

**MINISTRY OF DEVELOPMENT OF INFORMATION TECHNOLOGIES  
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*UDC*

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**ECONOMIC EFFECTIVENESS OF ICT ADOPTION IN  
COMMUNAL SERVICES**

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**DISSERTATION**

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## INTRODUCTION

**Validity and actuality of the topic of dissertation.** One of the main factors affecting scientific and technical progress in all spheres of mankind is massive application of innovative information and communication technologies. The sphere of housing and communal services takes a special place among the spheres where ICT plays a decisive role. The sector of housing and communal services is considered as one of the important as well as complex sectors of economy. The scholars of several developing countries are interested in how to use the ICT and by this to achieve economic effectiveness both in the scope of country and company. For example, regardless of the reforms and development in this sphere, a row of problems are unsolved. ICTNews (2013) declares that population is not satisfied with the supply of communal services, hence the number of complaints on the work of service providers is increasing. In addition, the problems of expenses and debts above normal and not correctly calculated are still remain open. Besides, the problems in the sphere of housing and communal services also arise from the lack of the mechanism of monthly taking measurements from the counters and absence of database of consumers. Thereafter, to create convenient condition both for population and specialists of the sphere of housing and communal services the achievement economic effectiveness through the application of modern ICT is actual.

**The object and subject of the research.** The object of the research is the sector of housing and communal services of the Republic of Uzbekistan. The methods and approaches of achieving economic effectiveness in the sphere of housing and communal services through the application of ICT are the subject of the research.

**The aim and tasks of the research.** The aim of the research is development of recommendations and suggestions through the exploration of the ways of achieving economic effectiveness in the sphere of housing and communal services in the Republic of Uzbekistan by the introduction of information and

communication technologies. To achieve the aim, the following tasks are formulated:

- To investigate the current situation in the sphere of housing and communal services of the Republic of Uzbekistan and the need for informatization;
- To analyze the foreign experience of applying ICT to the sphere of housing and communal services;
- To analyze the prior methods and approaches in determination of economic effectiveness in the sphere of housing and communal services;
- To explore the risks arising from introduction of ICT to the sphere of housing and communal services and develop the recommendations for risk management;
- To develop the prior directions to achieve the step-by-step informatization of the sphere of housing and communal services;
- To examine the development perspectives of the national sphere of housing and communal services and develop recommendations in this regard.

**The scientific novelty of the research.** The contribution of leading information and communication technologies to the development of the sphere of housing and communal services was studied taking the features of public services, analysis of foreign experience and economic developments of the Republic of Uzbekistan into account, the approaches and methods of achieving economic effectiveness in the sphere of housing and communal services through the informatization and online monitoring of each type of these services are examined, the risks arising from application of ICT to the sphere of housing and communal services are investigated and the ways of managing the risks are explored, the principal directions of development perspectives of the sphere of housing and communal services are investigated.

**Literature review on the research topic.** Gracheva I.I., Gnezdova Y.V., Oboymova N.T. paid attention to study the theoretical and practical basis of the sphere of housing and communal services.

The problems of informatization in the sphere of housing and communal services and development perspectives are examined by Belova A.A., Chistova M.V., Konsevich G.E., Demina N.V., Saak A.E., Tyushnikov V.N., Gorbachov D.A., Xakimova E.G., Maksimov A.D., Makarova I.V., Boreyko A.A., Karayev A. and others.

The analyses of the risks arising from the application of ICT to the sphere of housing and communal services are studied by Slyusarenko A., va Oborinina V.A.

**The styles and methods of the research.** During the research logical, analytical, graphical, survey, comparison-based systematic analyses are used.

**Practical essence and application of research results** are determined by the opportunities of using scientific and practical recommendations in the improving the economic effectiveness of the organizations acting in the sphere of housing and communal services of the Republic of Uzbekistan. The recommendations based on the research results are formalized in the form of the act of implementation in the Uzbek agency “Uzkommunkhizmat”.

**The structure of the research.** The dissertation consists of introduction, three chapters, conclusion, list of literature and appendix. The total value is 100 pages.

## **CHAPTER 1. THEORETICAL BASIS OF INTRODUCTION OF ICT TO THE SPHERE OF COMMUNAL SERVICES**

### **1. Features of introduction of ICT in the sphere of communal services**

In the process of modernization of the economy, there is an increase in attention to the social sphere. Creating a comfortable environment and necessary amenities for the present and future life of the population is the main task of government agencies in any country. This goal is unattainable without creating and increasing efficiency in the housing and utilities sector. Housing and communal services are one of the most important branches of the economy, which directly affects both the economy as a whole and the vital interests of the population. In general, "primary" heat, electricity, sewerage and water supply are the main products for the welfare of the country and the life of society in the modern world. We will be able to build an effective sustainable economy, creating efficiency in housing and communal services.

Problems arising in the sphere of housing and communal services are among the most sensitive for the population of the Republic of Uzbekistan. According to sociological polls conducted today in Uzbekistan, despite the reforms in housing and communal services, a number of problems remain unresolved. For example, the population complains about the activities of the organization providing housing and communal services, over-norm costs and not always properly charged debts [1]. The main discontent of consumers relates to the prices for housing and communal services. In fact, the principle of calculating tariffs and the reasons for constant increases in prices for housing and communal services are still unknown to the owners of houses. Often, the amount indicated in the accounts of monthly use of utility services, leads consumers to be perplexed [2]. Successfully solving these problems is possible only by applying advanced and modern information technologies. Informatization of housing and communal services is a necessary link for housing and utilities reform.

The role of information and communication technologies in the development of housing and communal services has increased. Significantly, the transition to a community-based application of IT for the reform of housing and communal services has a significant social effect. For example, even simply informing market participants about the reform of the housing and utilities sector and saving money on payments due to the use of new consumption accounting technologies can have a positive impact on the attitude of market participants towards the reform of the housing and communal services sector [3]. The introduction of information technology carries not only social significance, but also economic and political. However, the housing and utilities sector is imperfect. Usually consumers of housing and communal services have four questions: How much do we pay? Whom we pay? What do we pay for? How does the quality of our services meet our needs? In this regard, we must send information technology to promptly obtain the necessary information about financial flows and services provided [4].

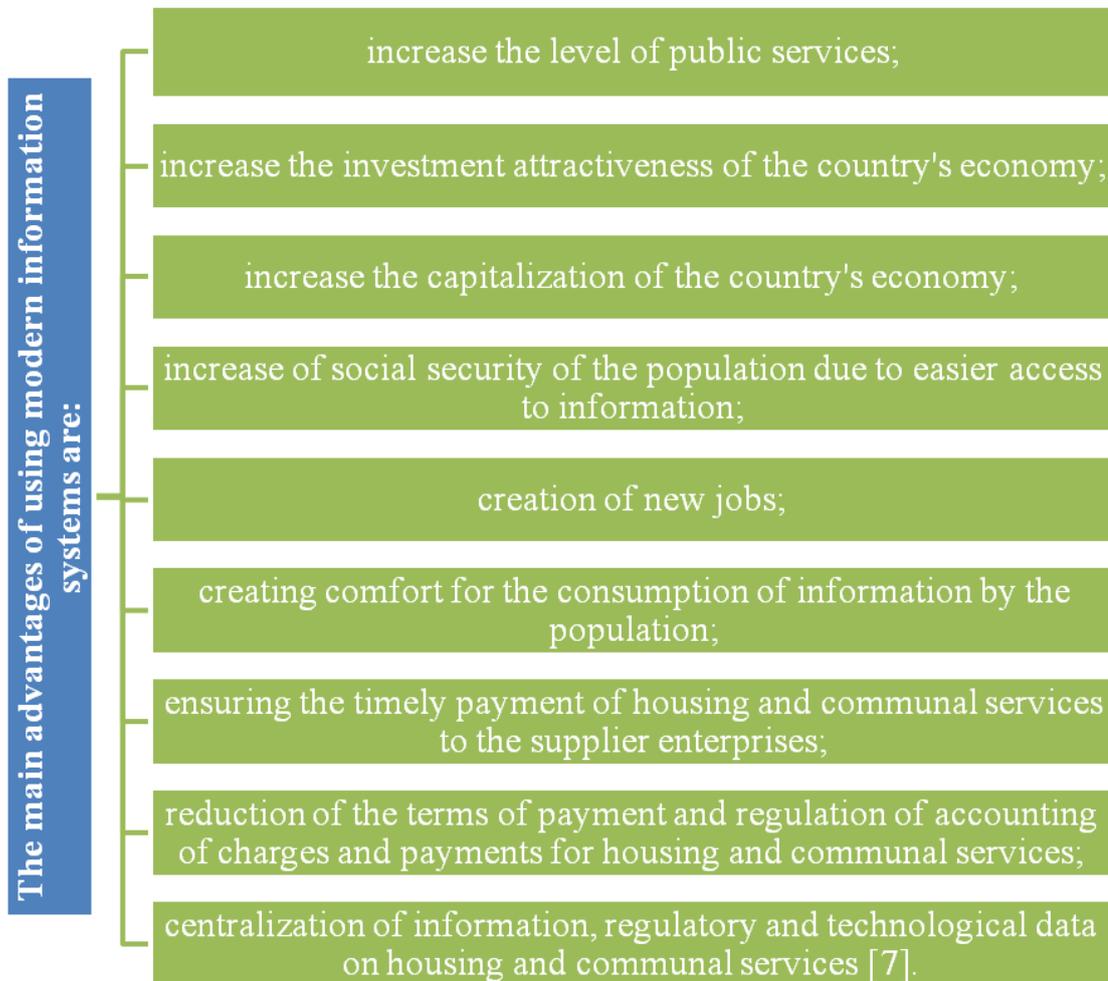
Recently, scientists and specialists are discussing the range of problems that have a significant impact on the organization's activities in the housing and communal services sector. The problems include:

- weak interaction of organizations in the sphere of housing and communal services with executive bodies of local self-government and state authorities;
- weak development of competition in the market of management organizations;
- violation of legislation;
- non-transparency of tariff setting procedures for different types of services;
- lack of reliable information on housing and communal services in the population [5].

The current information technologies provide interaction between suppliers and consumers of housing and communal services, allow you to keep a record of

energy, heat and water consumption, and monitor the status of the facilities. Thanks to information technologies, it becomes possible to create a qualitatively new management system for housing and communal services, and regulated interaction with the executive state bodies. The basis should be an information system that has the following advantages in general:

- bridging the gap between law enforcement practice and the regulatory framework;
- improving the quality of decisions and social protection of the population;
- strengthening of control over the housing and communal sphere of activity [6].



**Figure 1. The main advantages of using modern information systems.**

*Source:* Made by author.

In addition, the introduction of information technology in the sphere of housing and communal services allows:

- state authorities: to control the situation, which is necessary for planning and controlling work, accounting for payments and budgeting, developing a regulatory framework;
- citizens - consumers of housing and communal services: control consumed resources and minimize costs;
- investors: plan the necessary investments and calculate the possible return on them [3].

Therefore, it is possible to formulate a list of tasks, the solution of which will help the application of IT in the sphere of housing and communal services. The main tasks of using information systems in the sphere of housing and communal services are the following:

- remote management of housing and communal services;
- increase the efficiency of dispatching;
- accounting and calculation of payment for housing and communal services;
- processing of information on the technical condition of the housing stock of the territory;
- simulation of situations;
- information services for housing and communal services;
- improving the quality of work with the population;
- saving budget funds [8].

The field of activity and the degree of development of housing and communal services directly affect the comfort of living and the level of the well-being of the population. Therefore, the sphere of housing and communal services is under the constant attention of society and authorities. To sum up, we can say that to solve a number of problems in the sphere of housing and communal services, including

the satisfaction of different needs of consumers of housing and communal services and participants in the production processes, an integrated approach to issues concerning the interests of participants in the sphere, organization management, state support and the formation of a modern regulatory framework, which is based on information and communication management technologies.

In Uzbekistan, the housing acts as a kind of the locomotive of the stability and sustainable socio-economic development. With the significant potential demand, housing becomes a catalyst for the development of a number of industries economy. Speaking as a labor-intensive sectors, it employs large labor force and to stabilize employment. Table 1 depicts the number of multi-storey apartments over the last three-year period.

**Table 1. Number of multi-storey apartments**

<i>REGIONS</i>	<i>YEARS</i>		
	<b>2014</b>	<b>2015</b>	<b>2016</b>
<i>Republic of Karakalpakstan</i>	1233	1233	1233
<i>Andijan</i>	1510	1515	1515
<i>Bukhara</i>	1360	1360	1475
<i>Jizzakh</i>	1230	1230	1230
<i>Kashkadarya</i>	1722	1722	1722
<i>Navoiy</i>	1425	1429	1441
<i>Namangan</i>	1122	1122	1133
<i>Samarkand</i>	1692	1692	1692
<i>Surkhandarya</i>	1035	1035	1035
<i>Sirdarya</i>	1829	1829	1829
<i>Tashkent</i>	4547	4547	4547
<i>Fergana</i>	2787	2787	2948
<i>Khorezm</i>	1141	1141	1178
<i>Tashkent City</i>	9432	9432	9432
<b>Total</b>	<b>32065</b>	<b>32074</b>	<b>32410</b>

*Source:* Made by author based on data provided by Uzbek agency

“Uzkommunxizmat”

Despite the high rate of population growth (over the years independence, an increase of more than 9.4 million. pers.), there is a stable Lodging population growth. If the year 1991 it accounted for 12.4 sq .m of living space, then in 2016 this figure reached 15.0 square meters.

Living space per person in urban areas more higher (16.0 sq.m/person) than in rural areas (14.5 sq.m/person). Dynamic provision of housing growth, especially in rural areas (from 13.3 sq.m/person in 2000 to 14.5 sq.m/person. in 2016), driven by the successful implementation of state program of housing construction in rural areas. As seen, rates of input housing and the provision of housing per capita country slightly behind the demographic growth of the population.

In housing construction scale Uzbekistan ranks second among the CIS countries after Russia and the rated number of apartments built for 2005-2016. Republic also has a sufficiently high second place. By housing construction for 1000 people Uzbekistan occupies the fourth place among the CIS countries.

Commissioning of residential buildings in the country reached 10.3 million in 2016. sq.m. volume housing construction in recent years, since 2005, has a stable a positive trend and increased 1.7 times.

On the dynamics of housing construction mainly affects the construction of housing in rural areas. The housing policy focuses on rural housing the construction of model projects that meet the most modern of architectural - planning and development is not inferior to quality and luxury housing in the cities. Only in 2016 on the advance selected 276 arrays with total area of 1371 hectares of built 8510 houses "turnkey".

During the years of independent development of the country also marked growth dynamics the total area of housing in both urban and rural areas. There is a dynamic increase in the number of houses/apartments to meet needs of the population. Systematic work on supply housing communal services, including electricity, heating, drinking water, sanitation, and so on.

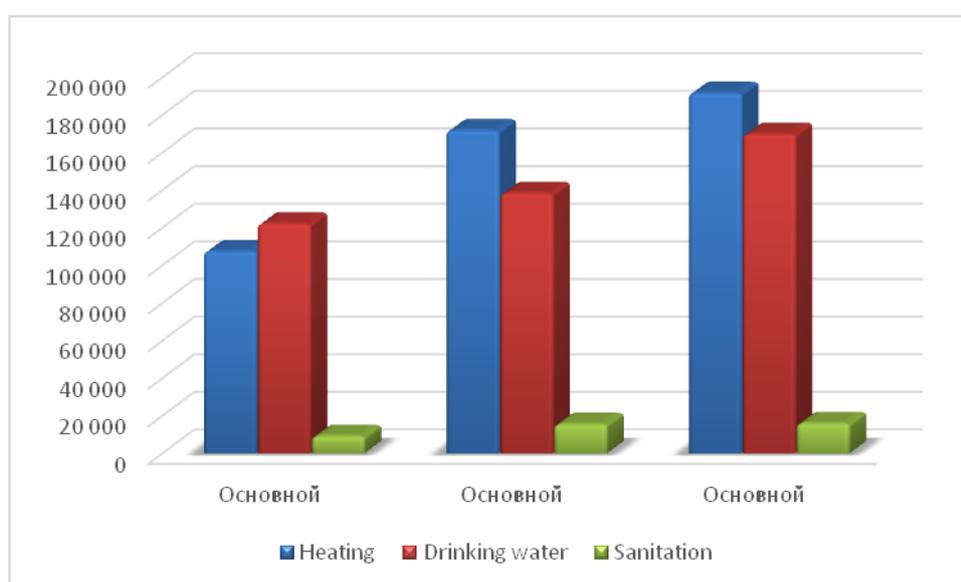
The existing housing stock is a relatively high-level provision of water supply (82.7%), gas supply (83.5%), heating (45.0%) and sanitation (37.6%).

A special feature of Uzbekistan is that the bulk of the housing construction (87.0%) are in individual housing. According to survey, 97.7% of s in the country have own house or apartment in t.ch.rural 99.5%. Generally 80.1%, while in rural

areas 98.4% of the families have their own land. The main type of housing at the same time acts as a separate house (77.1%).

The population for centuries traditionally focused on ownership own housing. The family, especially parents, have direct support to create favorable living conditions and provide housing for adult children.

Legal framework - the necessary legislative formed in Uzbekistan institutional framework, the system of privileges and preferences, creating most favorable conditions for the development of housing construction, specifically, in the countryside.



**Figure 2. Total debts for the communal services in the Republic of Uzbekistan**

Source: Source: Made by author based on data provided by Uzbek agency “Uzkommunxizmat”

In general, the national model of housing construction in Uzbekistan characterized by the following features:

- Long-term strategic priority acts accelerated development of housing construction in rural areas;
- Focus on housing and regional traditions mentality of the population have mostly their own homes;

- A high proportion of the housing stock and the volume of individual housing input housing;
- Housing conditions differ in their prevalence housing property (98.0%), houses with infield (80.1%);
- The formation of the demand for housing is significantly affected demographic factors (population growth and young families, the composition and structure);
- A large-scale system of privileges and preferences for sustainable housing development, especially in rural areas.

Evaluation of the existing housing stock. The total housing area in Uzbekistan in 2016 amounted to 446.4 sq. m, and the number of apartments/5.6 million homes. Over the years, the independence of the country's housing stock increased by 1.7 times.

There are 34.1 thousand in the republic. Units high-rise buildings, mostly of reinforced concrete, monolithic and brick construction. Considering high seismicity, in the high-rise buildings dominate the structure four- and five-storey (58.4%) at home.

The housing stock in the share of apartment buildings built before 1991 year accounted 83.2%. According to the program overhaul apartment houses built before 1991, 2002-2016 state supported the overhaul multi-dwelling buildings (heating, water supply, sewer and roofing of houses).

Condition of housing stock, especially apartment buildings, relatively well. The degree of wear of 50 to 80% is 3.3%, and more than 80% - less than 1%.

The structure of the security of living space per family member distributed as follows: up to 12 square meters. m - 32.7%, from 12 to 20 sq. m - 35.9%, more than 20 square meters. m - 31.4%.

Of the total number of houses provided 52.2% district heating, 87.4% - water, 77% - sewerage, 89% - natural gas. Given the high rate family, in the structure of the house is dominated by apartments with 4 or more bedrooms(63.5%).

In general, the current state of the housing stock is not big concern it causes. There is a purposeful work on the overhaul of the existing housing stock and the development of a new individual housing.

**Table 2. Current situation in Tashkent city.**

Name	Gas	Electricity	Cold water and sewerage	Heat and hot water	Household waste
Number of consumers, thousands	588,3	626,5	599,3	416,9	614,2
Total number of counters, thousands	376,4	595,6	360,3	362,4	-
Number of atomated counters, thousands	-	164,1	-	-	-
Number of employers, thousands	2,2	2,2	3,9	3,4	1,8
Number of inspectors	595	314	291	232	288
Existency of billing system, Yes/No	Yes	Yes	Yes	Yes	Yes

*Source:* Made by author based on data provied by Uzbek agency

“Uzkommunxizmat” and Ministry of development of information technologies and communications

To date, all utilities are billing systems, debeloped in various programming languages. An exception are the Only PHOCs and private enterprise for MSW disposal. JSC "Uzbekenergo" operates throughout the Republic unified billing system. Each regoinal department of JSC "Uztransgaz" operates on its own level typical billing system on natural gas consumption.

