes of the first wave are at an initial stage.

One of the main reasons for this is the insufficient level of development of digital and telecommunication infrastructures and significant disparities in its manifestation in different regions of the Russian Federation. In addition, there are problems common to the entire territory of Russia, leading to a lag behind global digitalization trends.

Therefore, according to the expert of the National Center for Digital Economy of the Moscow State University named after Lomonosov Khokhlov, relatively weak points are the development of fixed broadband Internet access, cellular communications of the 4G generation, the territorial distribution of data centers and the development of domestic companies in the data analytics market [35].

Russia is actively working to bridge technological gaps in the digital economy. So, by the Order of the Government of the Russian Federation dated July 28, 2017 No. 1632-r, the program "Digital Economy of the Russian Federation" [8] was approved, which defines the goals and objectives within the framework of 5 basic directions of development of the digital economy in the country for the period up to 2024: regulatory regulation, human resources and education, the formation of research competencies and technical groundwork, information infrastructure and information security.

The implementation of these tasks is aimed, first of all, at the digital transformation of the public sector, business and citizens, which presupposes the formation of an appropriate digital environment that ensures their effective interaction.

In recent years, Russia has made significant progress in implementing the current concept of e-government, which provides for the provision of state and municipal services in electronic form in parallel with other channels. Achievements include:

- Multifunctional centers and a functioning single portal of public services;
- Formation of a system of interdepartmental electronic interaction;
- Development of basic state information resources (national databases);

- Provision of common services, for example, identification and authentication, and information from payment systems [36].

Information and communication technologies, as noted in the Strategy for the Development of the Information Society in the Russian Federation for 2017-2030, have a significant impact on the development of traditional sectors of the economy and have become an integral part of modern management systems in all sectors of the economy, spheres of government, national defense, and state security and law enforcement [37].

The development of technologies for collecting and analyzing data, exchanging them, managing production processes is carried out on the basis of the introduction of cognitive technologies, their convergence with nano- and biotechnologies. A significant increase in the volume of data, sources and means of distribution of which are industrial and social objects, various electronic devices, leads to the formation of new technologies.

The widespread use of such technologies contributes to the development of a new stage of the economy - the digital economy and the formation of its ecosystem. A striking example of a radical change in the configuration of the global environment under the influence of the digital economy is the obvious fact that the world's largest fuel and energy companies are actively being crowded out by new leaders from the digital economy - Microsoft, Apple, Facebook, Amazon.

It is characteristic that the Strategy defines the concepts of "digital economy" and "ecosystem of the digital economy". The digital economy is defined as an economic activity in which the key factor of production is digital data, the processing of large volumes and the use of the analysis results of which, in comparison with traditional forms of management, can significantly increase the efficiency of various types of production, technologies, equipment, storage, sale, delivery of goods and services.

The ecosystem of the digital economy is a partnership of organizations that ensures the constant interaction of their technological platforms, applied Internet services, analytical systems, information systems of government bodies of the Russian Federation, organizations and citizens.

The main way to ensure the efficiency of the digital economy, according to the Strategy, is the introduction of data processing technology, which will reduce costs in the production of goods and the provision of services, will allow introducing new methods of protecting consumer rights, and accelerating the resolution of issues on the restoration of violated rights.

At the same time, states whose economic sectors are based on technologies for analyzing large amounts of

data have a competitive advantage in the world market. The widespread introduction of foreign information and communication technologies, including at critical information infrastructure facilities, complicates the solution of the problem of protecting the interests of citizens and the state in the information sphere.

For the sphere of housing and communal services (HCS), this program is of primary importance, since the automation of the collection of data from metering meters and utility bills is able not only to save significant amounts to the budget, but also to ensure reliable and impartial accounting of the consumption of utility resources.

