

DATA SOURCES DETERMINATION FOR INFORMATION MANAGEMENT IN OMIS

N. Bakanova*, T. Atanasova**

*Keldysh Institute of Applied Mathematics, Russian Academy of Sciences

**Institute of Information and Communication Technologies, Bulgarian Academy of Sciences

Abstract: The article is concerned with an approach to analyze the information capacity of the system of organizational management in terms of possible modes of implementation decisions to support management activities. The analysis is based on the study of the central components of the management process: functions-tasks and functions-operations.

Keywords: systems of organizational management, support management, data sources, improving management efficiency

INTRODUCTION

The main purpose of organizational management information systems (OMIS) is the automation of routine operations of management activities. The complex OMIS consists of subsystems ensuring the performance of various specific application tasks associated with managing large organizational structures: ministries, agencies, agency holding company, corporations, etc. While working the OMIS accumulates huge data sets that are stored in separate subsystems. The analysis of possibilities of using the accumulated information and developing services on its base to support management activities is recognized as an important trend in improving governance of organizational structures [1], [2].

For this aim on the stage of OMIS designing it is required to reveal the potential of its subsystems in terms of data accumulation that may be useful for the management purposes. In this case, it should be necessary to extend the functionality of the subsystems for the formation and preservation of information which can be used in the processes of its governance. Applying information from subsystems as data sources to maintain decision making insists on the development of new approaches to data structuring that will provide wide support for service management in OMIS. The OMIS functioning is based on algorithms that provide the decision maker (DM) with promptly prepared information as well as on methods of detection and identification of the required data in the software packages of organizational management systems.

SPECIFICS OF ORGANIZATIONAL MANAGEMENT INFORMATION SYSTEMS

The success of administrative activity in organizational management (OM) essentially depends on the rationality of management processes implemented in the organization. These processes are classified as hard to be formalized. They are studied from different scientific points of view, which include cybernetics, psychology, economics, sociology, and such

interdisciplinary areas as psychology of administrative activity, industrial sociology, etc.

For OM systems the concept of "activity" is defined as a particular type of work, in which the *subject of management* is always a person, group of people, the board of directors, managers of organizations, directors of departments, etc. The *object of management* also can be a person, group of people, etc. The complexity of the management process is directly related to the complexity of the managed object and requires the head of any rank (DM) to have high professionalism, competence in solving strategic and operational tasks, ability to perceive the whole situation and evaluate the incoming information, capability to the structuring of problems and finding the solutions. Management is effective when during implementation of its aims it takes into account these features. In addition, the important task for organizing of the rational management process is to remove uncertainty in management decisions, which can be achieved only through the implementation of information support in its whole.

Information systems, created for OM, (OMIS) are distinguished by scale, architecture, principles of construction, and different functionality. Despite of their diversity tools for decision making support in these systems almost are not developed. Support for decision making involves searching for information, receiving reports on the essential elements of the database, several modes of control and monitoring. The demand for support of decision regimes in the OM is high, because of its main purpose - implementing the strategic and tactical tasks that are set to the organization and are carried out by its employees at various levels of its hierarchy.

To perform these duties it is required to give support of different kinds and levels to provide access to the system information resources. The OM system have a number of specific features of its administrative tasks that derive from the complexity of the managed object, the particular activities and their influence on the environment, as well as features associated with the

intellectual activity of the subjects and objects of management, the necessary to consider the so called "human factor". These characteristics insist on involving some intelligent approaches in the OMIS to perform successful decision making activities.

Additional barriers to realization of decision-making tasks in the OM are as follows:

- shortage of algorithms focused on using of integrated information resources in OM systems;
- shortage of realizations that use the OM information resources for the implementation of different modes of decision support in OM.

The DM support recently is needed due to the growth of information flows in OM, increase of functional load on the system of institutional governance, conversion to electronic government and electronic document, the instability of external conditions, and the influence of the formed vertical of power. Management procedures are more complicated. As a result, the main functionality of the OMIS, designed to automate routine management procedures do not meet new contemporary requirements to support management processes. In real systems, necessities to expand functionality during resolving multidimensional goals of information systems emerge. Therefore, for more effective management it is required to develop the fundamental trends that define how to integrate the functionality of decision support systems (DSS) into OMIS.

To make a management decision aimed at implementing the strategic and tactical goals of the organization the DM have to constantly accept and reject hundreds of different options. An administrative decision is considered as impact on the managed object specifying the actions necessary for changing its condition. In the analysis of the functions that make up the main content of this investigation, two major classes are identified as:

- *functions-tasks* that are defined and characterized in relation to presented objects and levels of administration, so they exist in each case of the specificity;
- *functions-operations*, that represent sequences of management actions, which are characterized without reference to specific objects and subjects of the management process, as universal in the management.