Organizations providing survices for the provision of cold potable water, hot water and heating systems have their own billing systems. Territorial scale of each organization covers a city or district specific area. At the same timee, it should be noted that the billing systems are operated different levels of atomation and the possibility of interactive survices. For example, a company that proides cold drinking water to the popyulation Khorezm regoin uses a billing system that enables inspector-photographed controller readings accounting for the

consumption of cold water. Made inspector entry must match the readings unit accounting.

The billing system, which is used in "Suvsoz" SUE runs on MS-DOS. Therefore, operators use special computers with outdated version MSWindows-98 to start the emulator.

**Table 3. Current situation of possibility of online payment by consumers**

Communal services	UZ-KART	M-BANK	CLICK.UZ	Integration with clearing system of CBU
<i>Gas</i>	Yes	Yes	Yes	Yes
<i>Electricity</i>	Yes	Yes	<u>No</u>	Yes
<i>Cold water and sewerage</i>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>
<i>Heating and hot water</i>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>
<i>Husehold waste</i>	Yes	Yes	Yes	<u>No</u>

*Source:* Made by author based on data provided by Ministry of development of information technologies and communications

To integrate the information systems that will be created in the future with online payment systems. In this case, we should note that payments via Uz-kart, M-bank, Click.uz for consumption of cold water and sewerage, heating and hot water should be realized and integrated with the clearing system of the CBU.

## **2. Foreign experience of introduction of ICT in the sphere of communal services**

Analysis of the literature showed that in the foreign experience of management and regulation of the housing and communal services sector four main approaches to state support for the public utility and maintenance system are used. The common for all approaches is that government regulators define the rules

of interaction for organizations, protecting the rights of consumers, ensuring compliance with established quality [9].

The American approach to state support of the public service system is characterized by a high degree of bureaucracy, the creation of large federal commissions, and the slowness of decision-making.

The English approach is distinguished by the creation of transparent regulatory bodies, the delegation of authority, one person is responsible for the activities of each governing body.

The German approach in housing and communal services is the management, the creation of regulators in the field, the speed of decision-making.

The French approach to state support of the public service system is characterized by a management system, a bureaucratic management system at the ministerial level, lobbying interests by influential groups [10].

In the Scandinavian approach, the state's participation in the regulation of housing and communal services is very significant, but the requirements for competition in the market are low. Paying high taxes, the population in return receives high-quality housing and communal services.

The main difference between the above measures of state regulation should be the degree of speed of decision-making on tariff changes for all users of the housing and communal services, which provide a sufficient level of income for utilities.

The tasks of public authorities in the sphere of housing and communal services in developed European countries are the creation of a regulatory framework, setting tariffs for payment for services to consumers, as well as coordinating the activities of private companies and providing them with opportunities for business activity. Therefore, utilities in developed economies, where competition is strong, has always been the object of close attention from private business. But at the same time, responsibility for the state and development of these systems rests with the state in the person of local government bodies.

In most European countries, the communal infrastructure is not fully transferred to private ownership, but, remains municipal, or operated by private operators. The involvement of the private sector in customer service is very diverse.

For example, in France and Finland, such forms of attracting private entrepreneurs as a service contract, management agreement, lease agreement and concession agreement are the most common, but a form of state (municipal) ownership is retained, with the aim of effectively managing them.

Positive in this form is that private investors are interested in further work in this area, and provide consumers with high-quality utilities, since in this case competition laws operate.

The disadvantage in this case is that the state does not participate in the management of housing and utilities.

Special forms of organization of municipal enterprises operate in Poland and Hungary. These are such forms as: the own enterprise of the municipality, a managed enterprise of the municipality. They are distinguished by very low independence and, as a consequence, a slow and insufficiently flexible response to external changes.

In other European countries a large number of municipal enterprises are organized in the form of business entities: joint-stock companies and limited liability companies [11].

For example, in Germany, several municipal organizations operate in one municipality, most of which are privately owned by 100% in the form of LLCs, the remainder is in the form of mixed companies with the participation of private capital. The municipal organizations independently establish tariffs for services, with reflection in contracts with the owners of housing. Therefore, unilateral increase in tariffs does not occur.

It should be noted that regardless of the organizational and legal form of housing and utilities organizations in developed countries, it is common for them that collective bodies are created to manage and control their activities.

Thus, it should be concluded that one of the negative factors of foreign experience in housing management is the excessive role of the state and municipalities.

From the positive experiences of management of housing and communal services in foreign countries, which should be taken into account, is the attraction of investors and entrepreneurs through the mechanism of concessions. Do not discount the information technology, which is an important component in the provision of public services.

The impact on the procedure for the formation of tariffs for utilities in the Russian Federation is carried out at the federal, regional and municipal levels. In accordance with the current Russian legislation, each of the regulatory levels is assigned its own powers, implemented in the tariff policy process.

In developed foreign countries, the state in various ways regulates the pricing of housing and communal services. There are three most common methods of pricing utilities.

The first is the regulation of the profitability of production. The regulatory body establishes a tariff for housing and communal services on the basis of assessing economic costs, which allows organizations of the housing and communal services to work without losses.

The main disadvantages of this method is that the regulator has little information about the costs of the enterprise, therefore, the housing and communal services organizations have no sense in reducing them.

The second method is the RPI-X method (adopted in the UK), the essence of which is that utility tariffs can increase only in accordance with the level of inflation (for example, by 1% per month). In this case, housing and utilities

organizations are interested in reducing costs, which increases the independence of enterprises and the economic efficiency of their activities.

The drawbacks of the RPI-X regulation method include the fact that the enterprise does not have the incentive to improve the quality of services, since the reduction of costs is usually due to transaction costs, as the regulatory system encourages capital expenditures.

The third method - participation in profits, is that the total amount of profit organizations of the housing sector should always be the same. Exceeded the established marginal amount of profit is withdrawn by the state. Therefore, organizations are looking for ways to reduce costs.

To the main shortcoming of this system, it is necessary to include a constant detailed monitoring of the actual costs and profits of the enterprise, and therefore it is very difficult to implement [12].

It should be noted that in many respects the system of housing and communal services, in the countries of Europe is designed only for the integrity of the inhabitants. The counters of each individual apartment are usually installed in a separate room, where the representatives of public services come in every month, take testimony and make a calculation of the contribution amount. And the Europeans then simply pay the bills received, fully trusting the accuracy of the charges.

Thus, it should be noted that the regulation of prices for housing and communal services in foreign countries is carried out by the state, and it is effective due to the fact that utilities are put in conditions of tough competition. Consequently, they have no reason to constantly increase the cost of services, and they are forced to constantly improve the quality of these services.

According to experts, before raising the tariffs for light, water and heating, it is worth considering the modernization of the entire communal system [13, 14]. So in Europe it is impossible to imagine a situation where about 50% of the heat is

simply lost on the way from the boiler room to the consumer. At the same time, he pays for such losses, of course, ordinary citizens [15].

Abroad, it is common practice that homeowners, in order to better manage and improve the quality of public services provided to them, join various non-profit organizations. For example, such as territorial communities of residents, condominiums, housing cooperatives, syndicates, etc. In Russia, analogues of such organizations are homeowners' associations (HOAs) and housing construction cooperatives (HBCs) [16].

In many foreign countries, the sphere of housing and communal services is a kind of entrepreneurial activity, since the management organization receives remuneration from homeowners for managing multi-apartment buildings. Management companies justify decisions on the disposal of monetary resources (for example, the purchase of a particular product or service), and the governing bodies of the association of homeowners on the basis of this take decisions. All responsibility for the maintenance of facilities rests with the governing bodies of the association of homeowners.

To increase competitiveness, management companies insure their civil and material liability in case of damage to homeowners. Liability insurance managers are developed in most countries of Europe and America.

Legislation of many Western countries established high requirements for management companies. Experience and professionalism, management companies confirm the existence of certificates, which allows homeowners to hope that services will be provided in accordance with the of housing and communal services.

**RUSSIAN FEDERATION.** In the Russian Federation were examined "Uniform Settlement Cash Centers" (USCC). USCCs were created in the form of municipal unitary enterprises and municipal institutions in 2000. Basic functions USCC:

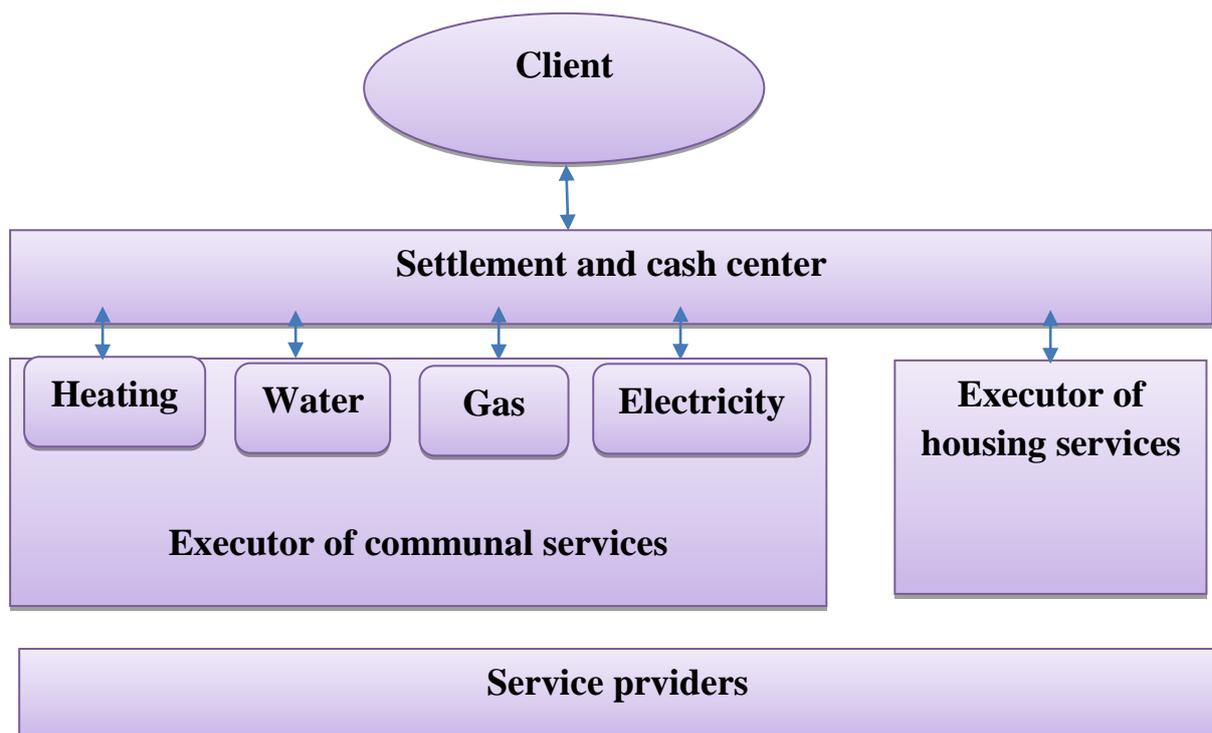
- Maintain database for invoicing, processing of meter readings (counters), charges on Triffs and meter readings, taking into account discounts, short shipments, recalculations;
- The formation and organization of delivery of the inhabitants of a single payment document summarizing charging providers of housing and utilities and other services and resources, taking into account existing incentives and subsidies;
- Organization of reception of the population, enabling residents to receive information about all provided housing and utilities and other services, charge and pay for them (single window);
- Design of the requested public documents, certificates, statements, etc., as well as the formation of a package of documents for granting subsidies for housing and utility services;
- Interaction with payment systems, dispatch and distribution of payments training in assessment and collection of reports;
- The introduction of a single payment document for the payment of utility and other services, providing payment processing, receiving from suppliers on charges of these services on the services and resources, as well as information on the allocations made in connection with the change of tariffs;
- Claim work with the population.

Financing: mainly due to the municipal budget. But there are centers set up in the form of joint-stock company founded by municipalities (controlling interest), and service providers.

Financial flows:

- Payments are collected in the bank to the account ERKTS. Most often, this second checking account, all operations which are connected only with the passage of payments of the population that is isolated from the rest of the financial and economic activities;

- Electronic registers of payments and notification (if any) of the payment of all claims, whether banks, post offices services, payment terminals, in ERKTS sorted by points calculated, which calculation performed;
- The estimated point on registries payments for each service provider is determined by the amount of the fee for the day;
- On the fee per day is issued the payment order to transfer money to each supplier;
- According to the amounts accrued for each personal account payment is calculated attributable to service providers, presented in a single receipt;
- Design data (how much money is owed to the supplier any of the fee per day) are sent to each management company.



**Figure 3. Scheme of interaction between the client and service providers.**

*Source:* Made by author.

Interaction of providers (electricity, heat, water, gas and lift facilities, waste disposal, service providers intercom, cable TV, etc.) with customers through ERKTS. This approach will improve the quality of service of the population and

the degree of customer satisfaction, as well as provide a solution to problems of interaction between people with different Energy service providers and utilities.

Interaction of participants of the market of housing services in the following manner. Service providers perform the billing of its services in the RIS system utilities, or transmit the calculated data on the services provided. It serves as the basis for the formation of a single payment instrument (ENPI). After printing, the ENP is transferred to the consumer, it fills data from meter readings and pay for services. Payment is fixed in the housing and RIS is carried by service providers and management companies.

The created system can be combined into a single information space administration, customers and suppliers of utility services and other services. It is systematized information on payers Receiving payments, payments for services rendered. The participants of this settlement system may be in addition to the utilities, services, social protection and power supply company, whose needs and interests must also be taken into account within the framework of such projects.

Results of the first implementations of utility billing systems, combining all payments of the population in a single circuit, showed their high potential in terms of improving the efficiency of housing and communal services.

Benefits of USCC:

- Creation of a single information space for all subjects of the market of housing services with the use of software products;
- Maintaining a uniform methodology calculation for housing and communal services;
- Having a single customer service center for all types of housing and communal services, and the same type of ENP;
- Support for the functioning of a wide network of payment acceptance points;
- Integration of administrative bodies in the regional information;

- Disconnected (water, electricity) and nondisconnectable (residential services and heating) are paid a receipt, so the receipt of a partial payment on the debt leads to everything, including the shutdown, service that is fraught for the payer.

ESTONIA. In Estonia, the natural gas delivery system was studied. Formation Rate: For home users on weighted average price, consisting of the price of the purchased gas and the margin, the marginal rate that is consistent with the Competition. At the end of the year consumption are offset on the basis of actual gas purchase prices and margins. Price group:

- The consumption of up to 200 cubic meters per year;
- The consumption of 200 cubic meters to 750 cubic meters per year;
- Consumption of 750 m<sup>3</sup> to 100,000 m<sup>3</sup> per year;
- The consumption of more than 100,000 cubic meters per year.

Free Consumers Gas is priced according to the price formula, which is formed on the basis of customer consumed during a calendar month, the amount of gas in the following manner:

- to 0.01 million cubic meters / month;
- More than 0.01 to 0.1 million m<sup>3</sup> / month;
- More than 0.1 to 0.5 million m<sup>3</sup> / month;
- More than 0.5 million m<sup>3</sup> / month.

Connecting to the network:

- application form for connection to the gas supply network, sent by e-mail, fax, mail or in person;
- Conclusion of the contract to connect the gas supply network, including the design and construction of a gas pipeline to the connection points;
- Design and construction of a gas pipeline from the customer point of connection to the gas appliances in accordance with the connection contract.

Meter reading: The procedure for meter reading and communication to the supplier is specified in the contract of sale. Posts methods: e-survices; by phone; by mail; by fax or by e-mail; with the obligatory indication of the details specified by the contract (name, address and reference number).

When a contract direct debit, you must report the meter readings for the last 5 days of each month.

Terms of payment:

- Cash (in all areas of customer service provider, post offices, banks);
- bank card (at customer service points, banking payment machines);
- Payment e-invoice (sent by the Internet bank electronic account, which is identical to the bill on paper legal tender document);
- Direct debit (transfer of money in the amount of payments from the customer's account to the account of the supplier);
- Standing order (the customer enters into a contract with the bank committing periodic payments to a certain amount).
- E-survices (service provider customers on the Internet). Using the service, you can: To inform and check their readings of the gas meter; view and pay bills for gas; To enter or modify their contact details; Communicate with customer service points; Track your gas consumption; Get an overview of the prisoners with you sales contracts; Get an overview of places of consumption.

BOSNIA, DENMARK, SWEDEN. "Atomated heat metering system" was considered and studied for Bosnia countries (Sarajevo), Denmark (g.Viborg), Sweden (g.Evle). The atomated system reads the data from heat meters, through the installation of heat meters ultrasonic «MULTICAL®» with embedded radio modules. It allows you to transfer data from metering devices to handheld terminal «MULTITERM», equipped with an antenna. «MULTITERM» installed in car and reads the readings from heat meters, inside the buildings as the vehicle on a specified route. This procedure eliminates the need to intrude into private

ownership of energy consumers, in order to obtain data on the amount of heat consumed.

**MALAYSIA.** As Malaysia has been studied in electricity billing. In 1990, the Malaysian government adopted the law "On electric power", according to which a large utility company for electricity «Tenaga Nasional» entrusted with the function of collecting deposit payments for 2 months from customers for electricity consumption. The deposit amount is calculated based on the average value of power consumption for 6 months.

Payment methods:

- For deposits less than 2,000 Malaysian ringgit (\$ 600.) - In cash;
- For deposits larger than 2,000 Malaysian ringgit - Exchange;
- The counter is removed by the subscriber;
- The connection between the subscriber and the provider is supported via SMS or the Internet;
- If there is no access to the meter exhibited a current account.

Benefits:

- View detailed information about your own account;
- View recent and past payments;
- Monitor monthly energy consumption.

Payment Methods: Payment without intermediaries; Automatic payment from the escrow account; Direct Debit; ATMs; Check by mail; Payments through the internet; Banking by phone.

**NETHERLANDS.** According to the Netherlands was studied system is an integrated accounting system utilities. The city of The Hague in the student hostel for 309 apartments has been successfully piloted automated data reading of meters for hot and cold water, heat and electricity. The operating principle of the pilot system is that it is in line determines the amount of resource consumption and bills attracts students.

Advantages of the system:

- Ability to answer all the questions of the students;
- Instant readout expenses all types of energy;
- Immediate billing students.

USA. From existing information systems of the United States in the communal area we have chosen a system of «Broken arrow click2gov» based on the similarity of the objectives of the system with the need for the Republic of Uzbekistan.

It provides its customers with real-time access to the accounts information via the Internet and allows the possibility of immediate payment. Billing and / or payment requests sent to the system utilities.

Features:

Payment history

- View payment history
- Pending payments (payments entered, but not sent)
- The current billing information
- Make payments - you can choose to enter your credit card details each time a payment is made, or if you wish, you can store this information in a payment option on demand for quick future reference.

Please note that all credit card numbers stored records are periodically removed in accordance with industry guidelines Pay Card.

Information on the personal account - Displays the current balance, last payment is made, the account status (active or inactive) and current billing information

Information on consumption - the consumption history can be displayed billing period or in the comparison charts. It also displays the current value of the counter, and the average daily usage.

Billing History - View historical accounts, including the date of invoice, date, balance forward, payments and adjustments, as well as the current charge details. Past accounts can be easily viewed and printed.