Innovations in housing and communal services are being actively implemented, so a modern person can feel comfortable and comfortable in his home. Organizations working in the field of housing and communal services are engaged in the maintenance, repair, improvement and implementation of innovative technologies with regard to engineering and communication systems. A comfortable human life largely depends on reliable communication systems, namely systems:

- Water supply;
- Heating;
- Drainage systems (sewerage);
- Electricity supply and so on.

Innovations allow the introduction of new equipment, machinery and mechanisms, taking into account the existing technical requirements, standards and regulations. Of course, for the effective operation of all systems, competent and qualified specialists are required who have tremendous experience in this area of activity. Only in this case it is possible to introduce innovations without difficulty, as well as to carry out their maintenance, which is necessary for their full operation.

To date, the Federal Law "On the State Information System of Housing and Communal Services" has been adopted and is in effect [29]. This regulatory legal act enshrines the basic concepts, legal foundations for the creation, operation and modernization of the system, and also lists the rights and obligations of participants in information interaction. This is one of the first regulations governing the development of digital technologies at the moment in Russia.

Each owner of a real estate object today has the opportunity to obtain complete information about the state of communication systems, in particular, in this matter, it is necessary to use the GIS of housing and communal services. Access here is open to everyone, which means that there will be no difficulties and difficulties, while you can learn about the innovative technologies being introduced into the communication systems and engineer-

ing systems of your apartment building. Innovative technologies reduce spending on utility bills for the user, so all "innovations" are for the benefit of an ordinary person.

According to Fairushina, digitalization should become one of the mechanisms for implementing the future strategy. For this, in particular, it is planned to form an ecosystem of a "smart urban environment" and universal digital platforms for managing urban resources. According to the expert, "the introduction of digital technologies should correct a number of systemic problems in the industry. Today in the field of housing and communal services there is no complete, reliable and up-to-date data on the state of the housing stock, consumers, the volume of services provided and their quality. In addition, there is no coordination in the development of IT systems of different levels and mechanisms of information aggregation are not built" [38].

At the same time, the authorities are interested in increasing the efficiency of the sector, including through the introduction of digital technologies. Digitization of housing and communal services should increase the efficiency of management of all enterprises and economic indicators, ensure transparency and payback of services, as well as attract investments in housing and communal services. Almost 70% of payments in housing and communal services are already made online. For convenience, cost reduction of processes and increase of competitive advantages, we need to move to the digital plane.

As part of the digitalization of housing and communal services, the industry plans to introduce "smart" metering devices, robotize routine processes, and use the capabilities of artificial intelligence and big data for analysis and making adequate management decisions.

It is planned that the digital platform for housing and communal services will operate on the basis of the National Data Management System (hereinafter referred to as NDS). It allows, on the basis of methodological, regulatory, technological and organizational mechanisms, to organize the work of authorities in accordance with the modern challenges of digital transformation. According to the expert of the Analytical Center, Fost, "The key task at the first stage is not only to focus on the development of regulatory and methodological documents, but also to test the elaborated mechanisms of LAMS in practice within the framework of a state experiment." And since the best practices will be replicated and become mandatory for use in federal and regional authorities, they should already be connected to the tasks of the LAMS. At the same time, the national system will not store primary data, but will allow them to be optimized and significantly reduced [39].

Analysis of foreign literature allows us to conclude that digital cities of the future are not fantasy, but reality,

the embodiment of which is possible in the near future [40], [41].

A digital city can be defined as a city that collects and organizes digital information, provides public information for communication between people on the Internet, and digital citizens can live in it that can participate in an online society. As large cities become more fragmented physically, socially and culturally, computer communications are seen as a potentially integrating medium, linking disparate fragments into new threads of public discourse in ways that few media outlets can control. In this sense, the concepts of connectivity, accessibility and responsiveness need to be covered.

The concept of digital cities focuses on collecting and organizing digital information to optimize the delivery of public services and ensure interaction between citizens and residents. It creates a digital networked environment that connects advanced technology systems with government services, assets, brands, schools, non-profit organizations, enterprises, micro and macro communities.

