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Methods of modeling the regulation of housing and communal payments

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Housing and communal services in the economy of the Republic of Uzbekistan are one of the important factors in ensuring the normal living conditions of citizens. Today, the implementation of housing reform, the provision of services to the population and the material needs of the industry are aimed at determining the demand for modern information technology. The readiness of the industry for transformations is determined by the mass privatization of the housing stock and the establishment of non-governmental organizations for the repair and construction of housing.

For housing and communal services, there is a limited amount of time to process large amounts of data and corrupt documents with huge amounts of data. In addition, the data is constantly updated as the composition of the population, classes, legislation, preferences, types of services, prices, tariffs and calculation algorithms are constantly changing. Management structures in this area are also changing. Therefore, the need to automate housing and communal services has long been a topical issue.

The creation of modern information systems for housing and communal services, automation and implementation of settlements is a more complex and laborious process, which ultimately leads not only to the calculation and collection of utility bills, but also to a new level of quality management of housing and communal services. the need is being met.

It is necessary to solve completely transformed organizational, technological and technical problems in order to solve the problem of creating a system of payment of payments, especially for housing and communal services. The basis for solving such problems is a modern automated information system for the new generation, which should become an information infrastructure that unites all participants in the process of calculation and registration of utility bills.

To date, a third-generation billing system has been developed and proven to be effective in addressing the complex problems of housing and communal services and mobile adaptation to the work of process participants.

This article proposes an information model that allows the design of payment systems of varying complexity, taking into account the expanded order of performance of housing and communal services. It is proposed to combine the technology of creating an information base for payment systems in housing and communal services with banking information systems. Methods of designing the system were analyzed in the new application of accounting systems in housing and communal services in Uzbekistan, information management functions and subsequent modeling of modifications in the system of prepayments.

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Specialists in the design of computer systems have proposed approaches to address the problems of adapting and transforming them to the conditions of home and household services, which are constantly being repaired.

The aim of the work – is to create a comprehensive information model for the payment system designed to address the problems of managing and planning financial flows in housing and communal services, as well as the components of programs based on them.

Research **methods** are based on the use of CASE (Computer Aided Software Engineering), relational theory of databases (MB), data storage technology, and object-oriented software. The basis of the system creation project is based on the principle of complex automation of commercial operations of enterprises and institutions of the housing and public sector using modern means of communication, computer technology, methodology and software.

The automated information system for calculating utility bills is designed to solve the following tasks:

- accounting for the composition and condition of the housing stock;
- service provider accounting, service accounting, benefits for various suppliers;
- registration of residents, maintenance of financial and personal accounts, collection of income data and accounting of subsidies provided;
- registration of service consumers (subscribers);
- calculation of payments for services;
- acceptance of all types of payments;
-exchange of information on payments and fees between suppliers and payment receiving agents, etc. The information flows of the system are shown in Figure 1.