**SUMMARY OF GLOBAL EXPERIENCE.** Currently, e-govenment issues in general, as well as more narrowly - the organization of information interaction with the public utilities and businesses through govenment portals are engaged in dozens of large companies and associations. Here are the following maen reasons for the imbortant role of portals to impove the efficiency and effectiveness of public survices:

- Total selected global trend is to prvide "an integrated information and survices," which means a transition from the interaction of the applicant - the appropriate public survices to the ideology of the applicant - a common interface interaction to obtain public survices. Thus, the applicant does not require knowledge of the details of the process of organization of the required survices. The applicant prvides only the initial registration of a package of documents (in physical or elictronic form) for initiating the process of providing survices;
- International experience shows that in order to optimize the activities of public survices and increase the level of public satisfaction necessary to prvide consumers with their balance of accounts management tool for all utilities.
- The portal should have a customer feedback as part of the online survices;
- The whole complex inspections inspectors switching to an alternative in the form of one inspector for all utilities;
- Focused on customer portals are key to overcoming one of the greatest obstacles to the creation of e-govenment - the lack of interaction between utilities and consumers.

### **Conclusions drawn from chapter 1.**

The field of activity and the degree of dvelopment of housing and communal survices directly affect the comfort of living and the level of the well-being of the

population. Therefore, the sphere of housing and communal services is under the constant attention of society and authorities.

World experience shows that the request should be practiced in a single information space for the public services. The information solutions for public services needed to ensure interoperability with national databases, with related information systems. All communication must take place through e-government core.

Currently, e-government issues in general, as well as more narrowly - the organization of information interaction with the public utilities and businesses through government portals are engaged in dozens of large companies and associations. The goal of all transformations in the sphere of housing and communal services will be to increase the efficiency of interaction between the communal services and users of its services, with the state, regions, branches and, on this basis, improving the efficiency of the country's economy [17]. Thus, the main task of interactive government services at the present stage of world development should be in the following:

- a. Provision of timely, complete, consistent and accurate information for the public services on the basis of the applicant's needs.
- b. Ensuring transaction on the principle of "one window".
- c. Support for inter-agency cooperation in terms of ensuring the provision of integrated public services.

On the basis of the analysis of foreign experience in the organization and regulation of housing and communal services, the following areas for transformations in the communal sphere of our country should be taken into account:

- a change in the management system of the housing and communal services sector so that both private and state firms can work with the active participation of state bodies;
- development of competition among utilities;

- strict regulation to achieve profit-making goals while preserving state regulation in the monopoly sectors of the economy;
- increasing the role of the board and chairman of the HOA.

To sum up, we can say that to solve a number of problems in the sphere of housing and communal services, including the satisfaction of different needs of consumers of housing and communal services and participants in the production processes, an integrated approach to issues concerning the interests of participants in the sphere, organization management, state support and the formation of a modern regulatory framework, which is based on information and communication management technologies.

## **CHAPTER 2. ANALYSIS OF ECONOMIC EFFICIENCY OF ICT APPLICATION TO THE SPHERE OF HOUSING AND COMMUNAL SERVICES IN THE REPUBLIC OF UZBEKISTAN.**

1. Analysis of the principal approaches in of application of ICT to the sphere of housing and communal services in the republic of Uzbekistan.

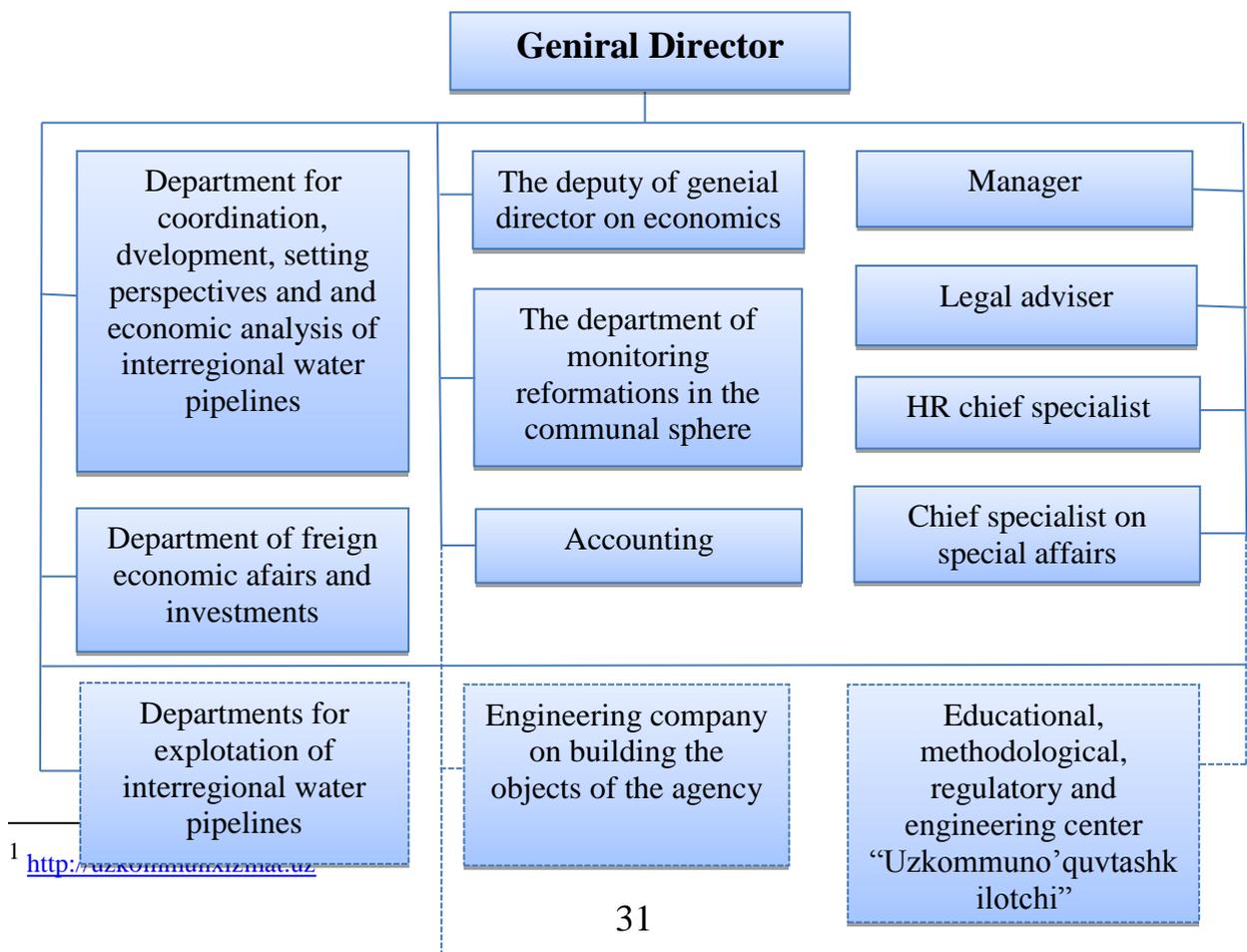
Uzbek agency “Uzkommunkhizmat” acts on the basis of the Resolution of the President of the Republic of Uzbekistan # PR-445 of August 17, 2006 "On measures to improve the activities of the Uzbek agency “Uzkommunkhizmat” "and the financial rehabilitation of utilities"

In accordance with the resolution, the main tasks of the Uzbek agency "Uzkommunkhizmat" are:

- participation in the development and implementation of the state policy to deepen economic reforms in the sphere of public services, the formation of a legislative and regulatory framework that meets modern

requirements, assistance in creating a competitive environment in the provision of public services to business entities and the population;

- implementation of a unified technical policy in the sphere of public services, assistance in attracting investments, including foreign ones, for the development, technical re-equipment and modernization of utility networks and enterprises, the introduction of advanced modern technologies, machines and equipment, equipping with metering and control devices for the sale and consumption of water and Thermal energy;
- coordination of activities of interregional water pipelines, ensuring their efficient operation, reliable and stable operation, organization of capital and current repair of networks and equipment in the public utility system;
- organization of training, retraining and advanced training of personnel for public service enterprises.<sup>1</sup>



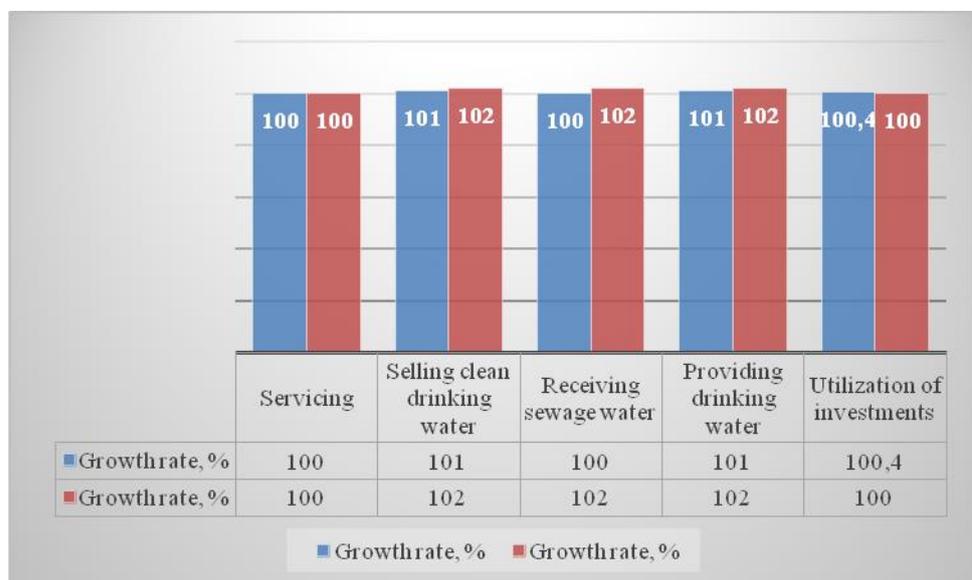
LTD  
“Uzkommunloyikhaq  
urilish”

**Figure 4. Organizational structure of Uzbek agency  
“Uzkommunkhizmat”.**

*Source: uzkommunxizmat.uz*

In 2016 the following measures were implemented by the agency and the organizations under the agency:

- The volume of the services provided by the organizations under the agency accounted for 20,8 billion sums. In fact, it was completed for 100 % with respect to the annual plan.
- Additionally, 99,1 million cubic meters of clean drinking water were sold by the offices for the operation of interregional water pipelines and the volume of receiving sewage water made up 10,45 million cubic meters (100%);



**Figure 5: Indicators of Uzbekistan “Uzkommunxizmat” agency**

*Source: uzkommunxizmat.uz*

- The growth rate of providing and selling drinking water, receiving sewage water in 2016 accounted for 101,6% compared to that period in 2015 while revenue made up 105,3%.
- In order to carry out an execution of the decree PD-2458-numeral “About the investment program of the Republic of the Uzbekistan for 2016” objects set for improving the provision of clean drinking water in inhabited localities of the Republic were succeed.
- Moreover, in 2016 for improvement of clean drinking water provision and sewerage within the framework of investment program funds 59,35 billion sums from budget account and 102,99 million USDs from freign investments account were financed.
- Overall length of water pipes consists of 6106 km in the republic, whereas out them 2415 km need reconstruction. To iprove water provision in sewages of villages 568,5 km of drinking water pipes were plumbed and reconstructed thanks to budget funds in 2016.
- The last but not the least, for the last accounting period, within the framework of the program of creating new vacancies the agency and the organizations under the agency could result 100% as for the plan for 2016 (Figure 5).

**Table 4: Indicators of financial capital allotted to ICT**

#	Name	Unit of measurement	Indicator		
			2016	2017 (budgeted)	2017 (actual in 1 <sup>st</sup> quarter)
1	Total capital allotted to introduction and dvelopment of ICT	mln.sums	100	89	17
2	Out of them:				
2.1	Introduction of information systems and software products	mln.sums	12	6	4
2.2	Salary of employers of special sector in ICT and providing them with financial and tehcnical base	mln.sums	23	30	7

2.3	Purchase of server and computer devices	mln.sums	40	25	460 thousand sums
2.4	Training and improving qualification of employers in the sphere of ICT	mln.sums	-	2	-
2.5	Accessing the Internet, servicing local and corporative network	mln.sums	14	13	3
2.6	Consulting and doing research in the sphere of ICT	mln.sums	-	-	-
2.7	Others	mln.sums	12	13	2
3	Proportion of financial capital allotted to ICT with respect to total capital of the organization	percentage	0.3%	0.33%	

*Source: Uzbek agency “Uzkommunxizmat”*

- Lastly, measures specified in the state program of “The year of healthy mother and child” were accomplished owing to the credits of foreign financial institutions and the funds of 102,99 million USDs were utilized, hence the indicators reached 100% on the first half-year.

One of the main factors influencing scientific and technological progress in all areas of human activity is the widespread use of new information technologies. Among the most important and mass spheres in which information technologies play a decisive role, a special place is occupied by the sphere of housing and communal services. Under the influence of new information technologies, fundamental changes in management technology are taking place, and the qualifications and professionalism of specialists engaged in activities in the housing and communal sphere are increasing.

Table 4 depicts total budgeted capital allotted to introduction and development of ICT to Uzbek agency “Uzkommunkhizmat”. In fact, it made up approximately 100 million sums in 2016. However, the budgeted amount for 2017 is 11 million less than that of in 2016 (89 million sums). Despite total amount of budgeted capital allotted to introduction and development of ICT in 2017 is less than in 2016, budgeted capital for salary of employers of special sector in ICT and providing them with financial and technical base and the other capitals have been raised.

Interestingly, last year the agency did not allocate capital for training and improving qualification of employers in the sphere of ICT. However, it allocated 2 million sums for training and improving qualification in 2017. Besides, consulting and doing research in the sphere of ICT is included in the list of capital distribution of the agency. Surprisingly, in 2016 they neither allocated capital, nor budgeted in 2017. The reason behind remains questionable. Overall, proportion of financial capital allotted to ICT with respect to total capital of the organization increased in 2017. In fact, it made up 0.3% in 2016 and budgeted to increase up to 0.33% respectively.

The use of information systems in the housing and utilities sector is aimed at the following tasks:

- increase the efficiency of dispatching;
- processing of information on the technical condition of the housing stock territory;
- remote management of housing and communal services;
- simulation of situations;
- accounting and calculation of payment for utilities;
- improving the quality of work with the population;
- information services for municipal authorities;
- information exchange between municipal authorities;
- saving budget funds.

Information systems of housing and communal services provide for an increase in the speed of receipt of current information on the status of facilities at the control center in order to quickly respond to problem situations.

Processing of information on the technical condition of the housing stock of the territory is the accounting of energy and water consumption, control of technical

parameters of heating, hot and cold water supply, electricity supply, ventilation, elevator equipment, control of technological discipline, information transfer in the context of houses, neighborhoods, quarters for the purpose of calculation Triffs, decision-making on capital repair, etc.

Remote management of objects of housing and communal services assumes control of pressure and voltage in networks, switching-on and off of lighting in entrances and intradivisional territories, control of access to technical rooms.

The consequences of changing triffs, rates for housing services can be predicting through modeling situations.

Accounting and payment for utilities include:

- keeping records of buildings, apartments;
- management of personal accounts;
- keeping quarterly accounting of public utilities and consumption;
- accrual of subsidies and accounting of benefits (in aggregate and for each tenant inscribed in the personal account) with the possibility of changing their list by the user;
- grouping of buildings in order to change other parameters for a large number of apartments, prompt execution of calculations in the process of such changes;
- keeping records of the incomes of each family and calculating subsidies in accordance with these data;
- calculation of the amount of benefits (with the possibility of its recalculation in case of changes in legislation) for each tenant;
- maintaining the accrual history.

Improving the quality of work with the population is achieved by reducing queues when obtaining certificates, extracts, automating the formation and printing of reports.

Savings of budgetary funds are achieved due to a reduction in labor costs for the implementation of operations and the number of personnel.

Currently, one of the areas of automation in the sphere of housing and communal services is the organization of single cash settlement centers (SCSCs). The main purpose of the SCSC is the calculation of the cost of utilities, the automation of payment for public services by the population in the context of contractual relations between utility producers.

The main objectives of the SCSC are:

- formation of a non-subsidized housing and communal services system based on financial analysis, control and accounting of available resources;
- accounting of payments flows for utilities and document management;
- control over the collection of payments;
- the creation of a database of urban

Information on the state of the housing stock, the population, quotas, subsidies, services provided.

The most important activities of the SCSC are:

- operative service of residents of the MO for the payment of housing and communal services;
- preparation and delivery of payment documents to the public;
- granting of privileges and subsidies;
- making adjustments to the calculations for changes in triffs, benefits and subsidies;
- registration of citizens who are in arrears in payment for housing and utilities;
- information and analytical support of administrative districts.

The subscriber services for the population on the basis of the SCSC enabled us to obtain a number of advantages:

- improving control over the correctness of triff changes and charging fees for housing and communal services, excluding different interpretations of documents and errors in their interpretation;

- the use of a single invoice in the city, handed to each payer personally;
- increase the efficiency of updating the information base;
- improving the quality of benefits through integration information base with the database of the social protection service;
- improving the quality of information services for the population through the organization of a "hot line" on the provision of housing and communal services.

The interest of public service providers to increase the collection of utility bills has increased, since the amount of money transferred to these organizations is determined by the volume of services actually provided. This stimulates the improvement of the quality of services provided.

At the same time, the existing system of unified information and settlement centers needs further development.

Currently, the SCSC does not cover all categories of payers for housing and communal services, which hinders the creation of an optimal socio-economic model for charging, collecting and distributing payments for housing and communal services.

The issues of more rational organization of management and functioning of the SCSC, primarily due to the unification and optimization of the processes associated with the charging of payments, the creation of a single information space covering all participants in the settlement system require solution.

There is a need for further material and technical strengthening of the number of EIRTS, as well as the creation of a system for the training and retraining of staff at centers of all levels.

Successful work of the housing and communal services sector at present, as well as its further development is impossible without the effective use of information technology. Active implementation of IT will create a qualitatively new management system for housing and communal services, as well as a system of gated interaction with the executive bodies of state power. The use of modern

information systems will help bridge the gap between the already relatively developed normative base and law enforcement practice, improve the quality of decisions made, social protection of the population and strengthen control over the housing and communal sphere of activity.

CURRENT STATE OF AUTOMATIZATION OF THE SPHERE OF HOUSING AND COMMUNAL SERVICES IN UZBEKISTAN. At the moment all organizations providing communal services except for association of housing owners and private enterprises of household solid waste removal have their own billing systems which were worked up in various languages of programming.

- “Uzbekenergo” JSC exploits a single billing system throughout the republic of Uzbekistan;
- Every regional office of “Uztransgaz” JSC exploits a billing system of consuming natural gas;
- Organizations providing services of cold drinking water, hot water and heating have their own billing systems. Territorial scope of each organization covers a city or a district of a certain region. It is noticeable that the level of automatization and opportunities for providing interactive services of utilized billing systems varies from each other. For instance, organizations providing population of Khorezm region with cold drinking water exploits the billing system by which inspector or controller is able to capture accounting unit indications of cold drinking water. In this case, recordings made by inspector should coincide with those of accounting unit.
- A billing system used by “Suvsoz” works on MS-DOS. Therefore, operators use special computers with outdated version of MSWindows-98 to start emulator.

Current state of automatization shows that it is necessary for organizations providing communal services to realize the followings for interaction:

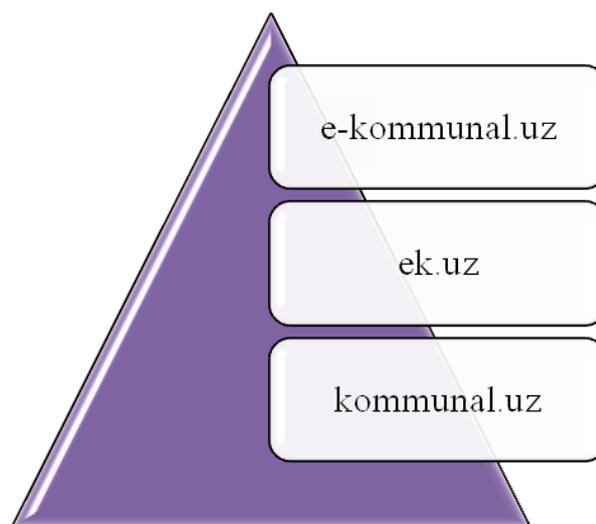
1. If there is a billing system in the organization, it has to be modernized and provided an interaction. A list of transmitting information will be depicted as separate list in single technical requirement. In this case, providing unnecessary information should be excluded.
2. If a billing system is not implemented in the organization, or it is outdated, a billing system foreseeing interaction should be worked up.