Activities that are related to the implementation of the functions-tasks in OMIS are supported, as a rule, by subsystem of information center. It is designed as regulation of interactions between hierarchical levels of incoming data streams according to the standards adopted by the organization's management system. The conceptual diagram of the OM information system is presented in Figure 1.

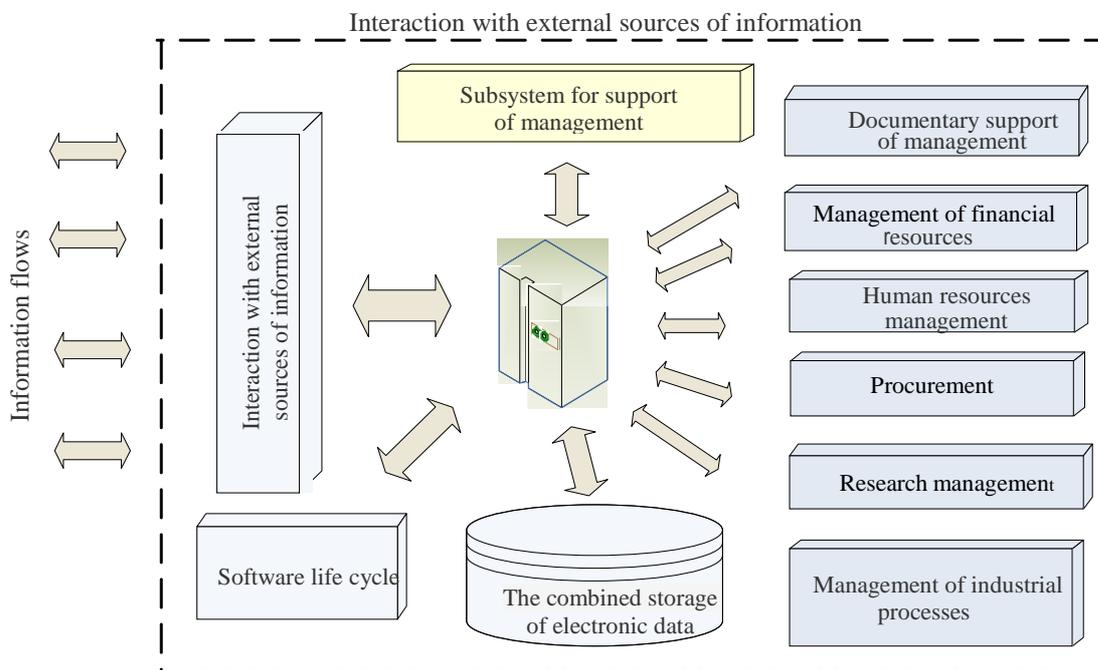


Fig. 1. Conceptual diagram of information system of organizational management

The diagram shows the *functions-tasks*, carrying out the purpose of the application system. The amount and outcome (objective) of application subsystems in a particular software package depend on the size and scope of the management of the organization.

Invariable components of OMIS are represented by the following subsystems: the documentary support, human resources management, procurement, financial and some other additional resources management. Industrial subsystem determines the scope of the

management of the organization. In a large administrative organization there may be several such subsystems, and their structure and tasks are focused on some management processes specific to the industry. For example, in the management of transport system there are subsystems of aviation, marine and rail transport, which reflect the domain specifics, typical for each kind of transport, but are subject to general principles of the management in the organization. In the central part of the scheme the subsystem for support of management activities is shown, which should provide the selection and analysis of data from various sources, ensuring modelling and envisaging of decisions [3], [4]. The main purpose of the subsystem is to accumulate information useful for decision making and to represent it in a convenient form for functions-operations.

In addition to these subsystems, tasks of the “software life cycle” subsystem are shown in the diagram for the fulfilment of system-wide general functions, such as: interaction with external sources of information; monitoring of subsystems; administration and synchronization of the subsystems; creation and maintenance of corporate electronic data storage. System-wide functions have no direct influence on the processes of management; they are designed to support the operation of different objects in the information system. The results of their work may be used for providing support of management tasks.

SUPPORT OF MANAGEMENT ACTIVITY IN OMIS

Implementation of functions-operations provides for specific actions to control organization administrative actions, which include the following components:

- long term, short-term and operational planning in each direction of the applications and in the work of the organization as a whole.
- development and management of decision making process on strategic and tactical goals of the organization;
- orientation to the specific situation and its diagnosis (assessment);
- recommendations for the implementation of the program decisions;
- prognosis of the expected results;
- operational monitoring, evaluation and correction of the wide-ranging results and action plans.

Development of algorithms for support functions-operations is the most complex phase of creation of the subsystem. The algorithms have to take into account the management specific, features of management processes, its tasks, organizational structure, official regulations and much more [1], [2]. In the case of successful implementation, including developing of rational algorithms, user-friendly interfaces and well thought-out sources of information, the subsystem will provide effective support to management activities [3].

The sources of information to perform the above functions are primarily internal to the application subsystem. They focus on information about resources of managed organization, on the status of industry processes, the directions of perspective future research. However, identification and selection of needed information sources require determining the interconnection of application subsystems and management tasks in the formation of information profiles of the subsystem support, which will provide quick access and easy to use reporting functions to perform desired operations.

SOURCES OF DATA TO SUPPORT MANAGEMENT ACTIVITIES

The identification of data sources to support the management activities are conducted on the basis of analyzes of the correlation functions of management and applied problems in OMIS subsystems.

We denote the set of functions-tasks, listed in the information complex subsystems of OMIS as $A = \{A_1, A_2, \dots, A_n\}$, where A_1, A_2, \dots, A_n – are data sets focused on the implementation of application-specific functions of each subsystem. For information files, for example, A_1 and A_2 can be written as $A_1 = \{x_{11}, x_{12}, \dots, x_{1p}\}$; $A_2 = \{x_{21}, x_{22}, \dots, x_{2q}\}$, where $x_{11}, x_{12}, \dots, x_{1p}, x_{21}, x_{22}, \dots, x_{2q}$ – are pieces of information of individual tasks of subsystems that can be used as data sources for the development of information support services in the performance of functions-operations.

Let denote by $D = \{D_1, D_2, \dots, D_m\}$ a set of functions-operations that require getting data from the application subsystems. The data sources are selected taking into account the behaviour of the coefficients k_1, k_2, \dots, k_m , which are characterized by the presence or absence of information for each function-operation and take the values 1 or 0. The coefficients are determined by the analysis of information tasks that run in subsystems. Then for each function, the operation can be written as $D_i \subseteq A_i$ for any $x_{ip} \in A_i$ and $k_j = 1$.

Table 1 illustrates the results of data analysis for OMIS shown in Figure 1. The table cell is shaded for the coefficient value equal to 1. The table shows that the content of the document management subsystem can be used as a source of information for decision support across all shown functions-operations.

The document management software accumulates flows of business documents in accordance with the targets and standards of the organization, maintains decision records and execution of these decisions, and contains information about performing activities in the organization. This subsystem can provide information on the status of work within certain areas of the organization activities.

Using of special tools for textual processing (such as content-analysis, specialized thesauri) gives a possibility to receive more information at a more wide range of issues about processes taking place in the organization.

The table shows that the coefficients of the availability of information for this subsystem are almost always equal to 1. Consequently, the document managing subsystem can be a major source of information to allow management of organization.

Resource application subsystems that support the operation of management information about the resources of the organization can provide information about status of the resources and tendencies of their changes, which is important when assessing the situation and strategic planning. So it can be used for decision-making according to the industry area and planning future activities.

Industry subsystem represents a source of information on the status of specific activities. Selecting the information that characterizes the industry task depends on the specific subsystem, and therefore should be carried out separately in each case.

Investigation of the relationship of functions-tasks (realized as subsystems) in OMIS and functions-operations of the management process presented in the

table shows that the most important information resources for the management has a subsystem for documentary maintenance of management. Consequently, at development of services to support management activities on the information basis it should be focused on the database of this subsystem.

CONCLUSION

Information systems of OM during their operation accumulate large data sets stored in a database. In these information files there is a lot of information that contains data reflecting different aspects of the organization. However, the use of this information is limited to the specific features of application systems. Therefore, empowering the use of information collected in the organizational management systems is one of the most urgent tasks for increasing the effectiveness of management activities.

Functions-operations Functions-tasks	Planning of application areas	Strategic decisions	Tactical decisions	Evaluation of specific situations	Recommendations for follow-up	Operative control, evaluation of results	Monitoring of action plans
	$D_1(k_1)$	$D_2(k_2)$	$D_3(k_3)$	$D_4(k_4)$	$D_5(k_5)$	$D_6(k_6)$	$D_7(k_7)$
Documentary maintenance of management	1	1	1	1	1	1	1
Human resources	1			1			
Material supply	1			1			
Financial resources	1			1			
Scientific researches		1					
Industrial processes			1	1	1	1	1

Table 1.

Compilation of information relating to various applied tasks provides enormous opportunities for its using. The application of these opportunities for purposes related to the implementation of decision support at OMIS is an interesting little-studied problem. One such task is to select information sources for the implementation of support management services. Its solution will give the description of services required to support management activities. The advantage of the created services will provide prompt and appropriate information from certain sources.

REFERENCES

1. Баканова Н.Б. Использование программно-технических комплексов для повышения эффективности контроля в системах документооборота, «Электросвязь», 2007г., №6, стр. 51-53
2. Bakanova N., Atanasova T. Development of the combined method for dataflow system. // II "Information technologies & knowledge". 2008, Volume 2, № 3, pp.262-266
3. Ларичев О.И. Теория и методы принятия решений. 2-е изд. – М.: Логос, 2002.
4. Петровский А. Теория принятия решений. М.: Издательский центр «Академия», 2009.