This prototype makes information available in several schemes aimed at developing the potential of the information society and transforming the citizen into an actor and hero of virtual reality.

The digital city is concerned about the physical changes that are required to embrace information and communication technologies (ICT) and maximize the conceptual, cultural and urban impact of technology. Cities need new elements for the organization and reproduction of urban areas, ensuring the reduction of distances through the use of ICT or similar cities in the network.

The development of digital city technology has a positive effect on the protection of the rights of consumers of public services. Digitization provides residents with complete transparency and correct charging. This is evident in the example of smart meters. The system of their work is simple and known to the majority: smart meters themselves take readings and automatically transfer them to information systems to form charges. At the same time, with one hundred percent equipping an apartment building with metering devices and ensuring synchronized reading of all metering devices, the payment for general house consumption of services immediately decreases. The calculation of utility bills on the basis of actual - not average monthly or normative data - guarantees the resident that he only pays for his own consumption.

Thus, smart meters give residents, firstly, confidence in the correctness of charges for housing and communal services and, secondly, relieve them of the need to transmit monthly readings. In fact, with such a system, the human factor is minimized. A clear understanding of

their consumption entails the emergence of an incentive for residents to save energy.

According to the analytical agency, IT devices will allow consumers in Russia to save up to four percent of the average monthly salary [42]. This effect is achieved by controlling the consumption of utilities, reducing the time and costs for cleaning the premises, preventing large losses associated with leaks, accidents, etc. [43].

In addition, digital city technologies make it possible to reduce the time of bringing information to consumers about the services available to them and the possible benefits for receiving them. The implementation of these technologies at the legislative level is supported in the Action Plan ("road map") for the transition to the application of tariffs in the areas of water supply, sanitation and heat supply by comparing analogs using reference values [44].

The third block of this document provides for the implementation of a set of measures for the development of informatization of the tariff regulation of the communal complex, which will make the housing and communal services system open to consumers, and increase the transparency and efficiency of regulatory decisions.

### 3. DISCUSSION

The introduction of digital technologies in housing and communal services is a necessity today. It should be noted that at this stage of the development of society and technology, the transition of the provision of housing and communal services to a digital format seems obvious. The protection and protection of fundamental human and civil rights and freedoms are guaranteed by international standards. Also, the national legislation of the countries provides for fundamental legal acts aimed at preserving the rights of citizens, preventing their violation, etc. Legislators in each country take measures to improve legislation, increase its effectiveness, strengthen guarantees of human and civil rights in accordance with international standards, including as a consumer.

The implementation of digital technologies, taking into account foreign experience in the field of housing and communal services, will serve as the clearest example of the observance of the rights of citizens, the compliance of the law with economic and scientific progress, and changes in the conditions for the provision of services to citizens at a higher level.

We believe that the introduction of information technology in the housing sector is a long overdue issue. The benefits are obvious: they include improving the quality of urban management, and improving the performance of industry enterprises, and reducing costs. Finally, it is the provision of normal services for citizens.

In our opinion, the implementation of state projects in the field of digitalization of housing and communal services, taking into account the experience of foreign countries, significantly increases the efficiency of protecting the rights of consumers of utilities, in addition, it will allow:

1. Increase the level of customer satisfaction. Customer service via WhatsApp Notifications of power outages via SMS, advanced flexible payment schemes.
2. Conduct a personalized analysis of consumption and savings tools.
3. Monitor current consumption indicators.
4. Obtaining reliable information.
5. Identify unscrupulous clients.
6. Analyze the state of communication networks and predict the time of the next service.
7. Obtaining information for prompt response to incidents.
8. Predictive maintenance of utility network elements instead of planned.