Realization of above mentioned tasks have to be done for the funding of organizations providing communal services.

Improvements of billing systems comprise the followings:

- a. Adding a single identifier of the property and information about owner of the property into database in accordance with the decree of the Cabinet of Ministers of the republic of Uzbekistan # CMD-365 “On measures to establish databases of individuals and legal entities and the introduction of a unified information system for the identification of users of the system "e-govenment”
- b. Adding and opportunity of sharing information.

THE RESULTS OF INVESTIGATING E-KOMMUNAL. E-kommunal is the portal of the municipal economy and housing fund which is accessible by the following addresses (Figure 6):



**Figure 6. The addresses for accessing E-kommunal portal.**

*Source: Made by author.*

E-kommunal was woked up and launched by the centre UZINFOCOM in 2012. It represents a portal which is integrated with the billing systems of communal survices in Tashkent city. Fundamentally, it performs informational function.

E-kommunal is the first try for integrating all communal survices into a single informational area. At the moment E-kommunal integrates communal survices on in Tashkent excluding association of housing owners and non-state organizations of solid waste removal.

In order to inform the users of the system, the following modules exist on the portal of the municipal economy:

- news in the sphere of housing and communal survices;
- contacts including requisites of all organizations in the sphere of housing and communal survices, state organizations and etc.;
- notifications' module is intended for efficient bringing of information to useers;
- "My bills" prvides an online acess to current state of useers' personal account;
- an oppportunity of online payments through "SMS-To'lov" paying systems;
- regulatory and reference information including lists of geographical names of entities in the country's territorial division;
- statistical data which are necessary for subdivisions in the sphere of housing and communal survices;
- "Investigation of public opinion" module enables the useers of the portal to send elictronic appeals to public authorities, and the other institutions and enterprises in the sphere of housing and communal survices;

However, E-kommunal does not solve all problems have been arising by consumers. Within the framework of increasing transparency of the sphere it is necessary to provide the consumers the information below:

- tariffs on operating costs of certain association of house owners for certain house;
- information about state of personal accounts of population by services of an association of house owners;
- automatic link of user's account and his personal accounts in different organizations of the sphere. (There is no identifier for all communal services. Consumer has to enter the numbers of his personal accounts for registration. This, in turn, causes additional difficulties in exploitation);
- online application for communal services;
- control over accuracy of consumer's accounting data and used tariffs in servicing companies in the sphere;
- control by consumer over the accuracy of accruals and receipt of payment;
- broadening servicing region to whole Republic of Uzbekistan (right now only Tashkent is embraced).

#### CRM FOR THE SPHERE OF HOUSING AND COMMUNAL SERVICES.

Nowadays Information Communication Technologies are penetrating in all spheres of our life. The sector of housing and communal services is no exception. Experts assert that there is a great impact of Information Communication Technologies on effectiveness of sphere of housing and communal services.

The sector of housing and communal services is considered as one of the most important sectors of economics of Uzbekistan, as well as one of the most difficult. In spite of development in the sphere, some problems related to consumers still remain unsolved. For instance, population complains about shortcomings in the provision of communal services, problems of expenses above normal and not

always correctly calculated debts [18].

The main goal of any competent management company is to understand thoroughly the needs of each resident, be aware of his problems, wishes, and find right approach to each of them. In fact, for sphere of housing and communal services establishing a relationship with clients plays a great importance. In this case, automation of financial and economic operation of Management Company, building and loan association, Homeowners Association leads to increase in transparency level in company's operation and its accountability to consumers. Particularly, in order to maximize the effectiveness of interaction with clients of a company CRM system should be introduced [19].

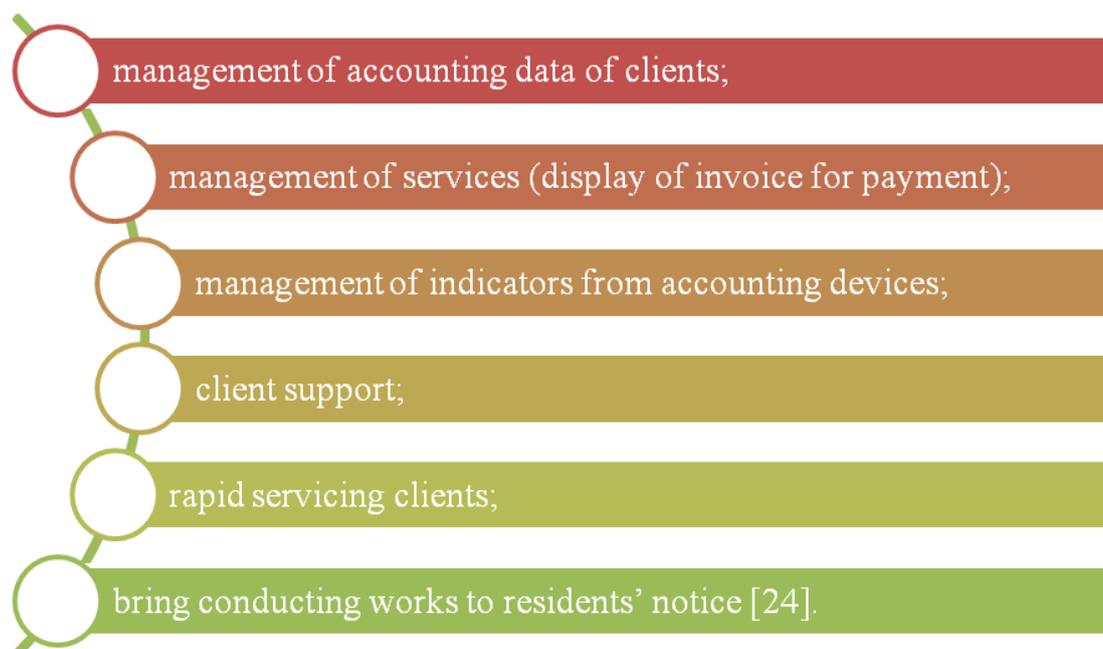
Several years ago a term like CRM sounded strange for companies in the sphere of housing and communal service: why do they need a system that helps the manage relationship with the clients where from clients only need is a receipt paid on time? Nowadays there is variety of solutions to automation of management company and homeowners association. As a matter of fact, introduction of CRM system in the sphere of housing and communal services creates several opportunities. In general, it allows receiving a range of privileges:

- improving quality of servicing clients;
- shortening time spent for fulfillment of tasks and activities regarding interaction with clients;
- shortening time spent for process and passage of information;
- accelerating provision of services to clients;
- effective control over quality and completeness of applications and appeals of clients;
- increasing percentage of paying off debts for housing and communal services;
- accurate and correct calculations on population and strengthening control over payments and control over quality of employees' work;

- regular monitoring, analyze condition of work and quick reaction to change of a situation;
- receiving payments for communal services on 24/7 regime to the account of a management company in bank;
- additional income for company thanks to commission for using service [20].

Foreign experience shows that until implementation of CRM they kept all information about clients in Excel tables. However, in this case, risk of data loss was very high. Moreover, they had to keep open both CRM system to view basic information about a client and Billing system to view his debts. Integration of CRM and Billing systems enables managers to keep all data in single system and to achieve the main aim of cooperating with clients – reducing accounts receivable [21].

Furthermore, from the experience of the leading management companies in housing and communal services' sector, adoption of CRM-systems provide the best control of processing of clients' appeals, enable to reduce employees' working hours for accessing data, which is necessary for relationship with clients, simplify and accelerate procedures of service provision. As a result of these improvements management can achieve loyalty of clients, and it is in turn, volume of overdue debts will decline [22].



**Figure 7. Opportunities provided by automation of working process.**

*Source:* Made by author.

A sphere of housing and communal services needs CRM system in order to manage database in which all appeals of population can be recorded. The system helps not only for processing inflow of information, but for integrating the work of this sphere with all sectors as well (e.g. phone calls, fax, email) [23]. In addition, automation of working process creates the following opportunities to employees of a management company acting in housing and communal services' sector (Figure 7)

Now any management company acting in housing and communal services' sector able to make his own decision: to implement CRM system in his company or not. On the other hand, for a business to prosper in this sector adoption of information technologies is necessary for their advantages from both administrative and clients' perspective. On the base there must be implemented information system which allows improving quality of decisions to be made and strengthen control over activity of management companies in the sphere of housing and communal services. Specifically, CRM system should be employed to create a new qualitative system of management of housing and communal services' sector,

mainly interaction with clients. Undoubtedly, investigating a range of advantages of CRM system we can conclude with every reason that your business in sector of housing and communal services gets succeeded starting to use CRM or you will have to leave market in near future.

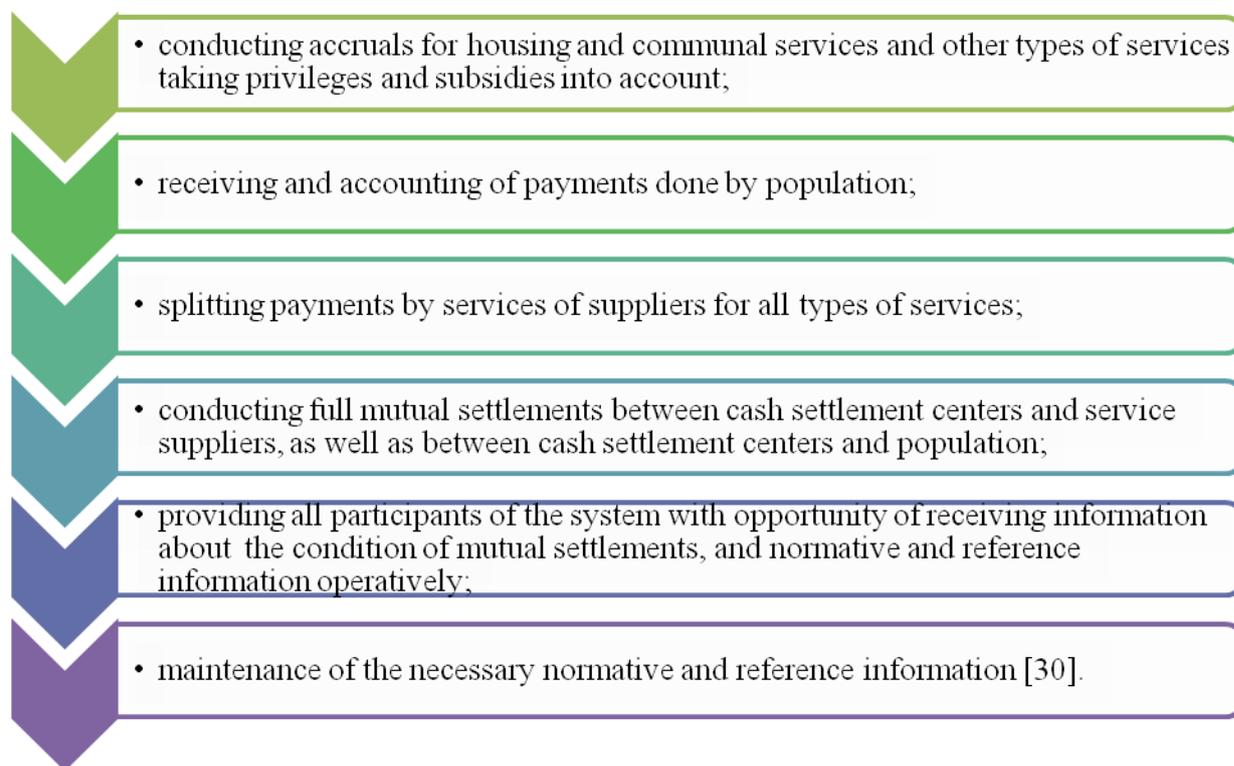
**BILLING SYSTEM FOR THE SPHERE OF HOUSING AND COMMUNAL SERVICES.** One of the main factors of influence of scientific and technological progress to all spheres of mankind activities is wide use of modern information technologies. A sphere of housing and communal services takes a special place among more important and mass spheres in which information technologies play a crucial role [25].

Nowadays several important decisions are being made for modernization of the system of the communal infrastructure, enhancement of reliability and effectiveness of work of the sphere of housing and communal services, as well as improvement of quality of providing communal services to population. It is important to notice that in cooperation with the UNDP in Uzbekistan a project in creation of billing system of invoice consumers of housing and communal services such as heating, water, gas and electric power supply, and sanitation was introduced [26].

In spite of reformation of the sphere of housing and communal services, many questions remain open and problems remain unsolved. For example, population complains about activities of organizations providing housing and communal services, problems of expenses above normal and not always correctly calculated debts [27]. The main dissatisfaction of consumers relates to costs of housing and communal services. In fact, principle of tariff calculation and reasons behind steady growth of costs of housing and communal services are still unknown for homeowners. Total sum showed in bills for monthly use of housing and communal services results in consumers' perplexity [28].

One of the effective ways of solving these problems is implementation and change of existing billing system of housing and communal services [29]. The

results of early implementations of billing system show that it is powerful efficiency improving instrument of activities of housing and communal services. As a matter of fact, minimum functionality of the communal billing system has to provide the followings:



**Figure 8. Minimum functionality of the communal billing system.**

*Source:* Made by author.

The system of billing in housing and communal services sector creates several opportunities. For example:

- payments for housing and communal services are calculated on daily basis;
- all changes regarding provided services, their tariffs, service accidents and personal account are automatically taken into account;
- opportunity of large recalculations including recalculations for past period is realized;
- opportunity of distributing organization's human resources economically [31];

- offers modern complex of processes of servicing and calculations with all categories of consumers of the housing and communal services sector;
- allows to gather and analyze information about the consumption of communal services, determine their triflication, issue invoices to users and provide feedback to them, for instance, via SMS-messages [32].

In many cases, in order to start receiving of payment for services in the sphere of housing and communal services online in terminals, introduction of the billing system to the sphere of housing and communal services is required. As regards the sphere of housing and communal services, the following issues of the day which can be solved with the employment of the billing systems:

- provision of subscriber “heterogeneous” clients and full control over relationship with them;
- providing calculation of consumption of energy and other resources used in housing and communal services with inclusion of losses;
- accumulation of data for supporting work with debtors;
- accumulation of data for analytical reporting which enables recognize weak points in work of a company and find the points to devote efforts for increasing effectiveness of a business [33].

Reformation of the sphere of housing and communal services turns out to be a long and complex process. Stage of transition to new business models needs enormous amount of investments and serious organizational efforts. Moreover, expenditures of the organizations for investigation and implementation of ICT to the sphere will be considerable as well. In this case, expenditures should be optimized and systems should be used effectively. Introduction of billing system to housing and communal services gives responsible institutions a chance of successful solution to these problems [34]. In accordance with past experience, the topic of billing system is urgent question for the sphere of housing and communal services that provides services of heating, water, gas, electricity and sanitation for

individuals and legal entities [35].

## **2. Analysis of the methods determining economic effectiveness in the sphere of housing and communal services.**

During the evaluation of the use of the information system, organizations speak of the effectiveness of this system. Effectiveness – the relative effectiveness of the process, operation, project, defined as the ratio of the result to the costs that ensured its receipt.

To date, there are two main approaches to the question of the cost-effectiveness of implementing information systems. In the first, the most widespread case, economic efficiency is estimated very conditionally. This happens when the company has a customer on the side of the business, who clearly understands why he needs this or that IT project. The customer is ready to assume full responsibility for the effect of its implementation. At the same time, before the introduction of the system, immeasurable or difficult measurable goals can be fixed, for example, increasing business transparency, improving manageability or providing a single information space, etc. In this case, it is often not easy to assess the level of similar results using numerical estimation methods, and the evaluation can be reduced to the reflection by the top management of its attitude to the implemented project. In the second case, attempts are made to estimate the effect from implementation more formally with the help of quantitative indicators. In this article, we propose to discuss some aspects of this approach.<sup>2</sup>

Evaluation of the effectiveness of the information system is based on the level of maturity of IT management in the organization. The COBIT methodology distinguishes between the following levels of maturity:

- Zero level. The IT management system does not exist, and the need to create it is not realized. All key IT roles are performed by supposedly

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<sup>2</sup> <https://www.iemag.ru/analytics/detail.php?ID=30577>

irreplaceable employees. The general strategy of development of information technologies is absent.

- First level. Top management is beginning to realize the need to implement an integrated approach to IT management. Usually this is caused by a large dependence on them and significant costs, which do not give visible results. There are no IT processes yet. Top management is only beginning to think about getting a return on investments made in IT, without having, however, a methodology for assessing their effectiveness. There is no connection between the business objectives and the activities of the IT department.
- Second level. IT processes are presented, but they are not documented and implemented as practices of individual employees. The need for the planned implementation of the IT management system is already in no doubt, active performance indicators are being developed, planning, monitoring and IT service delivery processes are being implemented, interrelations between IT and business processes are being established, and an IT strategy is being developed. Top management of the organization takes an active part in the formation of managed IT processes, for which there are already basic methods for assessing efficiency.
- The third level. The role of the management system becomes dominant. Here all procedures are documented, and employees are trained to use them. The activities of the IT department are regulated by these procedures. However, the quality control mechanisms for their implementation are not sufficiently developed.
- The fourth level. It is characterized by the presence of a system for monitoring the quality of IT processes. This system carries out continuous monitoring of information processes, establishes quality monitors their implementation. The presence of such a system makes it

possible to identify inefficiently operating IP management mechanisms and constantly work to improve their effectiveness.

- Fifth level. The IT management system differs from the previous level in essentially only a greater degree of process optimization and quality control. Information about the performance of each process is recorded. IT is an effective business tool, and the management system is one of the components of the company's overall management system.

After reviewing the levels of maturity, it can be concluded that in enterprises with a first or zero level of maturity, one should not even try to do an analysis of the effectiveness of IT use, because at these levels there are no records of the indicators of the effectiveness of IT use. Starting with the second level, the company has metrics and tools for evaluation, so conducting an analysis of the effectiveness of using IT can be considered appropriate.

Also, when considering the effectiveness of the application of IT, its importance for business should be considered. Based on this criterion, five categories are distinguished:

1. Ensuring the critical processes of the company;
2. Performing the non-alternative requirements of the external regulator;
3. Supporting the existing business;
4. Aimed at the growth and development of the firm;
5. Laying an innovative foundation for future development.

And for different companies, the same technologies can belong to different categories of importance: for some, e-mail is critical, while for others, the warehouse management system lays an innovative foundation for future development.

For categories 1 and 2, the most appropriate assessment is based on a cost analysis (including future, hidden and introduced risks), since the organization does not have alternatives for them, and their application is mainly related to costs and technological risks.

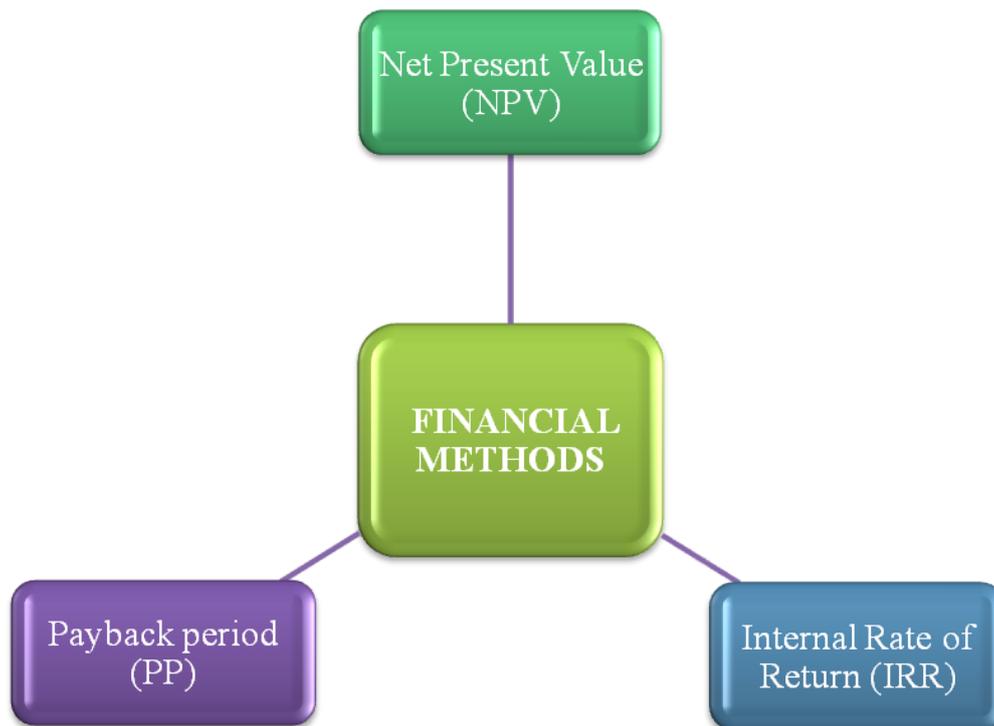
For Category 3, the most appropriate tools are return on investment, because their effectiveness implies a balance of costs and revenues.