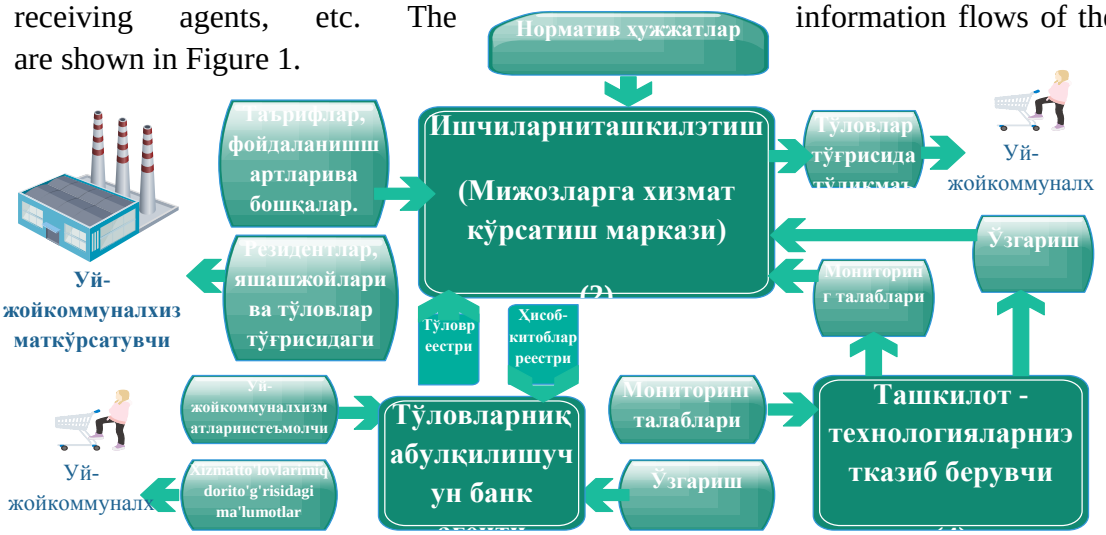

Figure 1. Automated information system for calculating utility payments

The basic requirements for the system can be formulated as follows.

Maximum correction options. Given the dynamics of the internal situation in the country, the possibility of adapting the system when the legal framework and conditions for the management of benefits, subsidies, tariffs and methods of calculation are constantly changing.

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Functionality options. Distinguish access rights for different groups of users from the system, automatically calculate preferences and take into account preferences, work with individual and group metering devices.

The principle of modular construction. This feature allows the system to be adapted to different businesses and operating conditions. In addition, the modular principle expands and enhances the functionality of the system.

Analysis of foreign and domestic business has shown that the task of building payment systems is unique, given the specific conditions of the organization of housing and communal services and, in particular, the reform of its market base.

The current state of payment systems in housing and communal services highlights a number of problems:

1. Analytical methods are complex, multi-step processes for analyzing multidimensional data. Existing software systems are not capable of alienation, i.e. the use of existing software tools and technologies in the creation of payment systems is not possible without the participation of developers.

2. Since the housing and communal services sector are in the process of ongoing reforms and the reform procedure has not yet been explained in details, information management tasks were first analyzed for initial measures, followed by modeling opportunities for the building and Reconstruction of payment systems based on changes in legislation and industrial management methods.

3.Existing payment systems do not have a mechanism to adapt to changes in management procedures and require labor-intensive reprogramming.

In the process of developing an automated payment system, a number of general principles have been developed, the most important of which are the principles of consistency, development (transparency), scalability, compliance, standardization and efficiency.

Features of the Automated Payment System (ATT) include:

1. The use of a three-tier client and server architecture as the core architecture of a hardware-software complex based on transaction controllers and database server technology allows to separate the ATT functions responsible for storing data from the logic used for data processing and the user interface.

This separation in system development implies the possibility of gradually increasing the productivity of a set of hardware as needed, simplifying system development and maintenance, and enabling effective data protection.

2. Use of replication technology for data exchange (offline mode) between separate geographically distributed system components. The use of this technology ensures the rapid exchange and management of the information structure required for the operation of payment receiving centers and information-consuming organizations. However, data exchange can be done through all possible digital data channels.

3. Provide access to a single database based on Internet technologies that provide effective and secure communication with the required information.

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ATT automates the information activities of organizations in performing the following tasks:

-taking into account the composition and condition of the housing stock; Resident registration and resident account;

-registration and registration of passports and categories of citizens; Entering information on the income of citizens;

-calculation of information and compensation (benefits) provided to residents; Registration and accounting of service consumers (subscribers);

-accountability of service organizations (tariffs, schemes, accounts, etc.);

-taking into account benefits (deductions) when paying for services; Payment calculation and accounting;

-recalculation of payments for services;

-calculation and recalculation of errors;

-calculation and recalculation of compensation (benefits);

-accept payment for services;

-preparation of reports on the status of the housing stock and utility payments in a certain form;

-exchange of information on payments and bills, accommodation and residents between service providers and payment agents; export the information required in financial accounting.

Advantages of ATT technology:

-single database;

-full access to objects and functions (electronic desktop support);

-modular structure of the system (configuration and scale); highly reliable flexible mechanisms for the preparation of algorithms, references and other system parameters;

-development of a reporting mechanism;

-modern technological basis.