From our point of view, this is the minimum set of tasks that can be performed using digital technologies in the housing sector. Taking into account the experience of European countries, the benefits of working with a smart home cannot be underestimated. A huge number of local regulators are installed in a "smart" apartment building. In an individual heating station (hereinafter referred to as IHP) these are regulators of heating, hot water supply (hereinafter referred to as DHW), ventilation, pressure drop at the inlet, make-up, electric motor speed and metering devices.

Most often, each is a separate digital device based on some kind of processor that executes machine instructions entered into it. At the same time, all processors work autonomously and do not receive information from others, which predetermines the primitiveness of the regulation algorithm itself.

According to Nesterov, at least the transition to the control of one processor makes it possible to make automation cheaper and to implement more complex high-quality regulation of power consumption - based on measuring the consumption of a general house metering device (hereinafter referred to as ODP) and taking into account the building's reaction to the sun, wind, etc. [45].

Connecting the building to the upper-level system allows for even better management and, accordingly, protection of consumers from additional costs, by:

- Issuing information in any form, to any state, municipal, industry, technological information systems (including operational information on deviations);
- Issuance of independent, understandable information to residents (for example: a certain level of your payments is expected for each month before

tariff adjustments; for the last day / month there were such and such deviations and your payment should be reduced by so much; compared to similar houses you pay so much less / more, including due to low energy efficiency; the quality of operation of your substation / heating and hot water systems is good / unsatisfactory; accounting is correct / incorrect, separately measured heat consumption for hot water circulation is correct and amounts to so much -that, including, as a percentage of the total consumption for hot water supply);

- Implementation of electronic voting for turning on the heating during the summer cold snap, or for increasing / decreasing the parameters of the coolant with an increase / decrease in the air temperature in apartments;
- The allocation of the value of the imbalance between the ODPU and apartment metering devices with its division for reasons of occurrence;
- Implementation of control of short-term deviations in hot water temperature, which is not realizable when fixing only hourly / daily average values;
- Solving problems of general access to information, including for independent commercial settlements or for their verification;
- Solving the problems of current metering of cold-water temperature measured at remote objects;
- Automation of continuous control over the reliability of meter readings;
- Automation of remote corrective adjustment of ITP with the achievement of continuous maximum control effect;
- Implementation of fully remote operation of the heat point;
- Analysis of the quality of heat supply to buildings through the volume of electricity consumption;
- Implementation of a centralized transfer of all ITPs to minimum consumption to preserve the survivability of the system in case of problems in heat supply;
- Determination of real loads of consumers and identification of a reserve of heat supply systems;
- The use of operational data from all ITPs to solve a variety of technological and commercial tasks of heat supply organizations, including the reduction of territorial current technological and commercial balances with the localization of places of commercial or excessive technological losses, etc., that is, raising the management of heat supply systems to a qualitatively new level (cross-sectoral coordination).

Of course, there are certain problems that lead to the implementation of advanced solutions not as quickly as we would like. This, for example, the lack of technological standards, non-systemic development of IT systems for housing and communal services at the regional and

municipal levels. The regulatory framework in the field of housing and communal services is largely incomplete, unstable and subject to frequent changes, regulation in the field of digitalization is almost completely absent. Taken together, this creates quite high barriers to entry for independent developers, manufacturers of software, technologies and IT equipment, which could contribute to the further development of modern technologies in relation to the housing and communal services industry.

The issue of financing is even more urgent for the industry: there are no mechanisms for attracting investments in the digitalization of housing and communal services, including from market entities.

We agree with the author, who believes that the disunity of regional project implementation practices leads to duplication of costs across regions, to the absence of information aggregation mechanisms, to a situation where the development of services can be very strongly differentiated even within one region [46].

#### 4. CONCLUSION

Overall, the existing digital services, including those introduced within the Smart City concept, are bound by outdated regulations and do not have integration tools.

If one does not deal with the solution of existing problems, then effective management of a set of disparate systems will be impossible, and the integration and aggregation of information from them will become an extremely expensive task. It is necessary to systematize the processes of the life cycle of the development of information systems in the field of housing and communal services, to create tools for the aggregation of information, to coordinate projects around a single legal field.