Systems belonging to the 4 categories are evaluated based on an analysis of the results of their application, since the costs of their operation are strategic and far exceed the received and potential indicators.

Systems of the 5th category have a high degree of uncertainty, therefore, they are evaluated by comparing the level of innovation costs and their main directions with companies of a similar profile.

To determine the effectiveness of IT implementation, three groups of methods are mainly used:

1. Financial methods
2. Quality methods
3. Probabilistic methods



**Figure 9. Financial methods of determining the effectiveness of IT implementation.**

*Source:* Made by author.

In this part of the series, we will focus on financial methods. The most commonly, three main financial methods for determining IT investments are used:

1. NPV (Net present value) - net present value or net present value, this depends on the wording.
2. IRR (Internal rate of return) - the internal rate of return or the internal rate of return, this also depends on the wording.

Payback - the payback period of investments (Figure 9).

The most common financial method is NPV (Net present value), that is, net present value or net present value. Just the word "reduced" and shows us that in it the income from the IT project is given at the moment, rather than the amounts sometime in the future. NPV is determined by the classical discount formula.

$$NPV = \frac{NCF_1}{1 + R_e} + \dots + \frac{NCF_i}{(1 + R_e)^i}$$

Where

$NCF_i$  - net cash flow on the i-th planning interval

$R_e$  - discount rate (in decimal terms)

The formula is simple, so immediately I would like to find out: what does the net present income show us? It shows whether we will have an economic profit or not. It is absolutely clear that financial methods must be applied only together with all the rest. Accordingly, NPV allows us to make a decision on the project. If the NPV indicator we get is greater than zero, it means it's good, it means that some money (given) the project will bring. He answers one of the main questions - how much future revenues will justify today's costs for the IT project. Precisely because the decision has to be made today, all future cash receipts are given for today. NPV shows, whether it is necessary to think about this project at all. If NPV is less than zero, it means that we will not get any economic profit from the project, the project should be rejected, and the money should be invested in another project or put into the bank.

However, in the NPV formula, there is absolutely no risk analysis. Therefore, after a positive NPV, the stage of the IT project risk analysis must necessarily follow. Accordingly, further, by comparing the magnitude of the risks, we can decide to start or reject the project. In addition, NPV works very well to justify the adoption of one project. To justify the choice between two or three projects, the NPV is already approaching badly, requires adjustments, bringing projects to the general budget, so that there is an opportunity to compare budgets.

If NPV is a relative indicator, then the second financial method is IRR (Internal rate of return), that is, the internal rate of return or the internal rate of return, the absolute indicator. Sometimes it is called the internal rate of return of investment or the rate of return of the project. To put it briefly, this is the value of the discount factor, in which the NPV of the project is zero. If we understand that the NPV is the current profit from the project that we will receive, then the internal rate of return is that rate of bank interest at which we will not receive any profit. If we build the dependence of NPV on the discount rate, it is obvious that the profit from the project will fall with the growth of the discount rate (see the figure). And at some point the NPV will be zero. And if the project is break-even (but also non-profitable) at a rate of the bank interest equal to 68% per annum, then under this project we get 68% per annum. When, for example, the project is fully funded by a loan from the bank, and the average risk-free rate of bank interest is 12%, then the project is profitable.

IRR, in fact, determines the interest rate from the implementation of the project, and then compares this rate with the rate of return on a risk-adjusted basis. If the calculated return on investment exceeds the payback, taking into account the risks, then the investments make sense. IRR defines the upper limit of the acceptable level of the bank interest rate. Unlike NPV, IRR is an absolute indicator that allows not only making decisions on specific projects, but also comparing projects with absolutely different levels of funding, with absolutely different budgets.

Finally, the third financial indicator is payback, the payback period of the project. In fact, this is an analysis of the return of funds based on the maximum payback periods accepted in the company. Today, quite often the companies set a maximum payback period for any projects. Suppose he is 30 months in the company. And we invest 300 thousand dollars with an annual payback rate of 100 thousand dollars. In this case, the payback period is three years longer than the maximum payback period set in the company.

Each of these methods is not free of shortcomings. Therefore, only the calculation of all three indicators together gives us a full understanding of the project's money, the profit and the economic effect that we receive from the IT project.

Now let's move on to qualitative methods for assessing IT investments (Figure 10). These methods are based on one idea - goals, priorities and indicators for them. The first method is called the Information Economy. Its idea is that the top management of the company and the IT service organize a certain coordinate system - they determine the priorities in the development of the company's business and prioritize the design criteria - even before considering any IT project. And then the project is evaluated for compliance with these developed criteria. Everything sounds a little abstract, but in fact it's a fairly easy method, which is very often used by companies. How is it good? The fact that the expected quality effect from the project we compare with our desired effects. These priorities for these effects and the criteria is the IT Director, of course, under the vigilant eye of top management.

To somewhat reduce the level of abstraction, this method is often combined with project portfolio management, when these effects are viewed throughout the entire IT project portfolio.



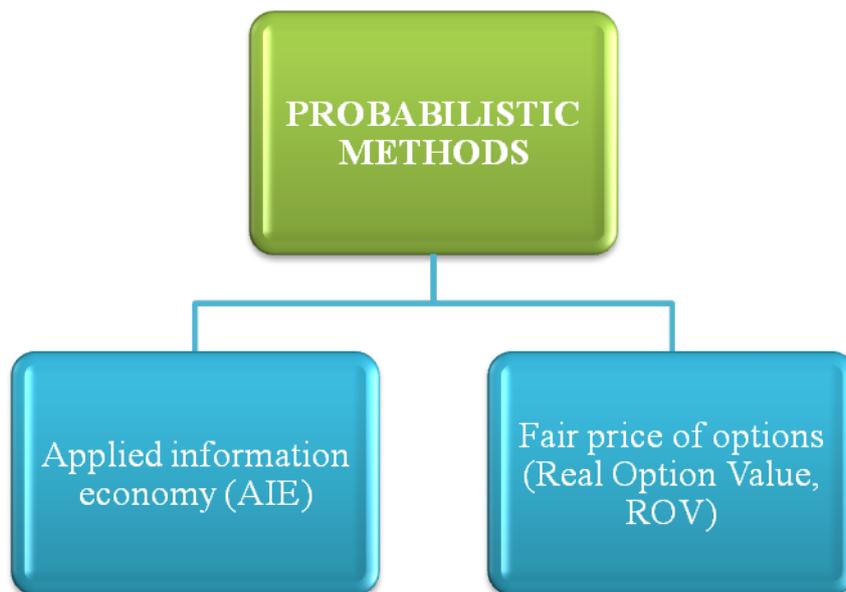
**Figure 10. Quality methods of determining the effectiveness of IT implementation.**

*Source:* Made by author.

Even more specific in this approach is the method called IT Scorecard. Its idea is to adapt the BSC approach to the IT department. As in the traditional BSC, IT Scorecard selects four more or less balanced directions (prospects in the terminology of BSC) of the impact of IT on the company's business. In the classical and most applicable case, these areas are as follows: help in developing the company's business, improving the quality of products (with quality in mind for both internal and external users), improving the quality of decision-making and increasing productivity. We note that both the directions themselves and their number can be any, which are important for a particular company. Then, as in the BSC, goals are defined for each direction (perspective), in other words - benchmarks that characterize the desired IT location in the company's business in

the future. It is these goals that make up the strategy for the development of the IT department (this is how we can interpret the prospects) will be transformed into the operational level, that is, into specific IT projects. In fact, these are the same priorities for design criteria as in the information economy method, only grouped by directions. Finally, as in the classical BSC, the goals follow initiatives, and the goals of the IT department determine whether the IT project will be effective in approaching one or more goals. The only difference from BSC, which is here, is a few other indicators of approaching the target.

The information economy method suffers from subjectivism, especially in terms of project risk analysis; on the other hand, IT Scorecard, like BSC, requires a formalized business strategy. For a qualitative assessment of the effect of investments in IT, companies use either the information economy method or IT Scorecard.



**Figure 11. Probabilistic methods of determining the effectiveness of IT implementation.**

*Source:* Made by author.

Finally, the last group of methods for assessing the economic effect of an IT project is probabilistic. There are, in general, two: applied information economy

(Applied Information Economics) and a fair price of options (Real Options Valuation, ROV) (Figure 11).

The method of applied information economy is quite trivial, it is a slightly modified qualitative method of information economy. His idea is to determine for each of the stated objectives of the IT project the likelihood of achieving it and then to derive from it the likelihood of improvements in the company's business processes.

The fair price method of the option is itself difficult enough (for its development, the Nobel Prize was recently received). When using the fair value option method, the project is considered from the point of view of its manageability already in the course of the project itself. In any project, five parameters are distinguished: the revenue from the project, the project costs, the complexity of the project, the cost of supporting the resulting solution, and the life cycle of the implemented IT system. Then we need to evaluate how much we can influence these parameters in the course of the project. The stronger we can influence these parameters, that is, lower the costs or complexity of the project, the higher is our assessment of this project using this method. Accordingly, the more rigid the project is, the more rigidly set the framework, the less interesting it is.

It should be noted that probabilistic methods are rarely used to assess the future effect of an IT project. The method of applied information economy is very subjective and generally does not look like a specific methodology. The fair price method of the option, on the contrary, is very specific, but it is rather difficult and requires a lot of time for analysis.

### **3. Analysis of risks in applying ICT to the sphere of housing and communal services.**

In the economic activity of housing and communal services, there is always a danger of losses arising from the specifics of the industry. The danger of such losses is a risk. Effective management of housing and communal services can be

achieved by timely identifying risks and reducing the likelihood of their occurrence. Taking into account the modern development of the Uzbek economy in general and the housing and communal services in particular, the risk component acquires an important aspect in forecasting the industry's activity and developing an effective management mechanism. It should be noted that the process of risk management in the housing and utilities sector is on the development stage, and therefore many organizations in this industry completely ignore risk management.

In the process of automation of the industrial enterprise management system, different risks may arise. They can be distinguished below:

- the risk of "failing" the tasks of the automation project within a particular activity;
- risk of non-completion of the project on time or non-receipt of the planned result;
- risk of changing project objectives;
- the risk that the behavior of the system in operation may not coincide with the expectations of users or that the results in one or another functional area will not meet the criteria for the success of the project [36].

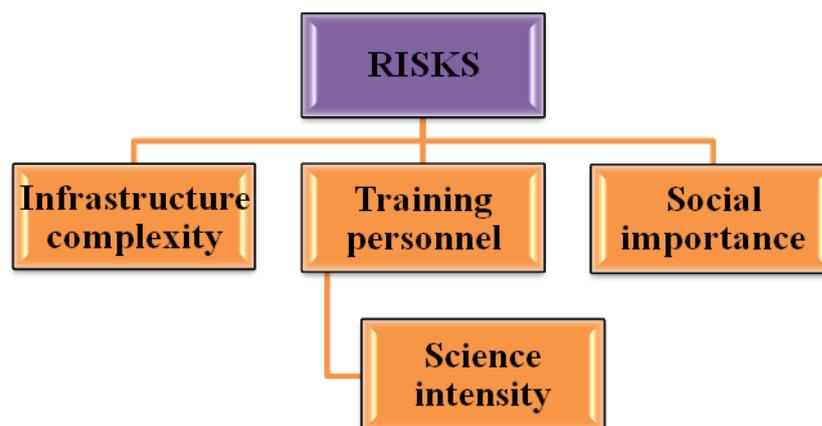
Below we will consider the risks that arise in most cases when implementing control systems and how to eliminate them. The main risks include:

- automation of unregulated business processes;
- the need for a partial or complete reorganization of the structure of the enterprise;
- the need to change the technology of business in various aspects;
- resistance of employees;
- temporary increase in the burden on employees during the implementation of the system;

- the need for the formation of a qualified implementation team, the choice of an influential team leader [37].

For the risks of introducing communal billing systems or atomation of settlement centers, along with the usual risks of the project activity, additional risks are associated with at least three factors:

- High level of complexity of infrastructure projects. Obviously, a citywide billing system is an important element of the urban infrastructure.
- High science intensity of implemented technological solutions, which supplements and strengthens the complexity given by the infrastructural nature of the project. A direct consequence of high science intensity is the need to train personnel that directly take part in the operation of payment and settlement systems.
- Social importance of the project for the municipality. It is clear that the quality of payments for housing and communal services, transparency and understandability of this system for the population significantly influences the attitude of people to local and state power (Figure 12) [38].



**Figure 12. The factors associated with additional risks.**

*Source:* Made by author.

Risk management is a complex multi-step process aimed at reducing the likelihood of a possible risk to an economic entity. It is necessary to understand

that the concepts of "risk reduction" and "minimization of damage" are not identical. The first implies either a lower probability of adverse events, or a reduction in possible damage.

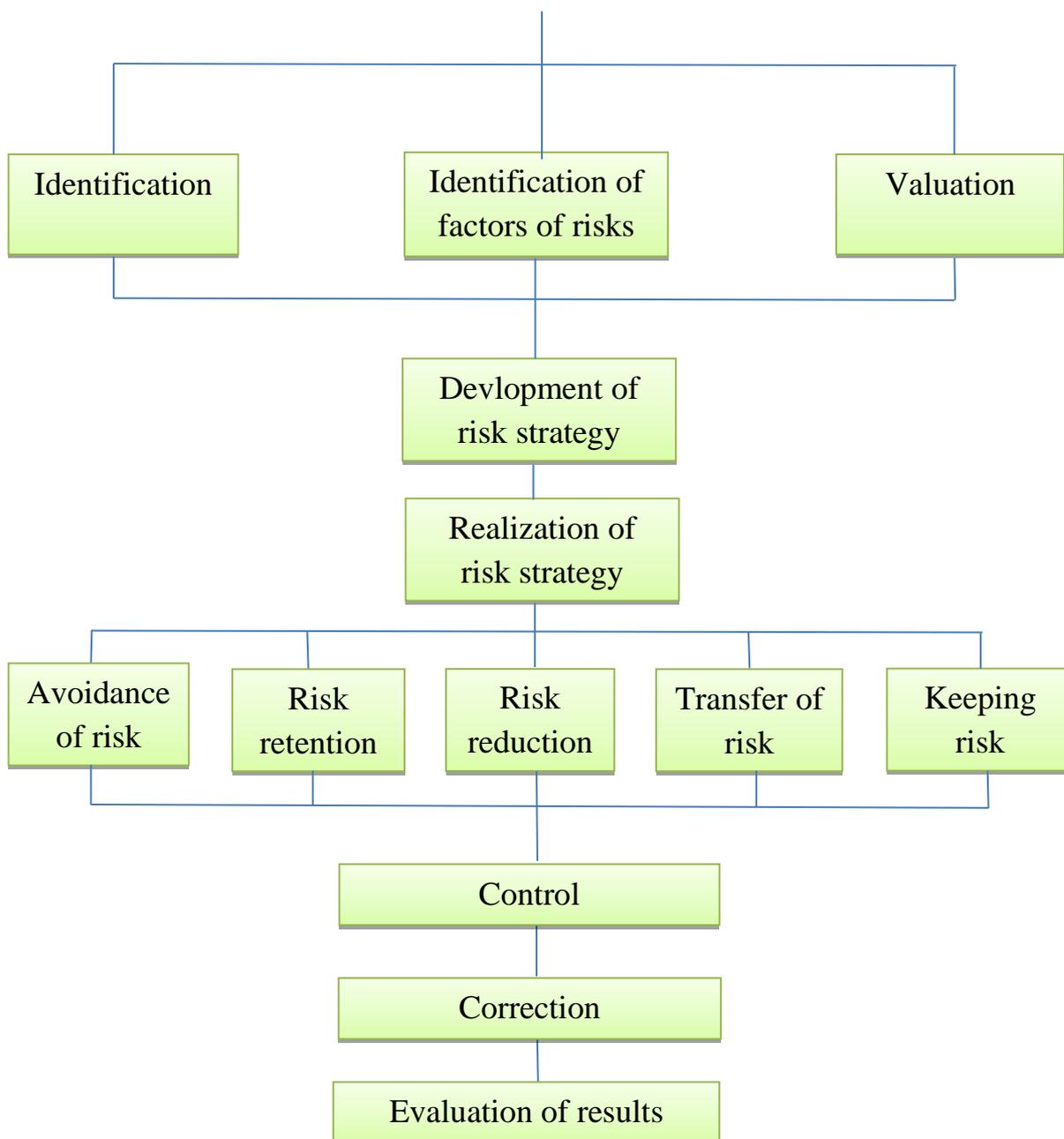
The management of the risks of the housing and communal sector can be considered as an important aspect of ensuring the sustainability of the industry. The need for early development and implementation of risk management methods in an unstable market economy is due primarily to the fact that at present there are no effective mechanisms for financial support for housing and utilities in Uzbekistan.

In general, risk management in the implementation projects of information systems includes the following processes:

- identification of anticipated risks;
- analysis and assessment of risks;
- choice of risk management methods;
- application of selected risk management methods;
- response to the onset of a risky event;
- development and implementation of risk reduction measures;
- control, analysis and evaluation of actions to reduce risks;
- development of corrective solutions [39].

From the point of view of the possibility of increasing the competitiveness of organizations, information technologies are of the greatest interest, and their implementation is a topic that certainly interests managers at various levels and relevant professionals. However, communications are a complex process, consisting of a set of interdependent steps, each of which is a point in which the meaning can be lost due to negligence or inaccurate awareness of what is being done. And so, the managers responsible for the company's activities should more widely see the problems and prospects associated with the introduction of ICT in various areas of business, which will increase the effectiveness of this process.

Analysis of internal and external environment of housing and communal services (Conducting SWOT analysis, PEST analysis)



**Figure 13. The algorithm of risk management in the sphere of housing and communal services**

*Source:* Made by author

The exchange of information is an integral part of all major types of management activities, and that is why we call communications a connecting process. And this means that for effective work of various kinds of organizations,

effectively functioning communications are needed. Therefore, it is especially important that the automation process be concentrated in a single control center, which implies a more accurate and error-free result of the work performed.

### **Conclusions drawn from chapter 2.**

Information systems of housing and communal services provide for an increase in the speed of receipt of current information on the status of facilities at the control center in order to quickly react to problematic situations.

The systems of automation such as Customer relationship Management (CRM) and billing systems are massively being implemented worldwide including Uzbekistan in the sphere of housing and communal services. Studies found that the organizations providing communal services in Uzbekistan introduced the billing system, except for the homeowners' association (HOA). For example, Uzbek agency "Uzkommunkhizmat" allocated 12 million sums for implementation of information systems and software products. However, the level of automation and language of programming vary among the organizations and regions. Hence, integration of CRM and Billing systems enables managers to keep all data in single system and to achieve the main aim of cooperating with clients – reducing accounts receivable.

Current state of automation shows that it is necessary for organizations providing communal services to realize the followings for interaction:

1. If there is a billing system in the organization, it has to be upgraded and provided an interaction with the other organization in the sphere. A list of transmitting information will be as a separate list in single technical requirement. In this case, provision of unnecessary information should be excluded.
2. If a billing system is not implemented in the organization, or it is outdated, a billing system foreseeing interaction should be worked up.

