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Information support for solving functional issues of automated management of corporate information exchange (on the field of tax authorities)

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Abctract - The article studies the issues of information support for solving functional issues of automated management of corporate information exchange (on the example of tax authorities), the design of its control structure and its use in the management system. The importance of using the accumulated experience to support decision-making in the organizational management system is emphasized. In addition, relevant recommendations are developed for the implementation of intelligent support for decision-making in integrated management systems, as well as service technologies.

Keywords - Information support, automated management, information exchange, design of organizational management systems, decision support systems, content analysis, problem-oriented thesaurus, process ontologies.

I. INTRODUCTION

For the efficient operation of information exchange in the automated information management system, information about the state of the managed object, the external environment and the received control effects must be correctly presented. The operation of the Unified Computer System (UCS) for Data Processing in Tax Authorities requires conditions such as the optimal volume of information coming from various control units, the distribution of information flows by time and area. This, in turn, means that information support must be built efficiently. The main tasks of the Unified Computer System for Data Processing in Tax Authorities (UCS) information support are to collect, control, modify, store, update, distribute and transfer information from sources to its consumers. The information support structure diagram is developed to determine the composition of the database elements of corporate management modules, that is, the unified computer system for data processing in tax authorities (MICT), to establish their interconnections in order to ensure the effective construction of information and computational processes, to select directions that provide the interaction of components within the corporate management modules with appropriate information, and to effectively organize the process of designing the information support of corporate management modules.

The MITC information support diagram is presented in Figure 1. The information support database is designed based on the relational model[1,2,3,4]. The process of designing the unified database of the MITC information support based on the relational model was carried out using the SQL Developer data modeling program. Its result is shown in Figure 2.

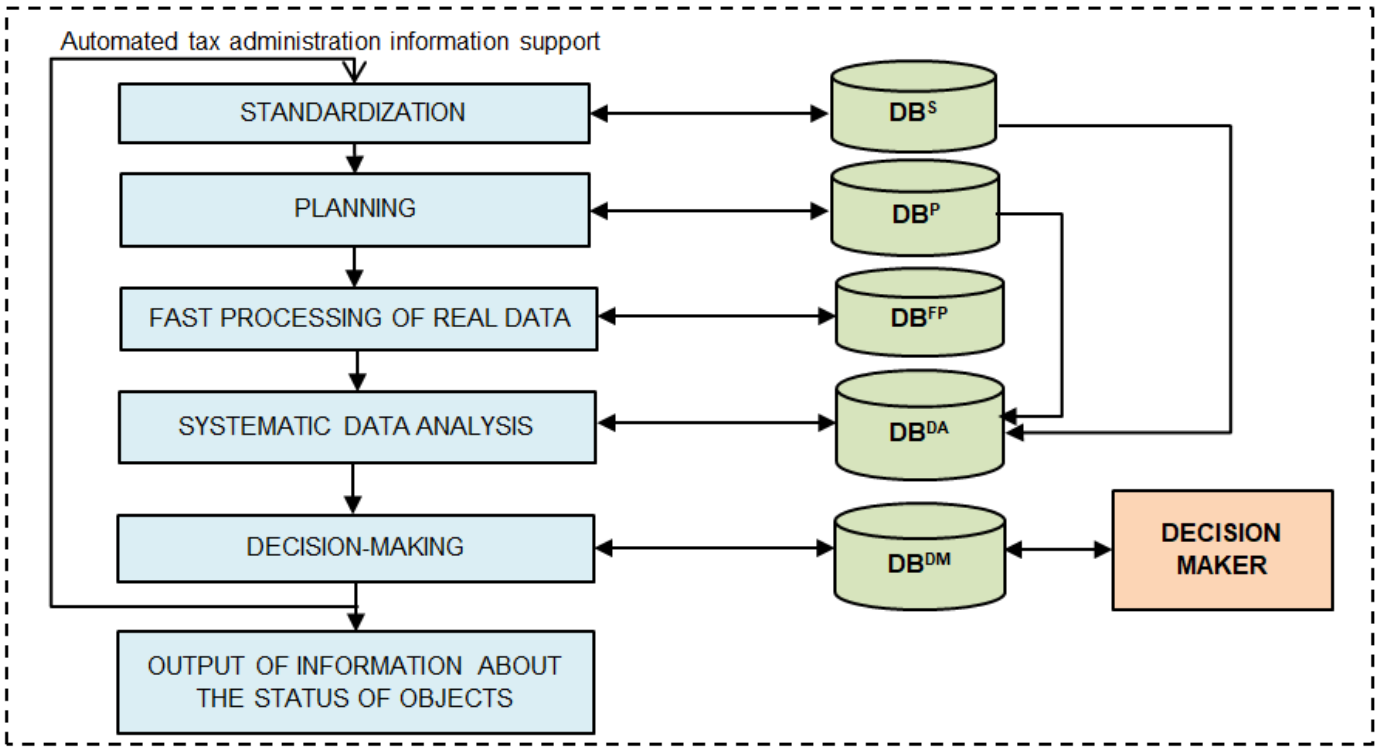


Fig. 1. Unified Computer System for Data Processing (UCS) information support diagram

The input data for building the information support structure of a unified computer system for data processing are (1) a generalized information model of the functioning of the processes of corporate management modules, (2) a diagram of the informational interconnection of the processes of the information system of different levels of management, (3) information on the development directions of the information systems of the small part included in the corporate management modules, (4) the structure of technical devices, and (5) information on the programs specific to the mobile technical means of information support of the corporate management modules. In general, the information model of the corporate management modules has the following form[6]:

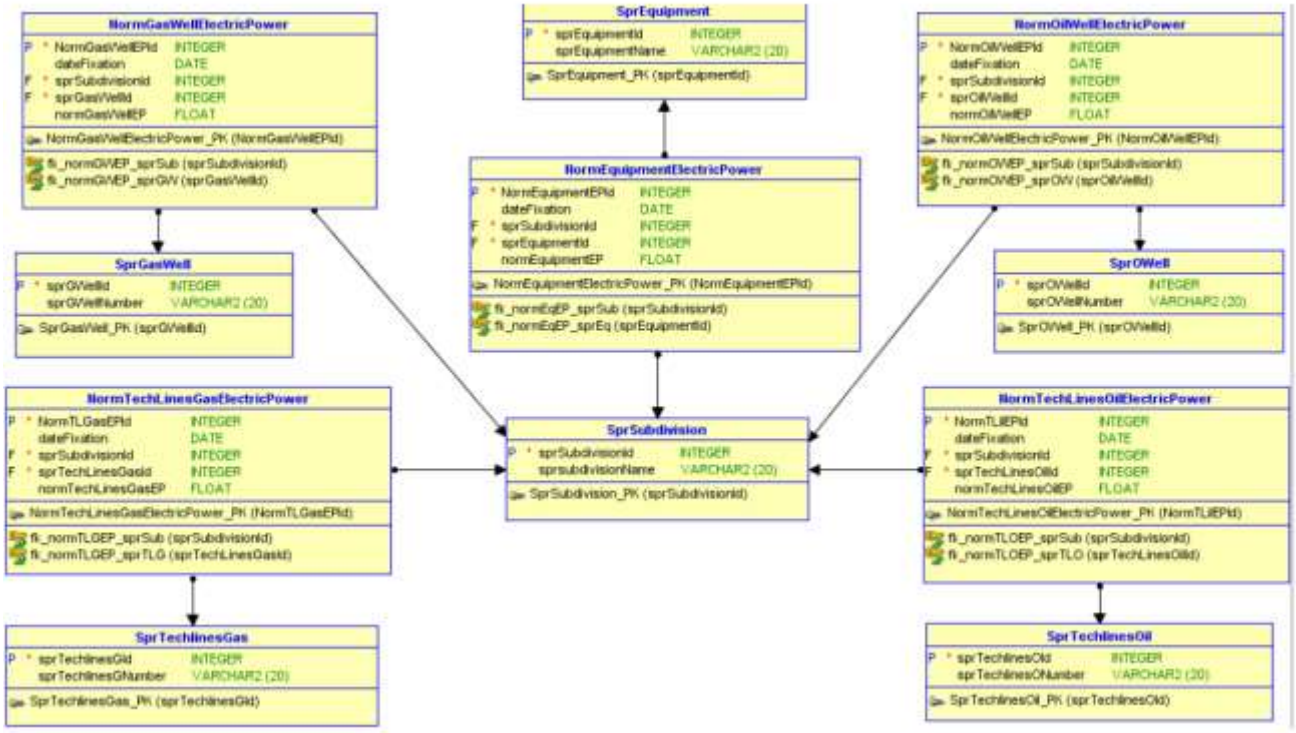


Figure 2. The essence of the communication diagram of the process of designing a unified information support database based on the relational model

$$AM = \{K, P, L, T, Z\},$$

where $K = \{K_i\}, i = \overline{1,k}\,, k > 0$ – set of possible structure components (the structure components in the MIYaKT information support are each process of energy management); $P\,P = \{P_\mu\}, \mu = \overline{1,p}\,, p > 0$ –set of possible operations applied to the structure components and their types; $L = \{L_\tau\}, \tau = \overline{1,l}\,, l \geq 0$ – set of possible integrity constraints applied to the structure components and their types; $T = \{T_{ij}\}, i = \overline{1,k}\,, j = \overline{1,t_i}, t_i \geq 0$ –set of types of all structure components; $Z = \{Z_{ijv}\}, i = \overline{1,k}, j = 1, t_i, v = 1, z_{ij}, z_{ij} \geq 0$ –a set of samples of all types of structural components.

In the MIYaKT information model, we distinguish the data model $D = \{K, P, L\}$ and the structure $S = \{K, T\}$. The set T is called the data graph[12].

The information model of corporate management modules must satisfy the following conditions:

1. The tools of the model, that is, all objects, subjects and events used to solve the functional problems of corporate management modules, as well as all relationships between them, must be described;

2. All constraints on ensuring the integrity of the information available in corporate management modules with the help of model tools must be described;

3. Modeling tools should provide all the explicit characteristics of the data needed to

design the external, logical, and physical schemas of the database;

4. The logical, external and physical data model used in database management systems should have a method and methodology that describes the general description of energy management.

Despite the variety of existing data models, it is almost impossible to create an information model to describe the objects of corporate management modules that would satisfy all the above conditions. Therefore, in this research work, the IDEF1X methodology was used to build an energy management information model[7-11].

The IDEF1X methodology is a method for creating a relational database and uses a specially developed conditional syntax for convenient construction of a conceptual scheme. The main advantage of the IDEF1X method compared to many methods used in the development of relational databases is its modeling based on a strict and rigid standard. Using the IDEF1X method, the processes of building an information communication model of corporate management modules can be represented as follows:

$$K = \{A, F, NR, \Theta, N\Theta\},$$

where $= \{A_i\} i = \overline{1, a} -$ a set of attributes; $F = \{F_j\}, j = \overline{1, f}, F_j = C_j \rightarrow A_k, C_j \subset A_k, A_k \in A$ –a set of functional relationships between attributes; $NR = \{NR_\rho\}, \rho = \overline{1, t}, NR_\rho \subset A$ –a set of non-functional relationships between attributes; $\Theta = \{\Theta^v\}, v = \overline{1, m}, \Theta^v = \{I^v, B^v, E^v\} -$ a set of object types, where $I^v \subset A$ – is the primary key, $B^v \subset A -$ mandatory attributes, $E^v \subset A -$ possible attributes; $\Theta = \{N\Theta_\rho\}\, \rho = \overline{1, q}, N\Theta_\rho \subset A -$ a set of relationships between object types.

The construction of an information communication model of all issues of corporate management modules using the IDEF1X method was carried out using the "Design for Database" program[11]. As an example, the information communication model of the database for calculating the cost of gas and oil products using the "Design for Database" program based on the IDEF1X method is presented in Figures 3-4.

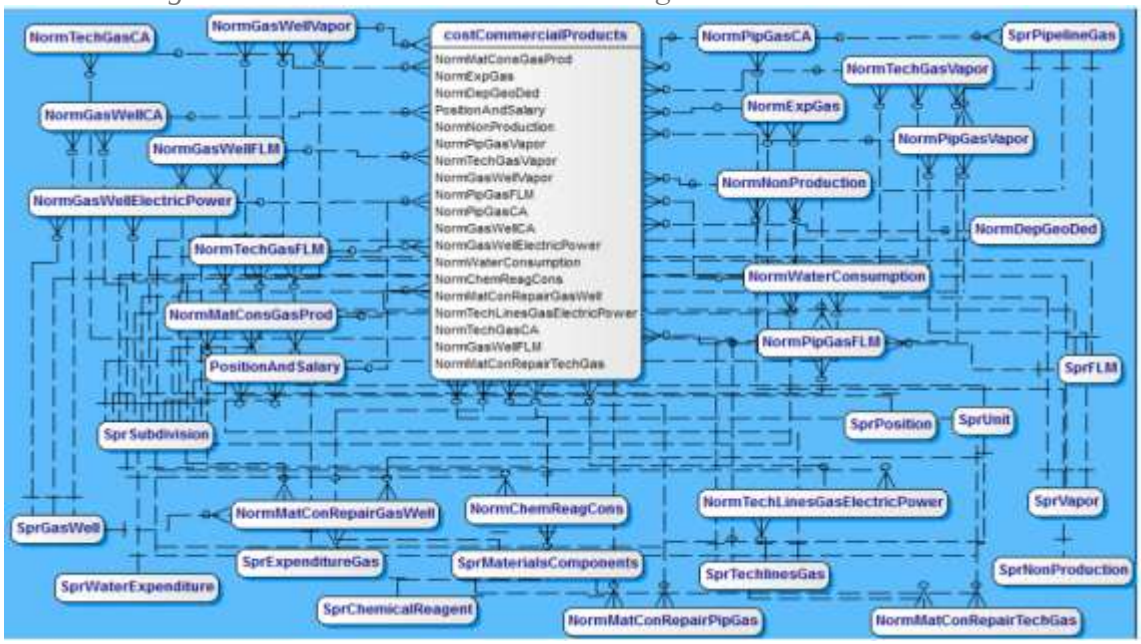


Figure 3. Information communication model of the database for calculating the cost of gas products using the IDEF1X method

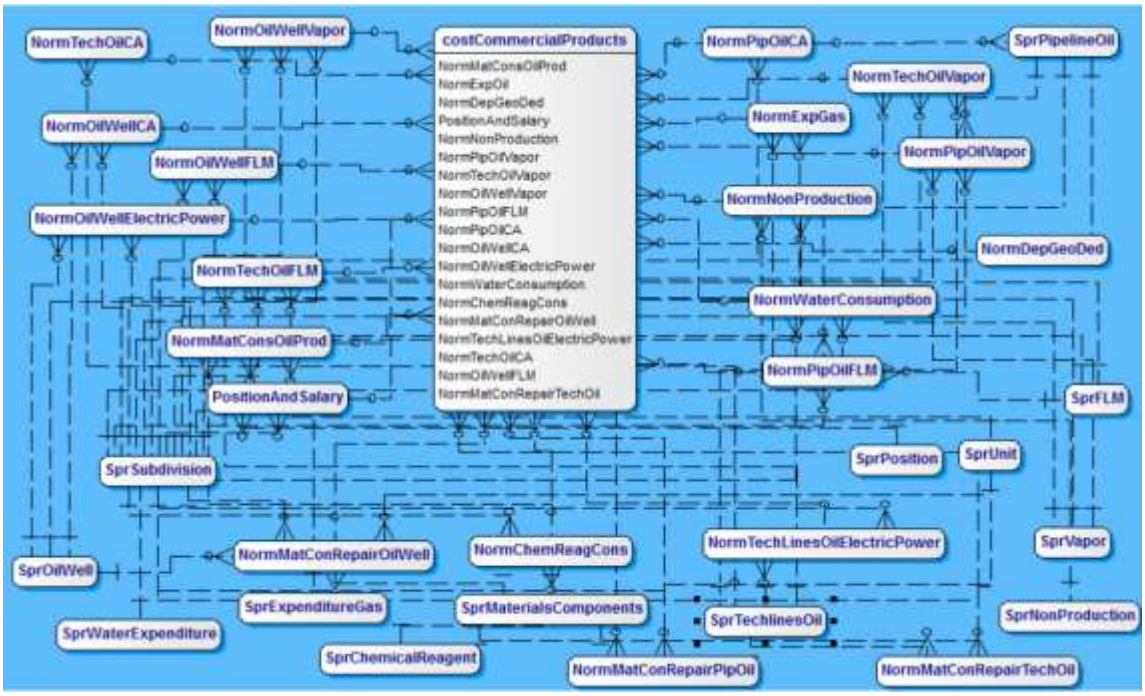


Figure 4. Information communication model of the database for calculating the cost of petroleum products using the IDEF1X method

Analytical results of the algorithm for determining the optimal solution to problems identified in management processes

In order to implement the Resolution of the President of the Republic of Uzbekistan "On measures to further improve the mechanisms for attracting foreign direct investment to the economy of the Republic", the issue of which production process to invest in and the dynamics of the expansion of the tax base of the enterprise "Shortanneftgaz" under the joint-stock company "Uzneftgazqazibchiqarish",

which is among the large taxpayers, was presented in the research work and was experimentally tested using a software tool for determining the optimal solution to the problems identified in the management system based on the models and algorithms used[15-17].

The purpose of solving the above problem is to implement monitoring in an automated mode, contribute to the growth of the coefficient of profitability in the MIYaKT environment, and invest in the economy. To achieve the goal, the following criteria were taken: (1) investment costs, (2) environmental or ecological impact, (3) operating costs, (4) productivity, (5) profitability, (6) time to profit from the investment, (7) satisfaction of demand and need with the produced product, and (8) employment of the population. The solutions considered were (1) processing, (2) extraction, (3) delivery, (4) exploration, and (5) repair of oil and gas products.

1. The goal, criteria, indicators, solutions, etc. necessary for solving the problem are described in a hierarchical form.

2. The matrices constructed for each level, the advantages of each element in the matrix over each other, the maximum value of the matrices, the compatibility index, and the relationship indices are determined (Figure 5).

Based on the results of the pilot test, the mining solution achieved a high result with an indicator of 0.424 in terms of contributing to the growth of the profitability coefficient and investment in the MIYaKT environment.

It can be seen that if the enterprise invests in mining within the terms provided on the basis of tax incentives, it will develop further and achieve its goals.

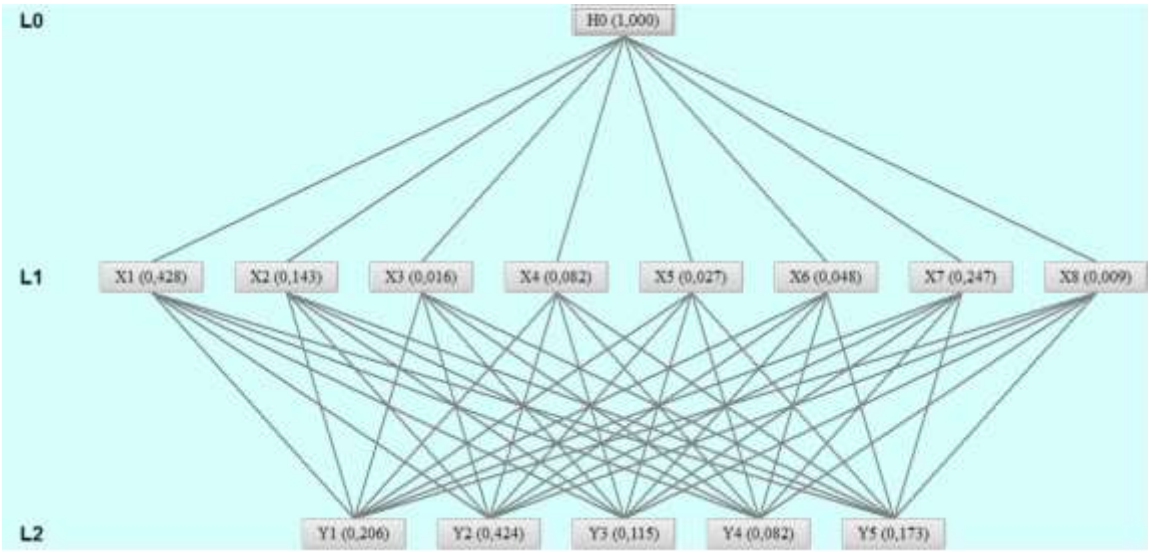


Figure 5. A diagram of goals, criteria, indicators, and solutions expressed in a hierarchical manner



Figure 6. Results of the algorithm for determining the optimal solution to problems identified in the control system using the hierarchical analysis method

The results of experimental studies showed that the algorithm for determining the optimal solution to the problems identified in the management system using the hierarchical analysis method was found to be the most effective. The proposed intellectual software, technologies created on the basis of a newly developed unique model and a special algorithm, is aimed at increasing the efficiency of information support. First of all, server devices that process data, software adequate to their database, ORACLE and MySQL database environments, and OPC technology (OLE for Process Control) for data collection are built.

CONCLUSION

Information support for solving functional issues of automated management of corporate information exchange As a result of our research on the analysis of the information flow of the automated management system of tax authorities, the following conclusions were formed:

– There are many databases in the management system, and there is a demand for software that provides integration between them;

– The increasing volume of data also requires the improvement of the system for processing them;

– the use of the latest network technologies in the use of network protocols has a positive effect on the stabilization process of information flows.

– we consider it effective to include modules for intellectual data analysis in the management system, in the process of processing large volumes of data (Big Data);

– it is necessary to organize the workflow using all the capabilities of the standards in the management system, and further improve corporate network programs;

– it is necessary to further intensify the information security policy in the management system, and also to organize the creation of the possibility of using some services without an electronic digital signature;

– we consider it appropriate to further expand the audience of users of the unified interactive services portal of tax authorities launched for individuals and legal entities and individual entrepreneurs, and further

modernize the mechanism for generating reports and making payments via the Internet;

– there is a need to develop a unified software for the head of the State Tax Inspectorate in the authorization network, integrate it with other information systems and software products, and serve to eliminate problems arising in the document management system.

Summarizing the above points, we can say that it is advisable to further modernize the level of integration of incoming and outgoing information flows into the database of the automated management system of tax authorities and make additions based on a new approach. There is a need to implement the approach taking into account the somewhat low level of intellectual management. This will have a positive impact on the level of automation in the tax system. As a result, there will be an opportunity to increase economic efficiency and reduce human factors[18-20].

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