One of the solutions to this problem can be the systematization of all data on housing and communal services available to a specific user. Important here is the timely delivery of information to each consumer of services, including this information should contain information about the available benefits and subsidies provided by the state. The transparency of information and the actual access to information can be realized through personal accounts of consumers on the State Services portal ([www.gosuslugi.ru](http://www.gosuslugi.ru)).

We see the implementation of this initiative in the automatic analysis of information about the consumer of utilities, his social and financial status and the program offer of options for using available benefits and subsidies in the housing sector. In addition, the system must contain:

- References to regulations that regulate a particular type of utility services;



- Calculation of tariffs for energy consumption online;
- A list of organizations that have the ability to provide these services with the ability to contact such organizations;
- A list of regulatory authorities for each utility service and the possibility of filing a complaint in electronic form in the event of a poor-quality service, incorrect charging, etc.

The consumer must be informed without fail by any available means (notifications in the personal account on the website gosuslugi.ru or through the personal account of the GIS Housing and Communal Services, SMS informing, sending emails or by standard letters to the user's registration address).

Such information will help, in addition to all of the above, to comply with the principles of social equality of housing rights and the right of consumers of communal services to the availability and quality of information.

## ACKNOWLEDGMENT

This work was supported by National Natural Science Foundation of China (61303022), Natural Science Major Project of Jiangsu Higher Education Institutions (17KJA520002), and Nanjing Scientific & Technological Innovation Project for Outstanding Overseas Returnees.

## REFERENCES

- [1] V. Migalin (2018) Important stage of the digital economy [https://www.rosenergoatom.ru/stations\\_projects/opornyy-tsod/](https://www.rosenergoatom.ru/stations_projects/opornyy-tsod/) Accessed on 2 Oct 2020
- [2] M. Lukyanova, Research of management systems of municipal formations in Russia, Scientific and analytical journal "Science and practice" of the Plekhanov Russian University of Economics 2(10) (2017) 48-60.
- [3] Sh. Surguladze, Network economy and information security in the twenty-FIRST century: Deindustrialization, changing psychology and prospects for aggravating social inequality in developed countries, Problems of national strategy 5 (2017) 210-219.
- [4] A. Urmantseva (2017) Digital economy: how experts understand this term. RIA Nauka. <https://ria.ru/20170616/1496663946.html> Accessed on 13 Oct 2020
- [5] M. Dubovik, The growth of inequality – a potential threat to the "digitalization" of the economy, Bulletin of the South Russian State Polytechnic University 25 (2017) 178.
- [6] M. Margolin, Ict infrastructure of public authorities, in: Materials of the 5<sup>th</sup> all-Russian conference "view to the digital future", Rostelecom, 2017, 14 p.
- [7] A. Chernysheva, V. Kalygina, Analysis of the world experience of digitalization of the economy and its use in the Russian Federation, Bulletin of the Academy of knowledge 32 (2019) 276-280.
- [8] Order of the government of the Russian Federation No. 1632 of 28.07.2017 -on approval of the program "Digital economy of the Russian Federation" (with amendments and additions).
- [9] S. Stelmakh (2017) Digital transformation-2018: five main trends. It Week. <https://www.itweek.ru/idea/article/detail.php?ID=199022> Accessed 13 Oct 2020
- [10] Abdrakhmanov et al., Indikatory tsifrovoy ekonomiki: statisticheskiy sbornik, NRU-HSE, 2017, 320 p.
- [11] Sh. Huseynov, Metodologiya upravleniya stoimostyu korporativnykh obrazovaniy v usloviyakh tsifrovoy ekonomiki, Ph.D. Thesis, MGIMO University, 2019, 320 p.
- [12] E. V. Talapina, Law and Digitalization: New Challenges and Prospects, Journal of Russian law 6(2) (2018) 5-17. DOI: [https://doi.org/10.12737/art\\_2018\\_2\\_1](https://doi.org/10.12737/art_2018_2_1)
- [13] I.M. Konobeevskaya, Digital Rights as a New Object of Civil Rights, Izvestiya of Saratov University 19(3) (2019) 330–334. DOI: <https://doi.org/10.18500/1994-2540-2019-19-3-330-334>
- [14] R. Calo et al. (Eds.), Robot Law, Edward Elgar, 2016, 424 p.
- [15] R. Maier (2015) Estimating method of the complexity of topics of school physics course. DOAJ - Lund University: Konzept: Scientific and Methodological e-magazine 9. <http://www.doaj.net/3013/> Accessed on 7 Oct 2020
- [16] R. Katz (2017) Socio-economic impact of digital transformation on the economy. [https://www.itu.int/en/ITU/Conferences/GSR/Documents/GSR2017/Soc\\_Eco\\_impact\\_Digital\\_transformation\\_finalgsr.pdf](https://www.itu.int/en/ITU/Conferences/GSR/Documents/GSR2017/Soc_Eco_impact_Digital_transformation_finalgsr.pdf) Accessed 7 Oct 2020
- [17] J. Meng (2017) China Wants to Bring Artificial Intelligence to its Classrooms to Boost its Education System. <http://www.scmp.com/tech/science-research/article/2115271/china-wants-bring-artificial-intelligence-its-classrooms-boost> Accessed on 9 Oct 2020
- [18] O. Demenko (2016) Intellectual property and Innovation in the methodology of designing strategies, developing forecasts and programs for social and economic