Realization of above mentioned tasks have to be fulfilled for the funding of organizations providing communal services.

To determine the effectiveness of IT implementation, three groups of methods are mainly used:

1. Financial methods consist of mainly net present value (NPV), internal rate of return (IRR) and payback methods. Each of these methods is not free of shortcomings. Therefore, only the calculation of all three indicators together gives us a full understanding of the project's money, the profit and the economic effect that we receive from the IT project.
2. Quality methods comprise information economy (IE), portfolio management, IT scorecard and balanced scorecard (BSC) methods. The information economy method suffers from subjectivism, especially in terms of project risk analysis; on the other hand, IT scorecard, like BSC, requires a formalized business strategy. For a qualitative assessment of the effect of investments in IT, companies use either the information economy method or IT scorecard.
3. Probabilistic methods involve applied information economy (Applied Information Economics) and a fair price of options (Real Options Valuation, ROV) methods. are rarely used to assess the future effect of an IT project. The method of applied information economy is very subjective and generally does not look like a specific methodology. The fair price method of the option, on the contrary, is very specific, but it is rather difficult and requires a lot of time for analysis.

Informatization of the sphere of housing and communal services is not free from risks. As a matter of fact, high level of complexity of infrastructure projects, high science intensity of implemented technological solutions and social importance of the project for the municipality are the factors correlated with risks arising from introduction of ICT to the sphere. Therefore, risk risks arising from

introduction of ICT to the sphere should be managed going through the following stages:

- identification of anticipated risks;
- analysis and assessment of risks;
- choice of risk management methods;
- application of selected risk management methods;
- response to the onset of a risky event;
- development and implementation of risk reduction measures;
- control, analysis and evaluation of actions to reduce risks;
- development of corrective solutions.

### **CHAPTER 3. THE PRIOR DIRECTIONS OF ACHIEVING ECONOMIC EFFICIENCY BY APPLYING ICT TO THE SPHERE OF HOUSING AND COMMUNAL SERVICES IN THE REPUBLIC OF UZBEKISTAN.**

#### **1. The principal directions of step-by-step realization of informatization of the sphere of the housing and communal services.**

According to the STRATEGY OF ACTION on five priority development directions of the Republic of Uzbekistan in 2017-2021 offered by the President of the Republic of Uzbekistan Shavkat Mirziyoyev priority directions for the development of the social sphere are mentioned. Particularly, increasing the level of provision with communal services, first of all, cardinal improvement of providing the population in rural areas with clean drinking water through the construction of new water lines, the progressive introduction of modern economical and efficient technologies is considered as one of the main priority directions of this section.

Information systems of the housing and communal services provides for an increase in the speed of receipt of current information on the status of facilities at the control center in order to quickly respond to problematic situations.

Processing of information on the technical condition of the housing stock of the territory is the accounting of energy and water consumption, control of technical parameters of heating, hot and cold water supply, electricity supply, ventilation, elevator equipment, control of technological discipline, information transfer in the context of houses, neighborhoods, quarters for the purpose of calculation Triffs, decision-making on capital repair, etc.



**Figure 14. Tasks of information systems of housing and communal services**

*Source:* Made by author

Remote management of objects of housing and communal services assumes control of pressure and voltage in networks, switching-on and off of lighting in entrances and intradivisional territories, control of access to technical rooms.

The consequences of tariff changes, the machine for utility services can be predicted through simulations of situations.

Accounting and payment for utilities include:

- keeping records of buildings, apartments;
- management of personal accounts;
- maintenance of quarterly accounting of public utilities and consumption;
- accrual of subsidies and accounting of benefits (in aggregate and for each tenant inscribed in the personal account) with the possibility of changing their list by the user;

- grouping of buildings to change the and other parameters for a large number of apartments, prompt execution of calculations in the process of such changes;
- keeping records of the incomes of each family and calculating subsidies in accordance with these data;
- calculation of the amount of benefits (with the possibility of its recalculation in case of changes in legislation) for each tenant;
- maintain the history of accruals.

Improving the quality of work with the population is achieved by reducing queues when obtaining certificates, extracts, automating the formation and printing of reports.

Savings of budgetary funds are achieved due to a reduction in labor costs for the implementation of operations and the number of personnel [40].

In the conditions of modernization of the economy, much attention is paid to the development of the social sphere. The allocation of funds from the state budget of the Republic of Uzbekistan to the social sphere shows the significance of this sphere in the government level.

The first President of the Republic of Uzbekistan, Islam Karimov, in his report at the joint meeting of the Legislative Chamber and Senate of the Oliy Majlis of the Republic noted that "the country, the people who have a well-thought-out program and strategy for its implementation, has clear guidelines and priorities, and that Especially important, working to anticipate possible crises and various cataclysms, ups and downs of the world economy. "

There are enterprises in the structure of the republican multifunctional communal services such as maintenance and protection of housing, water supply and sewerage, heating and gas supply, technical enterprises engaged in the cleaning of living quarters, urban passenger transport (tram, trolley, metro), electricity, and gas distribution networks, Improvement of agriculture, industry, construction, design organizations, enterprises, organizations and others.

The following are the main directions for improving the management of public services:

1. To create a system of relations based on the separation of management and service functions:
  - the owner of the property and (or) the managing organization (the customer);
  - utility contractors (suppliers);
  - Competent authorities for exercising state control in the field of communal relations. As an effective form of management of housing stock and public buildings and structures, property management is carried out on the basis of a power of attorney.
2. To develop the competitive environment in the sphere of housing and communal services. The most important direction of the reform of public services is the creation of a competitive environment and demonopolization, which ensures the quality and volume of services at affordable prices. And services needed to ensure quality and volume, which allows the utility to create a competitive environment and citizens.
3. To optimize of the state system in the sphere of housing and communal services management. The main directions of state control and regulation of the sphere of housing and communal services are the following:
  - creation of a regulatory and legal and methodological framework for creating favorable conditions for the normal functioning of the network;
  - increase the level of independence of economic entities for the transition to contractual relations in the sphere of housing and communal services;
  - creation of a healthy competitive environment in the market for servicing housing funds;

- prevention of changes in the profile of privatized utilities and licensing of certain activities in this area;
  - providing a guaranteed level of service for consumers of housing and communal services;
  - establishment of consumption and a minimum level of services to priority groups of consumers.
4. Optimization of the tariff system and financing. In the current system of prices, enterprises are not interested in resource-saving measures, because enterprises taking energy-saving measures will be forced to reduce tariffs and squeeze the profits of this enterprise and pay taxes.

The method of regulating tariffs, cost and limited effectiveness of profitability of enterprises operating costs creates incentives for the growth of tariffs that cover costs, will lead to lower prices. This approach does not reduce the company's costs, but also leads to increased interest. As the basis for the definition of a cost structure that requires a lot of energy, described the use of obsolete process equipment and other fixed assets does not correspond to the real financial needs of the enterprise.

Since the proclamation of the independence of the Republic of Uzbekistan, the process of democratic renewal and modernization of society, reform and liberalization in all specific aspects of the political and socio-economic life of the country are developing at a rapid pace. At the same time creating a solid foundation to determine the cause of a strong civil society and the consistent implementation of great tasks. The creation of economic development programs at various levels and comprehensive measures based on all aspects is a key role for success in ensuring the consistent and sustainable development of the national economy in the coming period.

## **2. The development perspectives of the national sphere of housing and communal services by applying ICT.**

Further deepening of reforms in housing and communal services is an integral part of the social and economic reforms being carried out in Uzbekistan.

Recently, the Government of Uzbekistan is taking important measures to modernize the system of municipal infrastructure, increase the reliability and efficiency of the housing and communal services.

This is evidenced by the creation of an effective regulatory and legal framework to support the interaction of the participants in the housing and communal process - suppliers and consumers of housing and communal services, the definition of the rights and obligations of tenants, partnerships and other utilities, the adoption of numerous government decisions to strengthen the activities and potential of housing and utilities, Implementation of innovative projects in this direction, etc.

In this context, to date, special attention is given to improving the quality of public services to the public and effective monitoring and accounting of this mechanism.

With the adoption in the country of the Comprehensive Program for the Development of the National Information and Communication System for the period 2013-2020, the country is increasingly introducing ICT elements in the communal sphere to improve its efficiency.

In particular, the computerization of business processes of many utilities is underway; Large providers of services, such as SJSC Uzbekenergo and Uztransgaz, implement pilot projects for the introduction of metering devices for the consumption of public services; A modern regulatory framework is being developed to create a single database and billing system that allows to provide interactive services in one information space.

In addition, in 2012, for the first time in Uzbekistan, the portal of the municipal economy and housing fund [www.e-kommunal.uz](http://www.e-kommunal.uz) was launched to ensure transparency in the work of public services, as well as their effective

interaction with the population and business entities by providing interactive and information services in this field.

Nowadays several organizations providing housing and communal services in Uzbekistan have been doing a row of reforms in order to automate the servicing system and provide the consumers with interactive services. In fact, software was developed in order to automate the system of doing calculations with consumers.

As an example, let us review the software those are being used by the organizations providing public services in Tashkent city. Problems related to informatization of provision of communal services system of Tashkent city are being raised relatively well. Today automated calculation systems are applied in all organizations in communal sector. The billing system of organizations are integrated to the internet portal of “e-kommunal” so these systems are successfully providing population and interactive services are successfully are being provided to the subjects of entrepreneurship.

In addition, with the intention to provide convenience for consumers in paying for public services payment systems such as “Click”, “SMS-to’lov”, “M-bank” were implemented.

On the other hand, systems discussed above are implemented in various languages of programming, so the level of automation is different as well. For this reason there is not possibility of integrating them into a single system. To overcome these drawbacks to embody the appropriate tasks were specified.

To implement the ICT extensively in economic sectors of our country and directions of a life, on the decree PD-1989-numeral approved by the president of the Republic of Uzbekistan in 27<sup>th</sup> June, 2013 the tasks of developing information bases and information system complexes of the system of “E-governments” were set.

The complex of information systems “Kommunal” (CIS “Kommunal”) is one of the projects that was included in the system of “E-governments”. The CIS “Kommunal” is designed to provide interactive services in the sphere of housing and

communal services. Therefore, a subject operating as a “single orderer” should be formalized to create CIS “Komunal”. Main operation of a “single orderer” should be creating, implementing, servicing the CIS “Kommunal” and formalizing the billing system in the sector.

With the aim to provide the fulfillment of these tasks by the Complex of problems regarding information systems by the Cabinet of Ministry, to implement the CIS “Kommunal” effectively there was specified a task of establishing the state unitary enterprise.

The billing systems have to fulfill the following tasks:

- to keep a record and pricing of provided services;
- to keep a record with the subscribers and consumers of services;
- to note contracts with regard to servicing;
- to keep a record of payments;
- to keep a record of debts;
- to keep a record of accounting with the suppliers and partners;

From the economic point of view, improvement of efficiency of organization in communal sector, reduction of operational and financial expenses in the system of communal billing and the other positive effects are compatible with the functions of the sphere, but it becomes a growth factor in national extent.

On providing communal services one of the main opportunities of billing systems in the state and companies is a single communal billing system (CIS “Kommunal”).

First of all, CIS “Kommunal” provides the new step of the sphere of communal services. As a result of automation all financial calculations are visible for the consumers. Easement in settings, opportunity of modifying information about suppliers of services and at the same time keeping the base of information system develop the competition, creates opportunities for every territorial unity to change the service providers for the large group of consumers.

The executive agencies can obtain actual data about emergencies in the communal sector and communal systems, the budgeted funds for social support for population and the other directions whenever they want.

Secondly, a single management system aids to make reforms in communal sector. It should be noted that making reforms by plan, analyzing them in details and systemizing the problems are very significant. In this case, communal sector should be regulated, communal systems should be capitalized, and then they should be privatized or the assets should be legalized.

The settlement centers staying between service providers and consumers may serve as the center of clearness. Moreover, they guarantee the regulation of the sphere of communal services on the level of reformations during the process of communal sector management.

Thirdly, the system of communal billing results in the the reduction of expenses in relation to service provision for individual consumer by suppliers and service providers. For example, the share of expenses of some service providers accounts for 13-15% of the revenue from their sales and working with consumers.

The CIS "Kommunal" outsources these functions for 4-5% of all earnings. Nowadays taking into consideration that many companies are keeping record of expenses regarding citizens and claiming works individually, making the calculations reducing the expenses of service providers results a significant economic effectiveness. In this case, they copy the technological operations looking like each other for several times.

On a single system existing convergent billing systems existing today take the various services and types of payments into account and encourages competition in market economy:

- provides a single base of clients (both individuals and organizations).
- further it limits the opportunities of consumers who do not pay in time;

- creating a hierarchy of account numbers comfortable for service providers (also keeping a record of private and cooperation services) and consumers (opportunity of monitoring accounts of services);
- creating payment schemes for services provided for using different combination of canals and the balance of account number of monitoring subscribers.

Thereby, convergent billing system, which is going to be implemented through the customer-oriented way of managing and improving the earnings from the services grabbing more attention, is considered as technological base.

Finally, keeping a record of debtors on payments reveals new opportunities while working with debtors. Reduction of debts is a result of decreased expenses in the communal sphere, particularly; reduction of getting loans and financial expenses of service providers declined operational cycles of service providers and increased economic effectiveness.

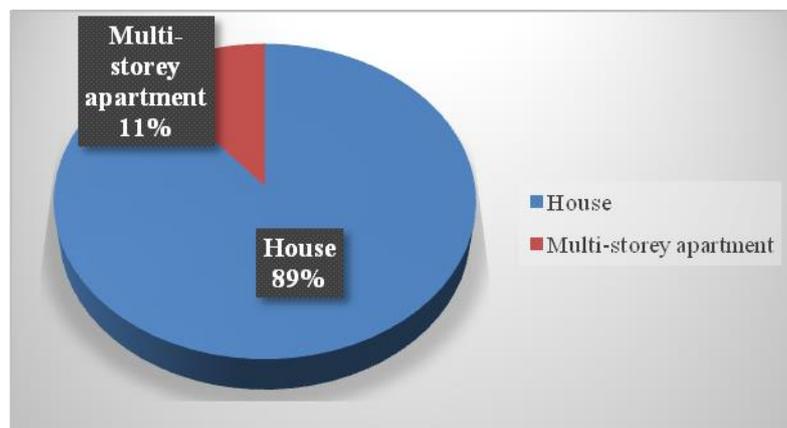
There is a great importance of investigating market and exploring the types of products and services for which consumers demand the most. In general, the purposes of market research are concentrated on two main points. First of all, market research enables a management of an enterprise to analyse the situation inside and outside the enterprise, forecasting possible changes and, based on this, develop a management strategy. Secondly, market research provides opportunity of searching for the criteria for making managerial decisions, check and confirm the hypothesis of the company's behavior in the market.

Conducting research through the questionnaires would be the appropriate method of market research for achieving the aims mentioned above. The author chooses the questionnaire method for conducting survey due to the following advantages:

- Cost effective. Questionnaires are relatively cost effective compared to interviews, especially, as the number of questions increase written questionnaires will become more cost effective.

- Practical. You can choose the groups of your target, the format of questions (multiple choice or open-ended) and manage in different ways.
- Quick results. The results obtained from the questionnaire can be easily and speedily quantified.
- Scalability. Huge amount of information can be collected from a huge number of people in a short period of time.
- Scientific analysis and predictions. Analyzing the information collected gives the capability to create a strategy and generate predictions.
- User anonymity. All the information provided will be held under strict confidentiality which encourages respondents to answer truthfully.
- Covers all aspects of a topic. Researcher can ask as many questions as he wants.<sup>3</sup>

There is a number of factors influencing market position of a company. To draw a picture of a situation in the sphere of housing and communal services, especially, in water services (Uzbek agency “Uzkommunxizmat”) the author decided to conduct a survey using questionnaire form provided in Appendix 1.

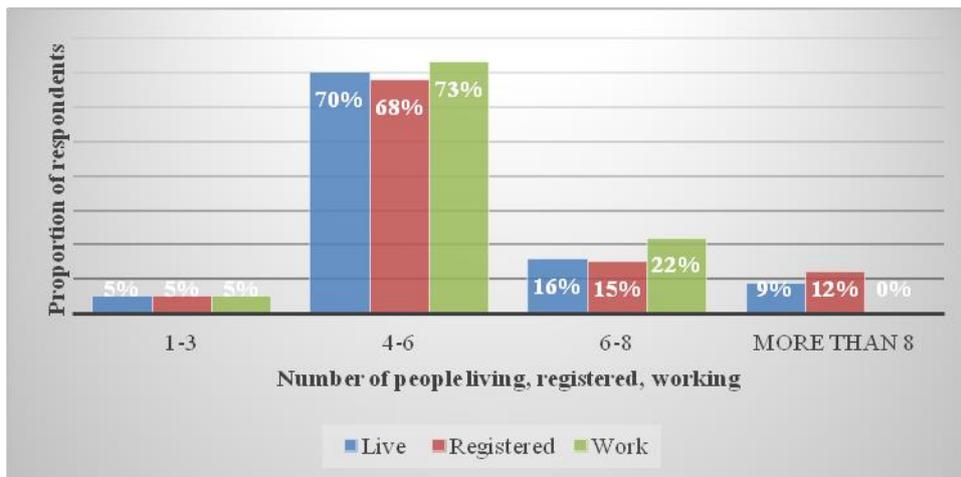


**Figure 15. Types of accommodation people live.**

*Source:* authors’ own calculations

<sup>3</sup> <https://surveyanyplace.com/questionnaire-pros-and-cons/>

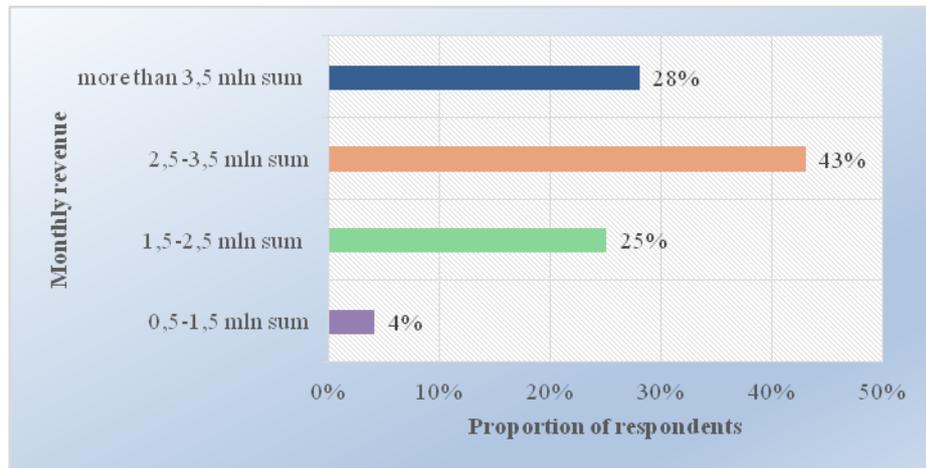
Survey was conducted using a sample size of 100 people living in makhalla named “Firdavsiy” (district Yunusobod). For conducting survey a questionnaire involving ten questions regarding the topic was compiled. Based on the answers the analysis report was generated. According to Figure 15 the majority (89%) of respondents live in ordinary houses. However, only 11% of respondents live in multi-storey apartments. The type of accommodation matters since usually multi-storey apartments require less water than that of ordinary houses.



**Figure 16. The proportion of people living, registered and working in families**

*Source:* authors’ own calculations

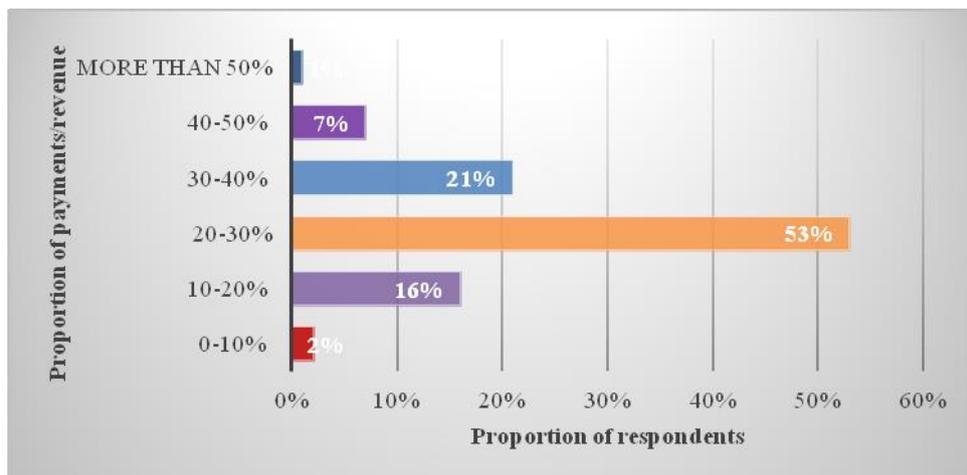
The number of people registered in certain house and the number of people are really living in that house may vary. It interesting to see that Figure 16 confirms that Uzbek nation really loves children and respects elder people as the majority of families consist of 4-6 members. Moreover, the number of people in family affects the amount of water used, thus the payments for communal services.



**Figure 17. Monthly revenue of families**

*Source:* authors' own calculations

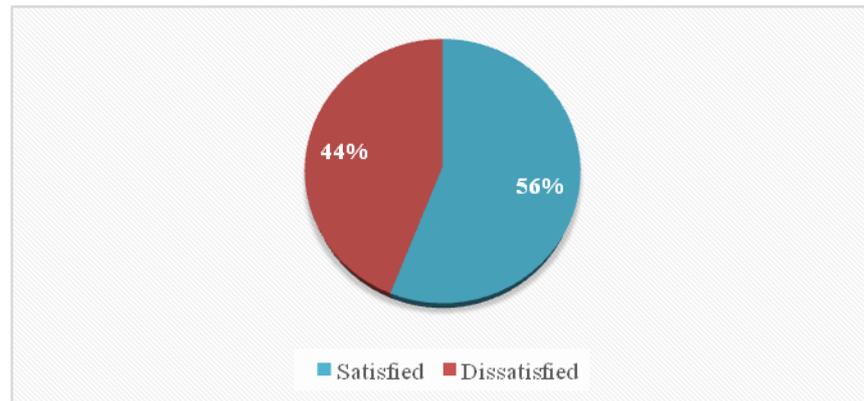
Monthly revenue of a family influences the amount of debts for communal services. Therefore, monthly revenue and the proportion of monthly payments for communal services with respect to monthly revenue in families were explored. Figure 17 illustrates that the majority of families earn well per month. For example, 43% of families' income per month accounts for between 2,5 and 3,5 million sums, while 28% of families earn more than 3,5 million sums per month. This means that if they are rational, the probability of paying for communal services in time is relatively high.



**Figure 18. The proportion of monthly payments for communal services with respect to the monthly revenue of families**

*Source:* authors' own calculations

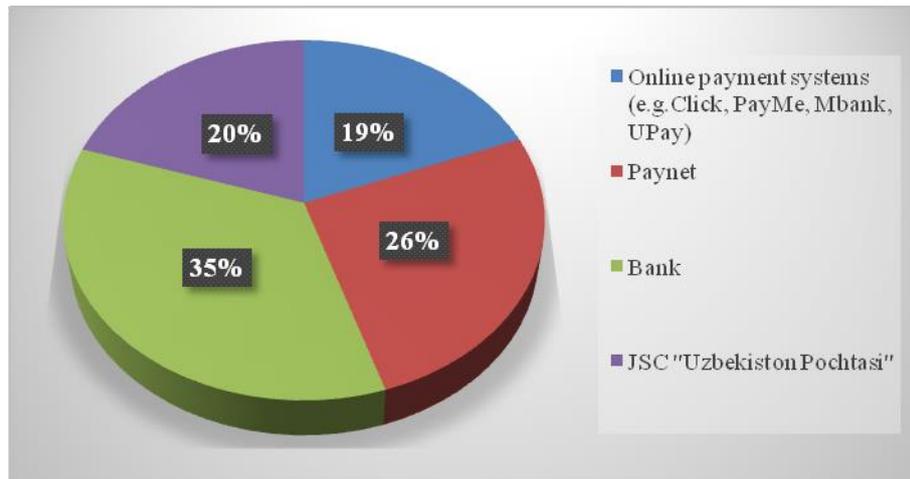
To identify if the families may default, the author decided to find out an answer for the question “*What is the proportion of monthly payments for communal services with respect to the monthl revenue of your family?*” Figure 18 graphs the obtained results. As it shows more than half of respondent families note that approximately 20-30% of their monthly earnings are spent for paying for communal services. This implies that the probability of defaulting is comparatively low. Consequently, debts for communal services should decrease to some extent.



**Figure 19. Satisfaction of respondents with provision of communal services**

*Source:* authors’ own calculations

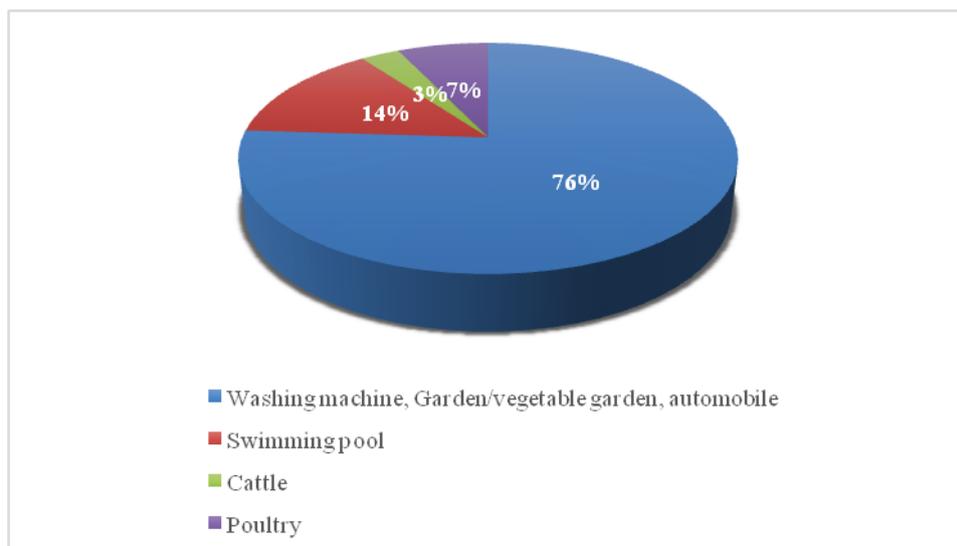
Consumer satisfaction is very crucial factor affecting the management and improvement of the municipal economy. It measures how products supplied and services provided by an enterprise meet or exceed a consumer’s expectation. As Figure 19 illustrates more than half (56%) of surveyed respondents are satisfied with the work of organizations supplying communal services. In spite of this the proportion of dissatisfied respondents is still considerably high (44%) meaning that a row of reformations should be done to develop the sphere of housing and communal services.



**Figure 20. The share of different payment systems.**

*Source:* authors' own calculations

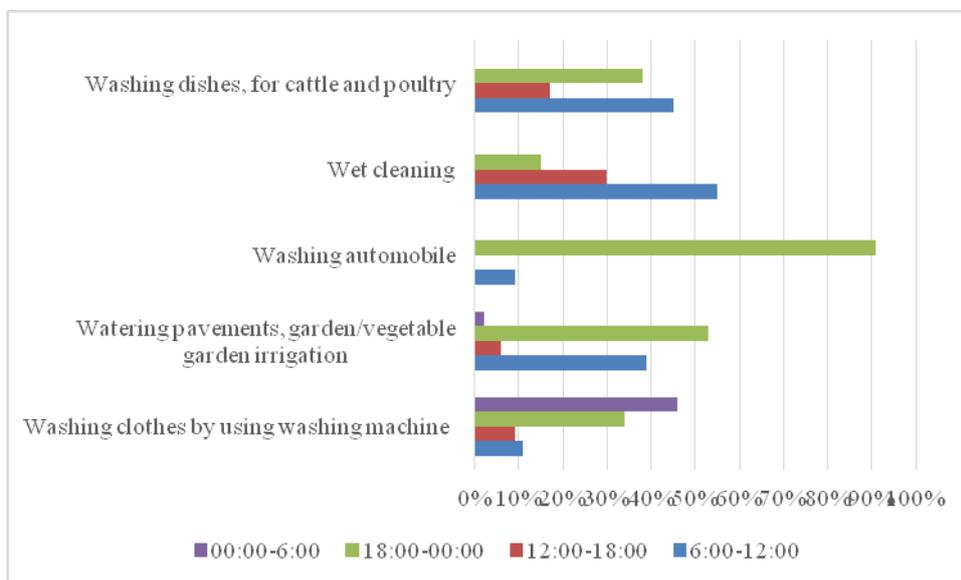
Technologies do not stay in a place. Some years ago people had to pay for communal services staying in a long queue for a long time. However, now people can do this by touching a screen of their smartphone by using innovative programmes and applications. Despite this people prefer making payments via Bank (35%), Paynet (26%), branches of JSC "Uzbekiston Pochtasi" (20%) than using online payment system such as Click, PayMe, Mbank, UPay. This might be explained by the conservative attitude of population with respect to ICT (Figure 20).



**Figure 21. The types of owings in families which require much water.**

*Source:* authors' own calculations

There is a code of provision for individual (popyulation) consumers confirmed by regoinal organizations “Suvoqava”. According to that code there is approximate daily amount of water spent for washing automobile, garden or vegetable garden irrigation, filling swimming pool, cattle, poultry and etc. Hence, the number of owings in the family requiring water influences the amount of water a family uses, and so the amount of payments for public survices. For this reason, the author is interested in the owings in the family. As Figure 21 depicts the larger proportion of respondents (76%) owe washing machine, automobile, garden/vegetable garden.

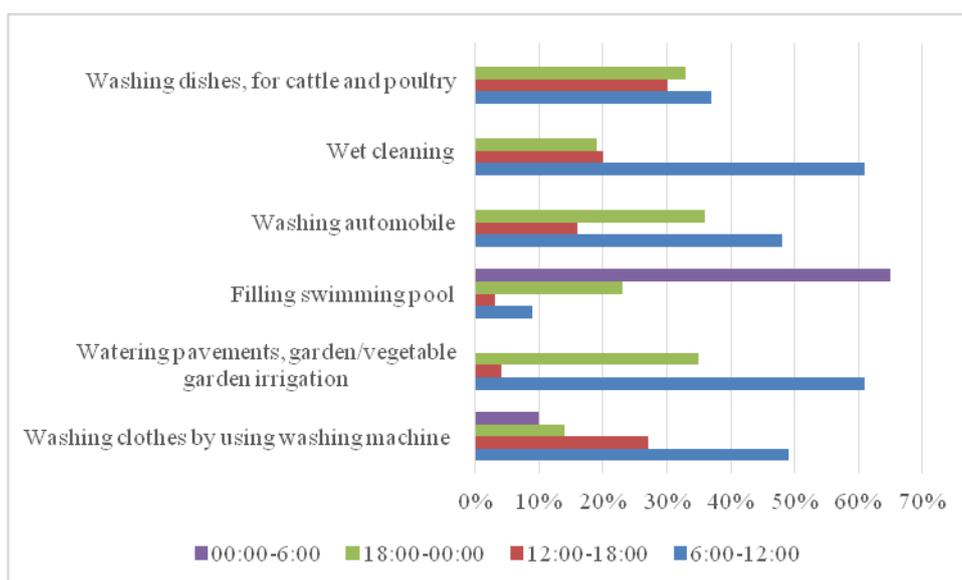


**Figure 22. The purpose and timee people using much water on weekdays.**

*Source:* authors’s own calculations

The factors such as days of the week and timee when the large amount of water is spent are interrelated with for what purpose water is used actually. As a matter of fact, families where the majority of members work usually use less water on weekdays compared to families where females (rarely males) do not work and stay at home being busy with houseworks. The survey explored that filling swimming pool and washing automobile on weekdays is not popyular work done by families. This can be explained by the large amount water and timee required for these works. These points should be taken into account in working out triff plans for utilized resorces.

Washing dishes, feeding cattle and poultry are considered as must be done three times a day regardless of a day of week. So these works stay popular both on weekdays and weekends (Figure 22 and 23). On the other hand, the day and time of wet cleaning of house, watering pavements, garden/vegetable garden irrigation, washing clothes depends on the family's image of life and plans. It is interesting to see that regardless of the day wet cleaning is usually done between 6:00-12:00 since working females do wet cleaning before they go to work, whereas housewives prefer this interval of time as it is easier for them to do wet cleaning when no one stays at home.



**Figure 23. The purpose and time people using much water on weekends.**

*Source:* authors's own calculations

In case of washing clothes by using washing machine, families using washing machine on weekdays, do the washing between 00:00-6:00 (46%) as because they send clothes into the washing machine and in the morning they are dry. On the contrary, the larger proportion of families (76%) prefer washing clothes between 6:00-18:00 as they can send clothes into the washing machine and do the other houseworks.

The system of "E-governent" is successfully being applied in developing countries of the world including Uzbekistan. It is stated in the decree # PD-1989

“About measures of development of national information-communication system of the Republic of Uzbekistan” approved by the president of the Republic of Uzbekistan in 27<sup>th</sup> June, 2013 that complex of information systems “Communal” was considered as the important component of the system e-govenment in 2016-2020. The complex is planned for providing interactive survices in the sphere of housing and communal survices.

As regards the deelopment and atomation of the sphere of housing and communal survices for interaction of organizations providing housing and communal survices with e-govenment system the author prvides the following recmmendations:

1. To devlop billing systems of organizations providing housing and communal survices so that they could interact with each other. The level of atomation should be the same and language of programming should match among the organizations and regoins so the informatization of the sphere will be achieved on the republican scope.
2. To enter an element of territorial affiliation in the process of developing billing system (e.g. coding). To differenciate the regoins frum each other aids to prevet waste of timee. Here, Tashkent city may be denoted as 1, Samarkand – 2, Bukhara – 3 and so on. Consequently, the problem arising would be solved faster.
3. To integrate the information systems that will be created in the future with online payment systems. In this case, we should note that payments via Uz-kart, M-bank, Click.uz for consumption of cold water and sewerage, heating and hot water should be realized and integrated with the clearing system of the CBU.
4. To optimize the number of inspectors meaning that intrduce a single inspector for all types of housing and communal survices. Currently, in each sector of housing and communal sphere there are inspectors for monitoring the condition of counters and gathering payments for the

services sometimes. As we know an inspector is responsible for certain territory which may include several makhallas or a whole region. Therefore, introducing a single inspector for all types of housing and communal services for a certain territory results in time saving and decline in expenses for salary of inspectors.

5. To introduce smart counters for utility of communal resources to strengthen the battle against the defaulting consumers and economize the resources. Firstly, regular payment is must for consumers using smart counters since utility payments are done by a special card. When there is no money left in a card for utility payment, supply of certain type utility will be automatically stopped. This, in turn, prevents the debts for utility consumption. Secondly, smart counter is considered as economically adjusted as it not only meters the total amount of utilized resources, but indicates the time of consumption as well providing opportunity of differentiating tariffs for consumption depending on time and season.
6. To work out tariff plans for utilized resources (gas, electricity, water). On the basis of conducted survey in makhalla called "Firdavsiy", several tariff plans are recommended. Firstly, study found that the resource consumption varies over time interval, days and purpose. With regard to water consumption, tariffs should be distinguished by the day and night. In general case, smaller amount of water is used at night compared to the day. Secondly, different tariffs should be introduced depending on the days of week. The study explored that the amount of water consumed on weekends is larger than that of the weekdays. Thirdly, depending on season tariffs should be various as because people consume more water in summer, while larger amount of electricity and gas is consumed in winter. Different tariffs provide opportunity of managing resource consumption decreasing the waste of resources.

Especially, tariff plans are most useful for energy saving. According to the fact, a 1 kW/hour decrease in consumption of energy at the end saves up to 4-5 kW/hour of energy from the manufacturer.

7. To introduce a partnership with banks to pay for communal services via opened accounts in banks. Bank operators will be responsible for regular payments for utility consumption. Payment will be made until the funds in personal account is enough. This, in turn, leads to improvement in payment discipline and collection.

### **Conclusions drawn from chapter 3.**

Informatization of the sphere of housing and communal services is not an easy task. Thus, the Uzbek government should set goals and go step-by-step to reach these goals successfully. Here are the principal directions of step-by-step achievement of informatization in the sphere of housing and communal services:

1. To create a system of relations based on the separation of management and service functions;
2. To develop the competitive environment in the sphere of housing and communal services;
3. To optimize of the state system in the sphere of housing and communal services management;
4. To optimize the tariff system and financing.

Further deepening of reforms in housing and communal services is an integral part of the social and economic reforms being carried out in Uzbekistan. In fact, the introduction of modern information technologies will create a qualitatively new management system for housing and communal services, as well as a system of regulated interaction with the executive bodies of state power.

In this regard, based on the results of conducted survey among population of makhalla called "Firdavsiy", the following recommendations are provided:

- ✚ To develop billing systems of organizations providing housing and communal services so that they could interact with each other;
- ✚ To enter an element of territorial affiliation in the process of developing billing system (e.g. coding);
- ✚ To integrate the information systems that will be created in the future with online payment systems;
- ✚ To work out tariff plans for utilized resources (gas, electricity, water);
- ✚ To optimize the number of inspectors meaning that introduce a single inspector for all types of housing and communal services;
- ✚ To introduce smart counters for utility of communal resources.

## CONCLUSION

The sphere of housing and communal services are one of the main branches of the economy, which exerts a significant influence on all aspects of the life of society. The cost and quality of housing and communal services are the most important characteristics of ensuring stability and sustainable development of the national economy, directly affecting the level and quality of life of all its citizens.

The sphere of housing and communal services is a complex of sub-sectors that ensure the functioning of engineering infrastructure, various buildings of settlements, creating convenience and comfort of living and finding citizens in them by providing them with a wide range of housing and communal services.

Today, housing and communal services is a complex, diversified production and technical complex. It includes: housing and maintenance; water supply and sanitation; Communal energy; External landscaping, including sanitary cleaning and landscaping of cities.

However, this sphere of society's vital activity is not in well condition, historically caused by a number of circumstances: ineffective management system, high costs associated with providing housing and communal services, underdeveloped competitive environment, chronic non-payments. The management of housing and utilities (utilities) has relatively low efficiency, and the lack of adequate information does not allow the implementation in practice the basic principles of the program-targeted approach to management. The efficiently functioning information management system is developed weakly, which should facilitate the process of reforming the housing and communal services and its transition to a qualitatively new state. Among the many problems that need to be addressed during the implementation of the housing and communal reform, the reliability and availability of information that is created, used and distributed in the housing and communal services occupies a special place. First of all, these are

information on the housing stock and residents, on the consumption of energy resources, on-line information on the current state of housing and communal services, and engineering communications.

Successful solution to this problem can only be based on advanced information technology. The basis should be an information system that will bridge the gap between the already relatively developed regulatory framework and law enforcement practices, and improve the quality of decisions, social protection of the population and strengthen control over the housing and communal sphere of activity.

In this regard, there is an objective increase in the need for structural transformations in the management of housing and communal services, based on a scientifically grounded array of information. This is necessary for making effective managerial decisions and, most importantly, for ensuring the principle of optimality of control over the activities of housing and utilities entities, which becomes a key element of management and requires complete information obtained from various sources. All communication must take place through e-government core.

Currently, e-government issues in general, as well as more narrowly - the organization of information interaction with the public utilities and businesses through government portals are engaged in dozens of large companies and associations. The goal of all transformations in the sphere of housing and communal services will be to increase the efficiency of interaction between the communal services and users of its services, with the state, regions, branches and, on this basis, improving the efficiency of the country's economy [17]. Thus, the main task of interactive government services at the present stage of world development should be in the following:

1. Provision of timely, complete, consistent and accurate information for the public services on the basis of the applicant's needs.
2. Ensuring transaction on the principle of "one window".

3. Support for inter-agency cooperation in terms of ensuring the provision of integrated public services.

On the basis of the analysis of foreign experience in the organization and regulation of housing and communal services, the following areas for transformations in the communal sphere of our country should be taken into account:

- a change in the management system of the housing and communal services sector so that both private and state firms can work with the active participation of state bodies;
- development of competition among utilities;
- tariff regulation to achieve profit-making goals while preserving state regulation in the monopoly sectors of the economy;
- increasing the role of the board and chairman of the homeowners' association.

The systems of automation such as Customer relationship Management (CRM) and billing systems are massively being implemented worldwide including Uzbekistan in the sphere of housing and communal services. Studies found that the organizations providing communal services in Uzbekistan introduced the billing system, except for the homeowners' association (HOA). For example, Uzbek agency "Uzkommunkhizmat" allocated 12 million sums for implementation of information systems and software products. However, the level of automation and language of programming vary among the organizations and regions. Hence, integration of CRM and Billing systems enables managers to keep all data in single system and to achieve the main aim of cooperating with clients – reducing accounts receivable.

Current state of automation shows that it is necessary for organizations providing communal services to realize the followings for interaction:

3. If there is a billing system in the organization, it has to be upgraded and provided an interaction with the other organization in the sphere. A list

of transmitting information will be as a separate list in single technical requirement. In this case, provision of unnecessary information should be excluded.

4. If a billing system is not implemented in the organization, or it is outdated, a billing system foreseeing interaction should be worked up.

Realization of above mentioned tasks have to be fulfilled for the funding of organizations providing communal services.

Information systems of housing and communal services provide for an increase in the speed of receipt of current information on the status of facilities at the control center in order to quickly react to problematic situations. To determine the effectiveness of IT implementation, the most commonly used methods are financial, quality and probabilistic.

4. Financial methods consist of mainly net present value, internal rate of return and payback. Only the calculation of all three indicators together gives us a full understanding of the project's money, the profit and the economic effect that we receive from the IT project.
5. Quality methods comprise information economy, portfolio management, IT scorecard and balanced scorecard. For a qualitative assessment of the effect of investments in IT, companies use either the information economy method or IT scorecard.
6. Probabilistic methods involve applied information economy and a fair price of options methods. They are rarely used to assess the future effect of an IT project.

Informatization of the sphere of housing and communal services is not free from risks. As a matter of fact, high level of complexity of infrastructure projects, high science intensity of implemented technological solutions and social importance of the project for the municipality are the factors correlated with risks arising from introduction of ICT to the sphere. Therefore, risks arising from introduction of ICT to the sphere should be managed going through the

identification of anticipated risks, analysis and assessment of risks, choice of risk management methods, application of selected risk management methods, response to the onset of a risky event, development and implementation of risk reduction measures, control, analysis and evaluation of actions to reduce risks; development of corrective solutions.

Informatization of the sphere of housing and communal services is not an easy task. Thus, the Uzbek government should set goals and go step-by-step to reach these goals successfully. Here are the principal directions of step-by-step achievement of informatization in the sphere of housing and communal services:

5. To create a system of relations based on the separation of management and service functions;
6. To develop the competitive environment in the sphere of housing and communal services;
7. To optimize of the state system in the sphere of housing and communal services management;
8. To optimize the tariff system and financing.

Further deepening of reforms in housing and communal services is an integral part of the social and economic reforms being carried out in Uzbekistan. In fact, the introduction of modern information technologies will create a qualitatively new management system for housing and communal services, as well as a system of regulated interaction with the executive bodies of state power.

In this regard, based on the results of conducted survey among population of makhalla called “Firdavsiy”, the following recommendations are provided:

- ✚ To develop billing systems of organizations providing housing and communal services so that they could interact with each other;
- ✚ To enter an element of territorial affiliation in the process of developing billing system (e.g. coding);
- ✚ To integrate the information systems that will be created in the future with online payment systems;

- ✚ To work out tariff plans for utilized resources (gas, electricity, water);
- ✚ To optimize the number of inspectors meaning that introduce a single inspector for all types of housing and communal services;
- ✚ To introduce smart counters for utility of communal resources.

## **LIST OF LITERATURE**

### **Orders, decisions and laws of the Republic of Uzbekistan**

1. Constituion of the Republic of Uzbekistan
2. The law of the Republic of Uzbekistan “On informatization”
3. The law of the Republic of Uzbekistan “On opening the activities of govenment authorities and management”
4. The law of the Republic of Uzbekistan “On the Electron Govenment”.
5. The law of the Republic of Uzbekistan “On Elictronic payments”.
6. Decree of the President of the Republic of Uzbekistan Mirziyoyev Sh.M. “On the strategy of actions for the further dvelopment of the Republic of Uzbekistan”.
7. Decree of the First President of the Republic of Uzbekistan Karimov I.A. # PD-2458 “About the investment program of the Republic of the Uzbekistan for 2016”
8. Reesolution of the First President of the Republic of Uzbekistan # PR-445 of August 17, 2006 "On measures to iprove the activities of the Uzbek agency “Uzkommunkhizmat” "and the financial rehabilitation of utilities"
9. Decree of the Cabinet of Ministers of the republic of Uzbekistan # CMD-365 “On measures to establish databases of individuals and legal entities and the inroduction of a unified information system for the identification of users of the system "e-govenment”

### **Speeches and reports of the President of the Republic of Uzbekistan**

1. Report of the President of the Republic of Uzbekistan Shavkat Mirziyoyev at the enlarged meeting of the Cabinet of Ministers devoted to the results of the country's social and economic devlopment in 2016 and the most imbortant priority areas of the economic program for 2017.
2. Report of the President of the Republic of Uzbekistan Shavkat Mirziyoyev at the solemn meeting dedicated to the 24<sup>th</sup> anniversary of the adoption of the Constituion of the Republic of Uzbekistan.

3. Report of the First President of the Republic of Uzbekistan Islam Karimov at the extended meeting of the ministerial cabinet dedicated to socio-economic development of the country in 2015 and the most important priority directions of the economic program for 2016.

### **Scientific articles and monographs**

1. Белова А.А. ИКТ в госсекторе: информатизация в сфере ЖКХ // Электронный вестник Ростовского социально-экономического института. — 2015. — № 3 - 4 (июль – декабрь). — с. 453-460.
2. Чистова М.В., Концевич Г.Е., Демина Н.В. Возможности внедрения информационных технологий для реформирования жилищно-коммунального хозяйства РФ // Научно-практический журнал «Гуманизация образования». — 2014. — № 6/2014. — с. 95-101.
3. Саак А.Э., Тюшняков В.Н. Применение информационных технологий управления в жилищно-коммунальном хозяйстве // Известия ЮФУ. Технические науки. — 2013. — № 1 (138)/2013. с. 246-252.
4. Гнездова Ю.В., Романова Ю.А. Принципы организации системы регулирования управлением коммунального обслуживания за рубежом // Журнал ВАК, Управление экономическими системами: электронный научный журнал, 08.02.12. – <http://www.uecs.ru/>
5. Обоймова Н.Т. Состав и функциональные особенности развития сферы жилищно-коммунальных услуг с учетом отечественного и зарубежного опыта <http://kommunalshik.ru/>
6. Королюк Е.В. Вектор экономической политики современной России // Вестник Адыгейского государственного университета. Серия 5: Экономика. 2011. № 2. С. 27-32.
7. Молчан А.С. Концептуальные аспекты теории и методологии формирования и использования совокупного потенциала мезоуровневых социально-экономических систем // Научный вестник Южного института менеджмента. 2013. № 3. С. 22-28.

8. Грачева И.И. Зарубежный опыт организации и регулирования сферы ЖКХ // Научно-методический электронный журнал «Концепт». – 2014. – Т.20. – с.4241-4245.
9. Горбачев Д. В., Хакимова Э. Г. Обзор современных информационных технологий автоматизации деятельности в сфере ЖКХ // Молодой ученый. — 2015. — №13. — С. 33-35.
10. Максимов А.Д., Макарова И.В. Биллинг жилищно-коммунальных услуг: проблемы и решения // Российское предпринимательство. — 2012. — № 09 (207). — с. 109-112.
11. Борейко А.. Пять рынков коммунального биллинга // Бизнес-Форум IT. – 2003. – № 10, октябрь 2003, стр. 62-66.
12. Караев А., Биллинговые системы в ЖКХ как инструмент бизнеса // Энергорынок. – 2007. – № 10 (47).
13. Оборина В. А. Проблемы и риски внедрения информационно-коммуникационных технологий как средства автоматизации системы управления предприятием [Электронный ресурс] / В. А. Оборина // Современные концепции техники и технологии: проблемы, состояние и перспективы. URL: [https://interactive-plus.ru/ru/article/5693/discussion\\_platform](https://interactive-plus.ru/ru/article/5693/discussion_platform)

#### **Internet sources**

1. <http://www.e-kommunal.uz/ru/news/detail/9322/>
2. Создана современная биллинговая система для сферы ЖКХ [Electronic source] Access mode: <http://bars.group/press-center/news/billing/>
3. ЖКХ на грани коллапса: вся надежда на ИТ [Electronic source] Access mode: [http://www.balans-oil.ru/articles/71.html?SHOWALL\\_1=1](http://www.balans-oil.ru/articles/71.html?SHOWALL_1=1)
4. Информационные технологии в ЖКХ [Electronic source] Access mode: [http://www.smib.ru/index.php?option=com\\_content&view=article&id=165:2013-02-15-05-31-27&catid=37:2013-02-26-12-01-31&Itemid=85](http://www.smib.ru/index.php?option=com_content&view=article&id=165:2013-02-15-05-31-27&catid=37:2013-02-26-12-01-31&Itemid=85)

5. Взаимодействие государственной власти и организаций ЖКХ на основе современных информационных технологий [Electronic source] Access mode: [http://old.ci.ru/inform08\\_07/ckr\\_2.htm](http://old.ci.ru/inform08_07/ckr_2.htm)
6. CRM для ЖКХ – выход на новый уровень обслуживания клиентов [Electronic source] Access mode: [www.tadviser.ru/index.php/Статьи:CRM для ЖКХ – выход на новый уровень обслуживания клиентов](http://www.tadviser.ru/index.php/Статьи:CRM_для_ЖКХ_–_выход_на_новый_уровень_обслуживания_клиентов)
7. <http://web-kolibri.ru/portfolio/servis-onlain-platezhei-dlia-upravliaiushchih-kompanii-zhkhcrm>
8. CRM в ЖКХ – уникальность процессов, уникальность системы [Electronic source] Access mode: [https://korusconsulting.ru/netcat/require/e404.php?REQUEST\\_URI=press-center/publications/crm-korus-uniservis.html](https://korusconsulting.ru/netcat/require/e404.php?REQUEST_URI=press-center/publications/crm-korus-uniservis.html)
9. CRM-системы для ЖКХ – это выход на новый уровень обслуживания клиентов [Electronic source] Access mode: <http://websekretar.chizh.ua/?p=719>
10. Как повысить эффективность деятельности коммунальных служб? [Electronic source] Access mode: <http://www.lgsp.uz/ru/node/109>
11. Проекты внедрения ПТК «Радей» [Electronic source] Access mode: <http://www.radey.ru/html/radey-projects-print.htm>
12. Обсуждены вопросы внедрения в ташкенте системы коммунального биллинга [Electronic source] Access mode: [http://www.norma.uz/nashi\\_obzori/obsujdeny\\_voprosy\\_vnedreniya\\_sistemy\\_billinga\\_v\\_kommunalnoy\\_sfere](http://www.norma.uz/nashi_obzori/obsujdeny_voprosy_vnedreniya_sistemy_billinga_v_kommunalnoy_sfere)
13. Биллинговые системы ЖКХ [Electronic source] Access mode: [http://www.exppay.tj/full\\_bank.php?id=3](http://www.exppay.tj/full_bank.php?id=3)
14. Коммунальные службы автоматизируют услуги [Electronic source] Access mode: [http://ccitt.uz/ru/press\\_center/news\\_ict/230/?sphrase\\_id=561863](http://ccitt.uz/ru/press_center/news_ict/230/?sphrase_id=561863)
15. Проблемы и риски внедрения информационно-коммуникационных технологий как средства автоматизации системы управления предприятием

[Electronic source] Access mode: [https://interactive-plus.ru/ru/article/5693/discussion\\_platform](https://interactive-plus.ru/ru/article/5693/discussion_platform)

16. Риски при внедрении системы автоматизации [Electronic source] Access mode: [http://www.itas.emd.ru/maen/secret\\_2.php](http://www.itas.emd.ru/maen/secret_2.php)

17. Управление рисками в проектах внедрения информационных систем управления предприятием [Electronic source] Access mode: [http://www.topsbi.ru/about-the-company/press-centr/publikacii/upravlenie\\_riskami\\_v\\_proektah\\_vnedreniya\\_informacionnyh\\_sistem\\_upravleniya\\_predpriyatiem/](http://www.topsbi.ru/about-the-company/press-centr/publikacii/upravlenie_riskami_v_proektah_vnedreniya_informacionnyh_sistem_upravleniya_predpriyatiem/)

18. Информационные технологии управления жилищно-коммунальной сферой [Electronic source] Access mode: <http://bibliofond.ru/download.aspx?id=486359>

19. Методы определения экономического эффекта от ИТ-проекта [Electronic source] Access mode: [https://iteam.ru/publications/it/section\\_53/article\\_2905](https://iteam.ru/publications/it/section_53/article_2905)

**APPENDIX**  
**QUESTIONNAIRE**

*After the completion of the questionnaire please return it to the person who gave it to you.*

**1. What kind of accommodation do you live? (Please, tick the appropriate box)**

House  Multi-storey apartment

**2. How many people live in your house?**

1-3  4-6  6-8  more than 8

**3. How many people are registered in your house?**

1-3  4-6  6-8  more than 8

**4. How many people work in your family?**

1-3  4-6  6-8  more than 8

**5. How much is the monthly revenue of your family?**

0,5-1,5 mln sum  1,5-2,5 mln sum

2,5-3,5 mln sum  more than 3,5 mln sum

**6. What is the proportion of monthly payments for communal services with respect to the monthl revenue of your family?**

0-10%  10-20%  20-30%

30-40%  40-50%  more than 50%

**7. Are you satisfied with the provision of communal services?**

Satisfied  Dissatisfied

**8. Indicate the way you pay for communal services.**

Online payment systems (e.g.Click, PayMe, Mbank, UPay)

Paynet

Bank

JSC "Uzbekiston Pochtasi"

**9. Which of the below do you have in your house? (Please, tick the appropriate box(es))**

Washing machine

Garden or vegetable garden

Automobile

Swimming pool

Cattle

Poultry

**10. For what purpose and what timee do you use much water on weekdays/weekends?**

WEEKDAYS		WEEKENDS	
Timee	Purpose	Timee	Purpose
6:00-12:00 <input type="checkbox"/>	Washing dishes <input type="checkbox"/>	6:00-12:00 <input type="checkbox"/>	Washing dishes <input type="checkbox"/>
12:00-18:00 <input type="checkbox"/>	Wet cleaning <input type="checkbox"/>	12:00-18:00 <input type="checkbox"/>	Wet cleaning <input type="checkbox"/>
18:00-00:00 <input type="checkbox"/>	Washing clothes <input type="checkbox"/>	18:00-00:00 <input type="checkbox"/>	Washing clothes <input type="checkbox"/>
00:00-6:00 <input type="checkbox"/>	Watering pavements <input type="checkbox"/>	00:00-6:00 <input type="checkbox"/>	Watering pavements <input type="checkbox"/>
	Garden/vegetable garden irrigation <input type="checkbox"/>		Garden/vegetable garden irrigation <input type="checkbox"/>
	Washing automobile <input type="checkbox"/>		Washing automobile <input type="checkbox"/>
	Filling swimming pool <input type="checkbox"/>		Filling swimming pool <input type="checkbox"/>
	For cattle <input type="checkbox"/>		For cattle <input type="checkbox"/>
	For poultry <input type="checkbox"/>		For poultry <input type="checkbox"/>

*All the information prvided will be held under strict confidentiality!*

*The answers are used only for academic purposes.*

*Thank you for your timee and contribution!*

## САВОЛНОМА

*Ушбу саволномани тўлдирганингиздан сўнг уни сизга берган инсонга қайтаришингизни сўраймиз.*

**1. Қайси турдаги уйда яшайсиз? (Илтимос, тегишли квадратли белгиланг)**

Ховли  Кўп қаватли уй

**2. Хонадонингизда истиқомат қилувчилар сонини белгиланг.**

1-3  4-6  6-8  8 кишидан ортиқ

**3. Хонадонингизда рўйхатдан ўтганлар сонини белгиланг.**

1-3  4-6  6-8  8 кишидан ортиқ

**4. Оилангизда неча киши ишлайди?**

1-3  4-6  6-8  8 кишидан ортиқ

**5. Оилангизнинг умумий ойлик даромадини белгиланг.**

0,5-1,5 млн сўм  1,5-2,5 млн сўм

2,5-3,5 млн сўм  3,5 млн сўмдан ортиқ

**6. Ойлик коммунал тўловлар оилангизнинг умумий ойлик даромадининг неча фоизини ташкил этади?**

0-10%  10-20%  20-30%

30-40%  40-50%  50% дан ортиқ

**7. Коммунал хизматлар таъминоти сизни қониқтирадими?**

Кониқтиради  Кониқтирмайди

**8. Коммунал тўловларни қай йўл орқали амалга оширасиз?**

Онлайн тўлов тизимлари (масалан, Click, PayMe, Mbank, UPay)

Paynet

Банк

"Ўзбекистон почтаси" филиаллари орқали

**9. Қуйидагилардан хонадонингизда мавжудларини белгиланг.**

Кир ювадиган машина

Томорқа ёки боғ

Автомобил: 1та  2та  2тадан ортиқ

Ҳовуз (бассейн)

Мол-ҳол

Парранда

**10. Иш/Дам олиш кунлари сувни куннинг қайси вақт оралиғида ва қандай мақсадда кўпроқ сарфлайсиз?**

ИШ КУНЛАРИ		ДАМ ОЛИШ КУНЛАРИ	
Вақт оралиғи	Мақсад	Вақт оралиғи	Мақсад
6:00-12:00 <input type="checkbox"/>	Идиш-товоқ ювиш <input type="checkbox"/>	6:00-12:00 <input type="checkbox"/>	Идиш-товоқ ювиш <input type="checkbox"/>
12:00-18:00 <input type="checkbox"/>	Уйни тозалаш <input type="checkbox"/>	12:00-18:00 <input type="checkbox"/>	Уйни тозалаш <input type="checkbox"/>
18:00-00:00 <input type="checkbox"/>	Кир ювиш <input type="checkbox"/>	18:00-00:00 <input type="checkbox"/>	Кир ювиш <input type="checkbox"/>
00:00-6:00 <input type="checkbox"/>	Кўча-ҳовлига сув сепиш <input type="checkbox"/>	00:00-6:00 <input type="checkbox"/>	Кўча-ҳовлига сув сепиш <input type="checkbox"/>
	Томорқани суғориш <input type="checkbox"/>		Томорқани суғориш <input type="checkbox"/>
	Автомашинани ювиш <input type="checkbox"/>		Автомашинани ювиш <input type="checkbox"/>
	Ҳовуз (бассейн)ни тўлдириш <input type="checkbox"/>		Ҳовуз (бассейн)ни тўлдириш <input type="checkbox"/>
	Мол-ҳол учун <input type="checkbox"/>		Мол-ҳол учун <input type="checkbox"/>
	Паррандалар учун <input type="checkbox"/>		Паррандалар учун <input type="checkbox"/>

*Тақдим этилган барча маълумотлар махфий сақланади!*

*Жавоблар фақат илмий мақсадлар учун қўлланилади.*

*Ажратган вақтингиз ва ҳиссангиз учун миннатдорман!*