The essence of the study is to determine the relationship between the data processed during the operation of the utility payment system. The definition is structured using only hierarchical formulas that indicate the relevance of the data.Include them in attributes and databases. Everything else, including the tour, remains outside the selected level of abstraction. The process according to the international standard will be considered separately in accordance with the changes that will occur in the process of developing software for automated payment systems for housing and communal services.

$K_{payment} = (address\ (snp\ (description1))) = (n\ (f\ (u_1, u_2, \ldots, u_m)))$,

Where $\{u_1, u_2, ..., u_m\}$ is a description of the registered citizen;

M - is the maximum number of described properties;

f - surname, name, patronymic of the tenant;

n - is the tenant's address.

Based on the above, we define the housing volume as s and the population as H_s to calculate the housing utility.

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$$c = f_1(s)+f_2(H_c),$$

where $f_1$and $f_2$are related factors. In order to calculate housing utilities in the description-different options, it takes the following view, taking into account the factors influencing it.

$$c = f_1 (x_1) + f_2 (x_2) + \dots + f_n (x_n),$$

where $x_1, x_2, \dots, x_n$ are the parameters on which the price of housing services depends, for example:

$x_1 = s$ - living space;

$x_2 = H_s$ - number of residents;

n - is the number of parameters affecting the calculation of the characteristics;

fn - is a function that describes the dependence of the xn parameter effect on cost

In general, the Ktulov structure can be expressed as follows:

$$K_{payment} = (number\ (description)) = (н\ (x_1, \dots, x_n)),$$

where $\{x_1, \dots, x_n\}$ is the set of parameters that affect the cost of housing services.

Thus, it is possible to review a limited number of parameters and create software on a modular basis,

where $f_n\ (x_n)$ is a program that calculates the values of the prices of housing services from the parameter x_n.

Requisites (Description 2) $K_{payment}$ describes many parameters that do not affect the cost of housing services, for example:

z_1 (description 2) $K_{payment}$ - order number for accommodation;

z_2 (description 2) $K_{payment}$- date of ordering the apartment;

z_3 (description 2) $K_{payment}$ - contract number for housing maintenance;

z_t (description2) $K_{payment}$ is a parameter that does not affect the cost of housing services, but is important in the formation of exit documents, when applying to the client (tenant) in t time, issuing all types of certificates, writing accounting records, communicating with others.

In general, the structure can be expressed as follows. I - is the type of service, ci - is the standard estimated value of the service, q - is the number of installed services.

$$K_{payment} = (number\ (description)\ (description\ 2)\ (snp\ (description\ 1))\ (name\_payment)) = (н\ (x_1, \dots, x_n)\ (z_1, \dots, z_t)\ (f\ (y_1, \dots, y_m))\ (s_1, \dots, s_q)),$$

where $\{x_1, \dots, x_n\}$ is the set of parameters that affect the calculation of housing services;

$\{z_1, \dots, z_t\}$ - a set of housing parameters that do not affect the cost of housing services;

f - full surname and number of the tenant;

$\{y_1, \dots, y_m\}$ is a set of parameters of the tenant properties from the subsystem in the passport table.

In practice, the calculation of benefits and adjustment of rent and consumption of other services arecarried out once a month on the basis of applications from residents,

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confirmed by a certificate from the relevant authorities, which are taken into account in the calculation of benefits.The list of benefits and the amounts for them are determined by the relevant state or municipal authorities in accordance with the legislation on benefits. The amount that covers the benefits is provided to the service provider, as a rule, through the budgets of local (sometimes state) governments.

Let $\{l_1, ..., l_r\}$ be a set of types of benefits accepted by state or municipal authorities, then f (l_i, c_j) is a set of function values describing the effect of the i-th profit on the price of the relevant service $\{c_l,\ldots, c_q\}$.

$$s_л = f_1(л_1, c_1)+f_2(л_2, c_1)+ \ldots f_p(л_p, c_1)+f_1(л_1, c_2)+\ldots f_p(л_p, c_q)$$

- is the sum of all types of benefits and compensations (benefits) paid for all types of services. As a rule, benefits are given to residents who have them. In this case, the amount of compensation for each consumer living in this apartment is: