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INTRODUCTION OF ADVANCED INFORMATION AND COMMUNICATION TECHNOLOGIES TO THE PROCESS OF COLLECTION OF PRIMARY STATISTICAL DATA

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ABSTRACT

In this article was reviewed introduction of advanced information and communication technologies to the process of collection of primary statistical data. The work on the formation of statistics of enterprises and organizations requires the analysis of existing databases, the development of methodological principles for the selection of types of business entities, the development of a system of indicators describing their activities and the improvement of traditional methods of network statistics. There are certain difficulties in the transition to the method of creating statistics of enterprises and organizations, and it leads to various consequences for statistical information systems during its operation.

Keywords: statistics, data, information technologies, economics, database, observation, development, methods, analysis, improvement.

INTRODUCTION

Modern methods and forms of accounting for the database of statistics, the formation of information resources and the widespread introduction of ICT in statistical activities can not be improved. To this end, it is necessary to develop software-technological and methodological tools for the development of information systems, which will provide:

- Obtaining economic information on enterprises of various forms of ownership and part of the network in a standard form;
- Formation and activation of the database of sample observations and coordination of programs of these observations;
- It is possible to create an integrated database of statistics and receive statistical data from various sources.

The main goal in the selection of this or that type of ICT for the statistics departments at the district level should be the criterion of minimizing the cost of operation of technical means in the conditions of maximum satisfaction of user requirements. A number of factors will need to be taken into account in determining the minimum cost of ICTs at the disposal of the district statistics department, namely the number of technological steps and the efficiency of these tools.

This topical issue can be solved by solving the following optimization model:

$$F = \sum_{k=1}^{K_n} \sum_{n=1}^{N} C_{kn} X_{kn} \rightarrow \min \qquad (1)$$

The following restrictions

$$\sum_{k=1}^{K_n} P_{kn} X_{kn} \geq U_n , \qquad (2)$$

X_{kn} – the whole end;

(3)

$X_{kn} \geq 0$, (4)

In where N – the number of stages of technological processes in the district statistics department;

K_n - n- the number of ICT types eligible for use in stages;

U_n - the maximum amount of data received by the district statistics department in n-stages per unit of time;

X_{kn} - n- the number of k-type ICTs required to complete the technological process stage;

P_{kn} - n- productivity of k-type ICTs used in the technological process;

C_{kn} - n- the cost of k-type ICTs used in the technological process.

The above limitation (2) indicates that the sum of the productivity of the technical means of each technological stage must be equal to or greater than the maximum amount of data coming to the district statistics department per unit of time.

(3) The constraint indicates that the number of technical means used at each stage is an integer. The next constraint (4) means that the number mentioned above is not negative. Thus, it would be expedient if the problems (1-4) become part of the whole programming problems and use ICT widely to solve them. Instead of a variable value, the number of ICTs used at each technological stage is used.

ANALYSIS AND RESULTS

The considered optimization model for determining the minimum cost of ICT used at the level of the district statistics department provides an opportunity to rationally use the new or spiritually obsolete used at each technological stage of collection and processing of statistical information.

The descriptions of technological processes of statistical information processing at different levels of the National Statistical Service (NSS) show that the main volume of information flows from the district level to the regional level and then from the regional to the republican level. In the current scheme of statistical information flows, this situation prevails.

Practice shows that there are also reverse information flows, which are directed from the republican level to the regional level. These information flows typically serve to form and activate the database. Economic descriptions of statistical work, generalized socio-economic indicators, packages of applications providing processing of statistical data will be sent to the district and regional levels.

In addition to vertical schemes of information flows, there is also a horizontal orientation of the data flow, which serves to provide generalized indicators to local authorities and other users. The scheme of flow and volume of statistical data in NSS is shown in Figure 1 below. In general, the volume of information flows is characterized by the volume of annual input information, which is the sum of the annual volume of input and output information at the district, regional and national levels, the objects of statistical observations in the state statistical system.

The results of the analysis of existing information flows of statistical data and their sources and

the number and location of users serve as the basis for decision-making on improving the technological processes of collection, processing and presentation of statistical information. It also provides an opportunity to modernize the existing hardware and software.

It should be noted that NSS were formed in the context of the management of the planned-administrative system, were intended only to provide statistical data to managers at different levels, and were aimed only at these consumers. Such monopolization eventually led to the system being closed and rigidly centralized, creating a corresponding data processing technology in the NSS.

There was a certain level of application of NSS software and technology in the conditions of centralized processing of information, based on the formation of the array in the local form. There were also objective problems in the formation and use of information resources, including the lack of a single fund of normative and reference information, violations of network standards for data processing, and others.

In addition, the limited and unreliable memory resources of personal computers, which are a major part of the computer technology fleet, and the low capacity of telecommunications facilities hindered the effective use of modern ICT functionality. The difficulties that arise at the NSS district level were primarily due to the limited financial resources available and the lack of highly qualified specialists. Unfortunately, some of the above-mentioned shortcomings still exist today, seriously hampering the process of effective use of new ICT at the district level of statistics, leaving the issue of further reform of statistical activities at the district level.

The basis of this system is a database, which in turn includes micro-data, macro-data and metadata. The national SIS architecture includes several functional systems, the most important of which is the collection, processing, retrieval and presentation of statistical information for users.

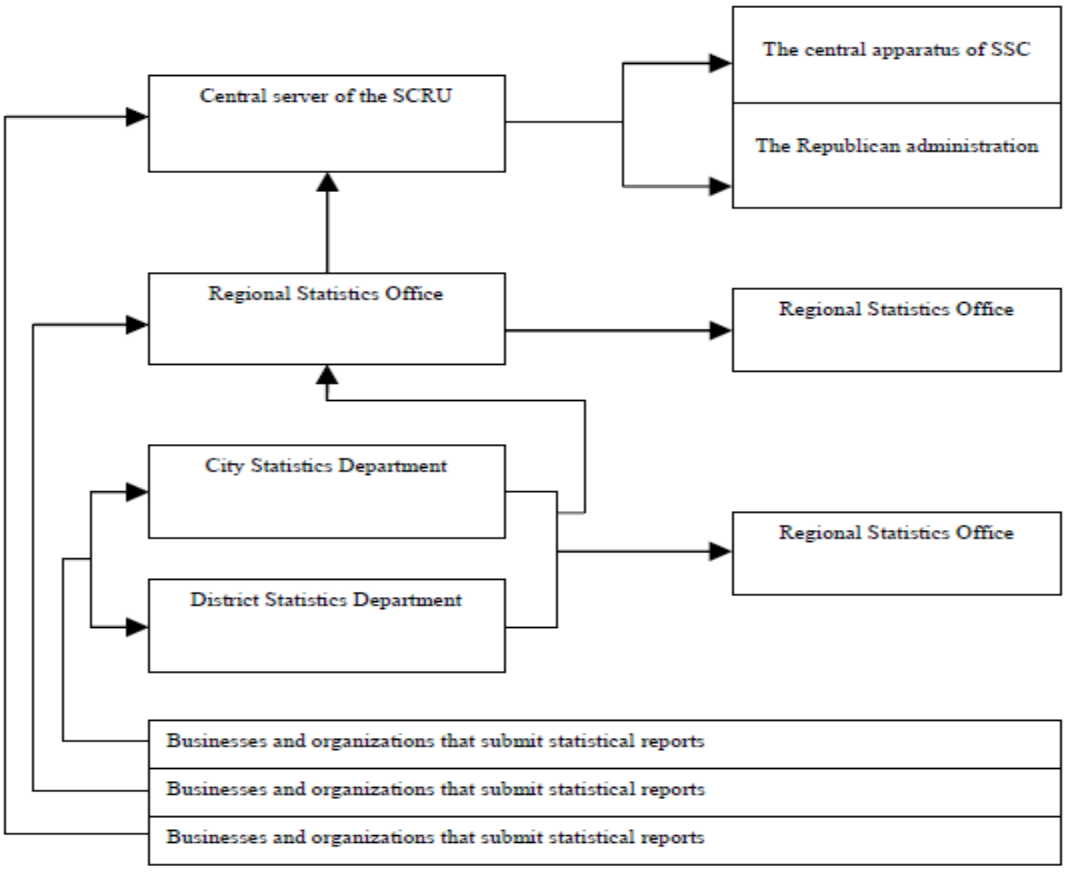

Figure 1. Diagram of statistical data flow in NSS

The obsolescence of 21 (87.5%) of the 24 server devices housed in the central office of the Committee may adversely affect the uninterrupted operation of the system and lead to data loss (Table 1). Therefore, practical work is underway to equip the State Statistics Committee with modern server devices that meet international standards and to introduce systems for early detection and elimination of information security threats (DLP, IDS / IPS).

Due to the low speed of the corporate communication network used in the system, it is difficult to exchange information between the central office of the Committee and the regional statistical bodies and receive timely statistical reports.

It is required to increase the speed of the corporate communication channel (VPN) network by introducing the use of fiber-optic communication channels in the exchange of information between the central office of the State Statistics Committee and regional statistical bodies.

Table 1.

Status of server equipment of the State Statistics Committee of the Republic of Uzbekistan

As a result of the work done in 2018, connected to the information exchange system of the

The name of server	The task	Company name	Model	CPU, RAM	HDD
GKS-CUCM	IP telephone server (Cisco 7835)	Cisco	7835H2	Xeon 2.33, 2 Gb	
HSERVER1	server Hyper-V, stores virtual servers for all information systems	Huawei	RH2288H V3	2 Intel Xeon CPU E5-2697 v3 2.60 GHz, 256 Gb	850 Gb+ 8Tb RAID6
HSERVER2	server Hyper-V, replication and virtual servers	Huawei	RH2288H V3	2 Intel Xeon CPU E5-2697 v3 2.60 GHz, 256 Gb	850 Gb+ 8Tb RAID6
HSERVER3	server Hyper-V, backup system	Huawei	RH2288H V2	Intel Xeon CPU E5-2603 v2 1.8 GHz, 16 Gb	280Gb+33,5Tb RAID6

International Monetary Fund, our main economic, financial and social indicators are reflected in the database of the fund, 422 types of data sets in 24 categories are published within the expanded system of data dissemination.

Today, quarterly statistical surveys are conducted in paper form to assess the volume of services provided to the population by about 10,000 individual entrepreneurs and more than 3,000 private motor vehicle owners. This leads to extra time and labor. Therefore, it is necessary to introduce observations using modern ICT (tablets). It is necessary to improve the existing "Procedure for the organization and conduct of selective surveillance of individuals serving the population" and "Procedure for the organization and conduct of selective surveillance of transportation activities of private vehicle owners." This saves time in data collection and further enhances data quality and transparency.

Over the years, the system has grown in size and does not meet the technical requirements of modern software. The system requires the introduction of software tools that work with databases such as Oracle, MS SQL Server to receive, store, process statistics, prepare analytical tables.

Monthly sample surveys of the prices of goods and services in farmers' markets were conducted in paper form and then entered into an electronic program. This has led to some errors in data entry, increased paper and time costs, and increased costs.

The study of prices for goods and services in farmers' markets was carried out step by step using special devices (tablets). As a result, it was possible to automate the processes involved in conducting observations, reduce the time required to enter paper and observation results into the software, and reduce some errors in data entry.

In general, the widespread introduction of advanced information and communication technologies in the stages of objective collection of primary information flows and the formation of performance indicators based on them will lay the groundwork for raising the quality of statistical activities.

The work on the formation of statistics of enterprises and organizations requires the analysis of existing databases, the development of methodological principles for the selection of types of business entities, the development of a system of indicators describing their activities and the improvement of traditional methods of network statistics. There are certain difficulties in the transition to the method of creating statistics of enterprises and organizations, and it leads to various consequences for statistical information systems during its operation. In the non-governmental sector of the national economy, the reduction of the time required to cover the rapidly growing number of economic entities is becoming a priority.

Our research shows that there are some shortcomings in the existing system of collection, processing, storage and transmission of statistical information, ie the approach to solving tasks individually, the presence of multiple manual operations in the stages of collection and control of statistical information, different machine algorithms in the same processing procedures application, dissatisfaction with the timing of obtaining the resulting information, etc.

Modern ICTs provide efficient organization of the processes of collection, processing, storage and dissemination of statistical data, based on which Figure 1 shows a generalized model of the National Statistical Information System (SIS).

The collected statistical data processing system forms the macro data. The system for searching and presenting statistical information, on the other hand, generates the resulting statistical data, which is targeted to specific categories of users. In countries with developed market economies, modern statistical information processing systems are characterized by a number of key trends, namely, the consumer requirements of users are becoming clearer, more understandable and diverse, namely:

- The emergence of modern ICT, which is cheap, powerful and convenient, for a wide range of users of statistical information;
- the emergence of new categories of users of statistical data, ie the emergence of the public, the media, firms, organizations, etc;
- Increased knowledge and skills of a number of users to use statistics.

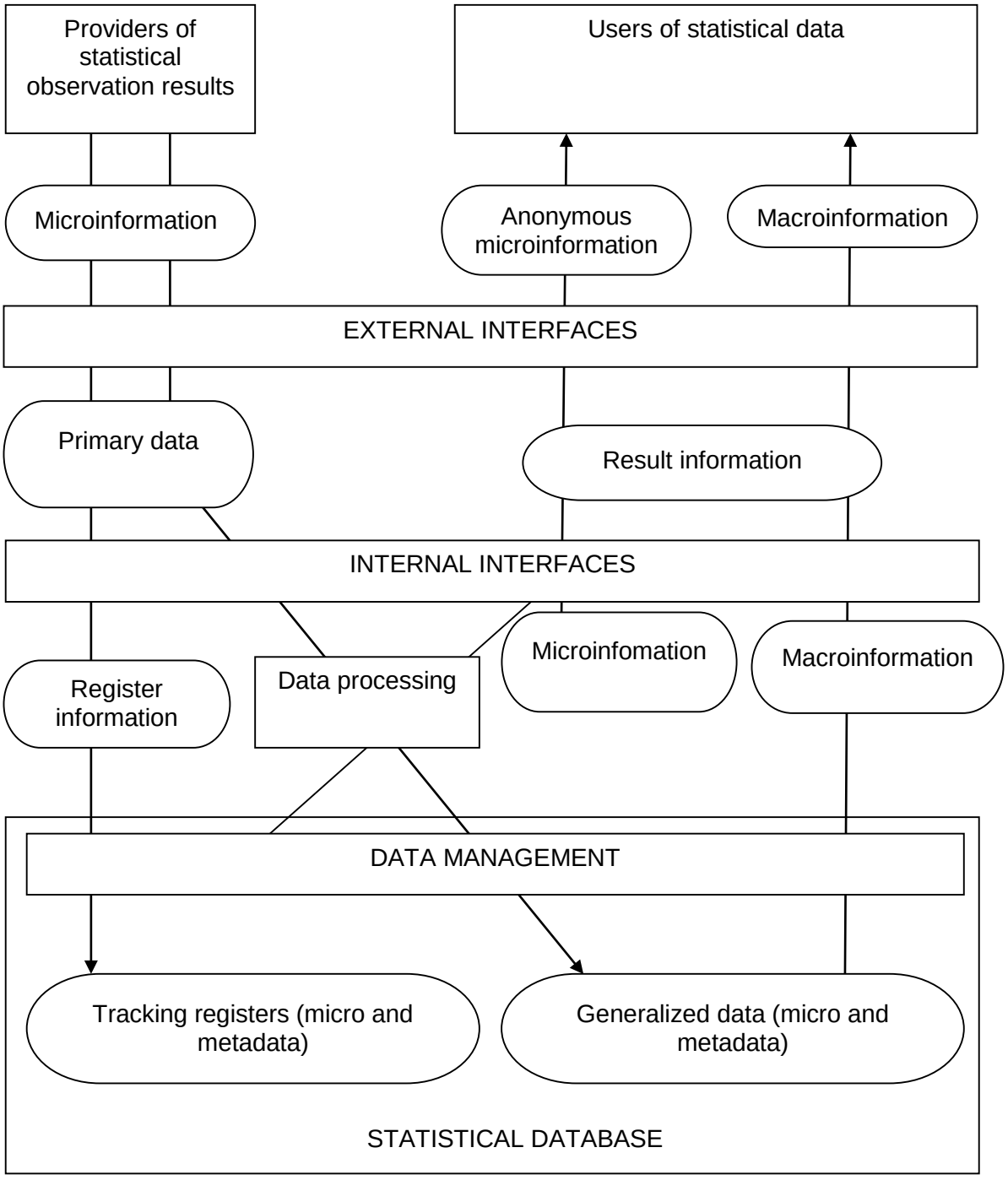

Figure 2. Generalized model of the national statistical information system.

The classification of technical, economic and social information plays a key role in the introduction of a systematic approach to the reform of the statistical information system, which is the core of the normative reference system and combines all stages of statistical observations into a single complex.

With the transition to the statistics of small businesses, it will be necessary to formulate rules for the clear separation of the unit of account, and to achieve its classification. In addition, the issue of determining the main type of activity of statistically monitored entities also needs to be clearly addressed. These two issues, which have a serious impact on the quality of statistical

information, plague not only our country, but also foreign experts. At the same time, the relevance and importance of these areas is explained by the ability to compare statistical, foreign trade, financial, tax, banking and other types of economic information, the collection and processing of which is carried out in a standard form in public administration.

In the process of developing the Republican Classification of Technical and Economic Information, there will be an opportunity for mutual integration of state information resources. This will allow analyzing the dynamics and state of development of the national economy, the development of social and demographic statistics, compiling statistical registers, maintaining registers in the tax system, registration and accounting of economic entities, solving the issues related to the formation of catalogs of their products.

The creation and maintenance of a system of socio-economic classifiers related to the types of economic activities of legal entities and individuals play an important role in the collection and analysis of information on social processes. The development of the monetary system and the development of financial accounts within the SCO requires the creation of classifiers for the financial, budgetary and banking sectors.

Solving the problems presented within the framework of the above system of classifiers leads to the optimization of their number, the consolidation of the composition of the structure, the simplification of the compatibility of the tables in them. The result is the creation of a coherent database of socio-economic information. From a methodological point of view, it is important to form a national classifier of technical and economic information through the introduction of new technologies and automation. systems must work.

Based on the above principles, statistical information systems should provide:

- Ensuring comprehensive automation of the process of collection, processing, storage and presentation of statistical information in the state statistical system at the district, regional and national levels;
- Formation and effective use of a single database of normative and reference information;
- Formation and use of electronic versions of state statistical observations and reports;
- Formation of a unified structure of software and technological means and their effective use in practice;
- Formation and use of information resources of the Committee on the basis of a single normative and reference information;
- Use of modern ICT functionality based on local information networks in the activities of statistical agencies.

Using the procedures for forming registers, micro-data are collected in accordance with the various objects of statistical observations. The statistical reporting processing procedure serves for the formation and generalization of macro data.

The basis for the effective operation of statistical information systems is an integrated database of statistical data, which includes micro, macro and metadata. The use of metadata makes the system self-informing, and micro and macro data are characterized by metadata. Generates data for specific user categories using statistical data search and final processing procedures.

Our research characterizes the modern processes of statistical information processing in the field of statistics in developed countries in the following areas:

- As a result of increasing literacy of a number of categories of users, the emergence of new techniques and categories of users, their demand is becoming more specific and diverse;
- There is a growing demand from users for the unification of data from national and international statistical information systems and others;
- The widespread use of the principle of big data in the formation of statistics is becoming increasingly important.

As a result of our research, the generalized model of operation of statistical information systems, taking into account the experience of national statistical services of developed market economies, is shown in Figure 2.

It should be noted that in developed countries there is a tendency to use information systems based on integrated database technology, which are increasingly replacing the centralized system of data processing.

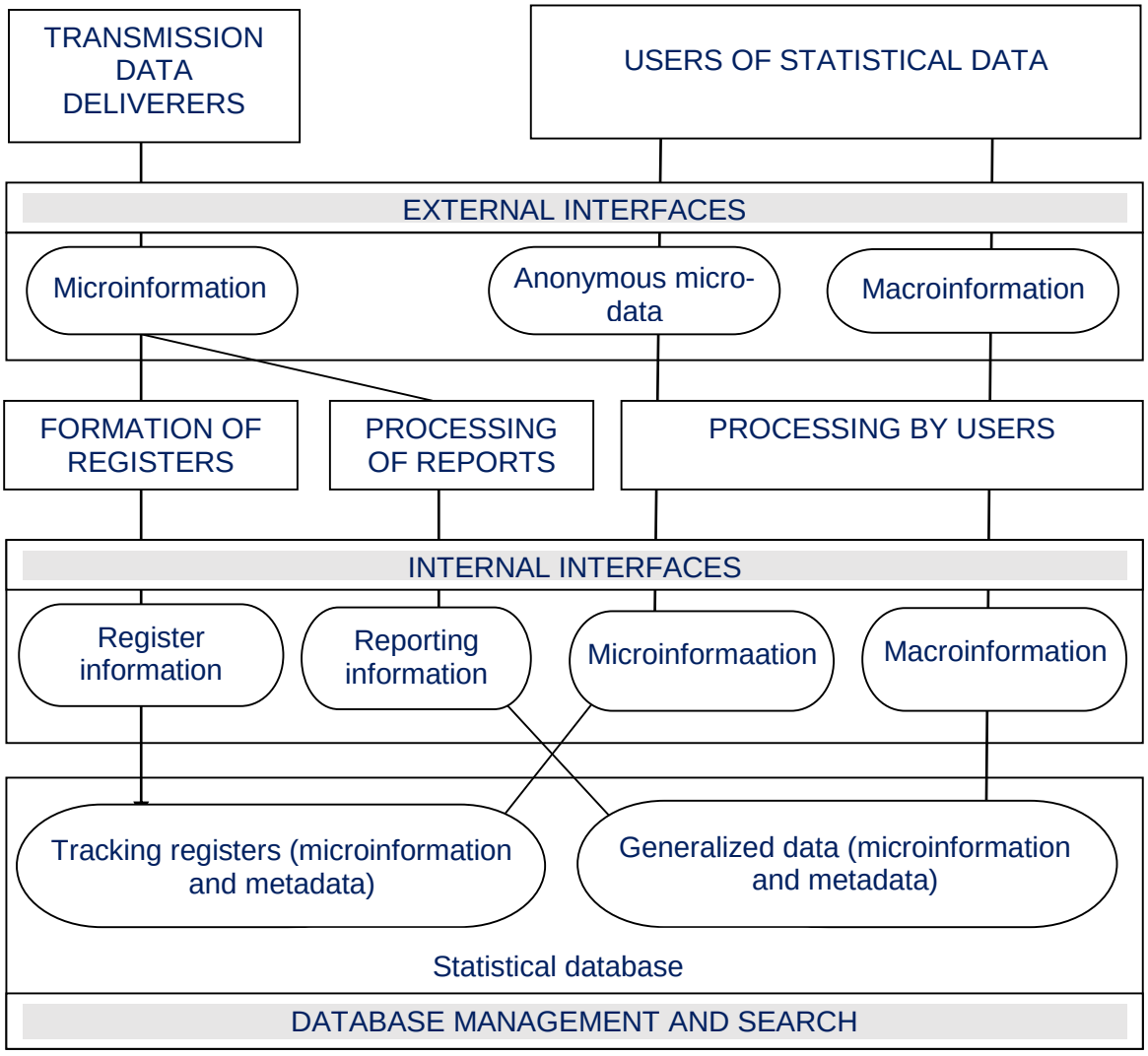

Figure 3. Generalized operation model of statistical information system.

Government agencies remain the main users of statistical information. At the same time, the demand for statistical information by entrepreneurs is growing day by day, and they are more interested in the state of the domestic and foreign markets, information about the products

produced, statistics on manufacturers. Therefore, the demand for various information about the development of society has increased. Based on this, we divide the main groups of users of statistical information specific to developed market economies into:

- Public administration bodies;
- Research organizations;
- Educational institutions;
- Enterprises and organizations;
- Joint ventures and foreign enterprises;
- Associations and other non-profit organizations;
- Public organizations;
- International organizations.

In addition to the above groups, there may be individuals, i.e. statisticians, private entrepreneurs, politicians, scientists and teachers, experts, consultants and ordinary citizens, in view of the maintenance of the national accounting system and the demand of users in organizations. Therefore, statistical information systems, which are part of the state information infrastructure, must provide all sectors of the national economy, including the population, with quality information.

Based on the analysis of the state of public demand with up-to-date and timely information, the following conclusions can be drawn:

- Collection, processing and dissemination of statistical data should be in the form of a continuous process;
- The systemic aspect of the reform of statistical activities should be focused on maximizing the demand for statistical information;
- The main criterion for assessing the performance of statistical agencies is the demand for users and information, on the basis of which the "order portfolio" is formed with information.

CONCLUSION

Statistical data collection and processing systems are at the core of the SIS, providing the processes for developing and publishing statistical data. The statistical data collection and processing system supports all stages of working with statistical data, from receiving data from respondents, carrying out the necessary controls, corrections, calculations and ending with the storage of processed information in memory.

The full transition of statistical information systems to the formation of information resources on an integrated basis requires:

- Development of new functions of the register of enterprises and organizations, which form the basis of the management of business entities;
- Extensive use of banking, finance, tax and other types of administrative statistics in the formation of a comprehensive statistical database;
- Further intensification of information exchange with government agencies and businesses and their territorial divisions in the context of privatization and denationalization of enterprises;
- Mastering new principles of organization of state statistical observers in the close study of the activities of small enterprises and micro-firms.

Statistical information systems operate on the principle of using single metadata and fully comply with the requirements of economic description of statistical work. Practice shows that one of the peculiarities of the introduction of SIS is the unified implementation and implementation of all statistical work, which is achieved through the use of a single software package.

In general, all issues included in the state statistics program are currently implemented in the SIS, and this system is widely used at all levels of district statistics departments, regional administrations and the central office. The electronic collection system, which is part of the SIS, helps to collect high-level statistical information at the level of enterprises and organizations at the district and regional levels. Overall, I can say that the role of information-communication technologies is very vital in the process of collecting statistical data for the development economy. We have to create new functions and tasks for the development of information-communication technologies in the gathering of statistical data in the future.

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