development of Russian municipalities, in: Proceedings of the 9<sup>th</sup> international scientific and Practical conference, Collection: Innovative development, Plekhanov Russian University of Economics, Moscow, 2016, pp.174-176.

[19] A. Tikhomirov (2018) My sdelali esche shag v tsifrovizatsii ZHKH <http://zseao.ru/2020/05/a-tikhomirov-my-sdelali-eshhe-shag-v-tsifrovizatsii-zhkh> Accessed on 9 Oct 2020

[20] N. Voevodkin, Problems of digital transformation of housing and communal economy of municipal education, *Economy and Business 2* (2019) 39-41. DOI: <https://doi.org/10.24411/2411-0450-2019-10396>.

[21] O.K. Mescheryakova, V.Ya. Mischenko, M.A. Mescheryakova, Sovershenstvovaniye sistemy upravleniya zhilishchno-kommunalnym hozyaystvom Rossii, *Finansy. Ekonomika. Strategiya 2* (2017) 43-48.

[22] N. Negroponte, *Being Digital*, Knopf, 1995, 243 p.

[23] E. Brynjolfsson, B. Kahin, *Understanding the Digital Economy: Data, Tools, and Research*, MIT Press, 2000, 408 p.

[24] M. Skilton, *Building the Digital Enterprise: A Guide to Constructing Monetization Models Using Digital Technologies*, Springer, 2015, 230 p.

[25] OECD Ministerial Declaration on the digital economy: Innovation, Growth and Social Prosperity (2016) <http://www.oecd.org/internet/Digital-Economy-Ministerial-Declaration> Accessed 19 Oct 2020

[26] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679> Accessed 15 Nov 2020

[27] Civil code of the Russian Federation <https://www.wipo.int/edocs/lexdocs/laws/en/ru/ru083en.pdf> Accessed on 15 Nov 2020

[28] Housing codes of the Russian Federation <https://cis-legislation.com/document.fwx?rgn=7623> Accessed on 15 Nov 2020

[29] Federal law No. 209-FZ of 21.07.2014 "On the state information system of housing and communal services" (with amendments and additions).

[30] Law of the Russian Federation of 07.02.1992 N 2300-1 (edited on 18.07.2019) "On protection of consumer rights"

[31] Presidential decree No. 204 of May 7, 2018 " On national goals and strategic objectives for the development of the Russian Federation for the period up to 2024.

[32] Resolution of the government of the Russian Federation of 06.05.2011 N 354 (edited on 13.07.2019) "On providing public services to owners and users of premises in apartment buildings and residential buildings" (together with the " Rules for providing utilities to owners and users of premises in apartment buildings and residential buildings")

[33] Single digital market strategy for Europe (2015) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52015DC0192> Accessed on 17 Oct 2020

[34] Key OECD issues for digital transformation in the G20 (2017) <http://www.oecd.org/G20/key-issues-for-digital-transformation-in-the-G20.pdf>. Accessed on 25 Oct 2020

[35] Yu. E. Khokhlov (2018) Assessment of the level of development of the digital economy in Russia. <https://www.econ.msu.ru/sys/raw.php?o=46780&p=attachment> Accessed on 25 Oct 2020

[36] Digital government (2020) Prospect for Russia. World Bank, Institute for information society development. <http://www.iis.ru/docs/DigitalGovernmentRussia2020RUS.pdf> Accessed on 2 Nov 2020

[37] The strategy for the development of the information society in the Russian Federation for 2017-2030 approved by presidential decree No. 203 of 9 17. <http://www.kremlin.ru> Accessed on 2 Nov 2020

[38] State news of the Russian Federation (2019) Digital technologies of housing and communal services will bring to a new level. <https://gov-news.ru/news/966022> Accessed on 2 Nov 2020

[39] I. Fost (2019) Analytical Center under the Government of the Russian Federation, The nsud is becoming a new philosophy of public administration. <https://ac.gov.ru/news/page/nsud-stanovitsa-novoj-filosofiej-gosudarstvennogo-upravlenia-22871> Accessed on 4 Nov 2020

[40] H.S Kehal, V.P. Singh, *Digital Economy: Impacts, Influences and Challenges*, Idea Group Publishing, 2005, 395 p.

[41] KfW Bankengruppe (2017) Unternehmensbefragung. Digitalisierung der Wirtschaft: breite Basis, vielfältige Hemmnisse. [www.kfw.de/PDF/Download-Center/Konzernthemen/Research/PDF-Dokumente-Unternehmensbefragung/Unternehmensbefragung2017-%E2%80%93-Digitalisierung](http://www.kfw.de/PDF/Download-Center/Konzernthemen/Research/PDF-Dokumente-Unternehmensbefragung/Unternehmensbefragung2017-%E2%80%93-Digitalisierung) Accessed on 4 Nov 2020

[42] KPMG (2017) Examples of using digital technologies in housing and communal services. <https://docplayer.ru/68950258-Primery-ispolzovaniya-cifrovyyh-tehnologiy-v-zhkh.html> Accessed on 5 Nov 2020

[43] V. Drozhzhinov, A. Strik (2016) The EU is DEVELOPING E-GOVERNMENT <http://www.pcweek.ru/themes/detail.php?ID=72616> Accessed on 5 Nov 2020

[44] FAS Russia (2019) An action plan ("road map") for the transition to the application of the method of comparison of analogs using reference values of costs when setting tariffs in the spheres of water supply, sewerage and heat supply: approved by The Government of the Russian Federation 08/06/2019 No. 7186p-P9 <https://fas.gov.ru/documents/685555> Accessed on 5 Nov 2020

[45] I.V. Nesterov, M.V. Korneev (2018) Creating legal conditions for digitalization of housing and communal services through PPP mechanisms Electronic resource. [http://www.energsovet.ru/bul\\_stat.php?idd=716](http://www.energsovet.ru/bul_stat.php?idd=716) Accessed on 7 Nov 2020

[46] NRU-HSE (2019) Digital economy. Statistical compilation. <https://www.hse.ru/data/2018/12/26/1143130930/ice2019kr.pdf> Accessed on 7 Nov 2020