Modern Management Technologies of the Department for Providing Epidemiological Supervision of the Volgograd Region

Alla G. Kravets, Natalia A. Salnikova, Lev B. Lempert, Ilya P. Mikhnev, Svetlana V. Mikhneva

Abstract: ***The modern leader has to deal with many problems that require optimization of management processes. The most important properties of modern management technologies are their consistency (it is impossible to change parts of the system with impunity, you need to see the system as a whole all the time), the complexity and balance of the approach. In order to effectively manage, today you need a lot of diverse information. It is necessary to constantly collect, save, structure, analyze, and then synthesize and make decisions. In this regard the role of effective management technologies is increasing. The presented paper describes the development of the configuration of an automated system for recording emergency notifications of the epidemiological department of the Federal Center for Hygiene and Health of the Center for Hygiene and Epidemiology in the Volgograd Region.***

Keywords: ***Management decisions; management problems; management technologies; economic effect; health care; automated system***

I. INTRODUCTION

The activity of any enterprise is carried out under conditions of tough competition and an unstable external environment. The need for rapid response to market conditions and a rapidly changing economic situation requires restructuring of the enterprise's internal microeconomics, management accounting, and optimization of management processes. In this regard the company needs to solve management problems at a qualitatively new level [1]. To do this it is necessary to know the basic laws of management, to own management technologies.

Revised Manuscript Received on April 15, 2019.

Alla G. Kravets, Department of Computer-Aided Design and Search Design, Volgograd State Technical University, Volgograd, Russian Federation

Natalia A. Salnikova, Department of Information Systems and Mathematical Modeling, Volgograd Institute of Management - branch of the Russian Presidential Academy of National Economy and Public Administration, Volgograd, Russian Federation

Lev B. Lempert, Department of Psychiatry, Narcology and Psychotherapy, Volgograd State Medical University, Volgograd, Russian Federation

Ilya P. Mikhnev, Department of Information Systems and Mathematical Modeling, Volgograd Institute of Management - branch of the Russian Presidential Academy of National Economy and Public Administration, Volgograd, Russian Federation

Svetlana V. Mikhneva, Department of Theory and History of Law and the State, Volgograd Institute of Management - branch of the Russian Presidential Academy of National Economy and Public Administration, Volgograd, Russian Federation

Management technology - techniques, procedure, regulation of the management process.

It consists of information, computational, organizational and logical operations performed by managers at various levels according to a certain algorithm manually or using technical means [2]. The content of control technology depends on the type and complexity of the control object, the qualifications of workers and the types of technical means that are used. Technology management includes the review of the situation, the preparation of information, the development and decision-making, bringing them to the performers and monitoring during the implementation of targeted programs or projects [3].

The concept of long-term socio-economic development of the Russian Federation focuses on the transition of the Russian economy from the export-raw material to an innovative socially-oriented type of development. This will dramatically expand the competitive potential of the Russian economy by increasing its comparative advantages in science, education and high technologies, and on this basis new sources of economic growth and wealth improvement are used [4]. The leading factor of economic growth and national competitiveness in the innovative economy is intelligence, the creative potential of a person and a source of high incomes is not only the possibility of obtaining rents from the use of natural resources and high global conditions, but also the production of new ideas, technologies and social innovations [5]. The basis of the innovative development of territories is the use of modern management technologies [6]. In general, management technologies are understood as a set of management works and operations performed in a certain order, a certain sequence of principles and methods. There is a complication of functions, tasks and management principles in the control system. This is due to the fact that the functioning of the governing bodies has been carried out over the past 18 years in the new conditions, there is a constant improvement in the legislative base. The object of management is a very complex system consisting of a large number of enterprises and organizations of different forms of ownership [7].

In order to be able to implement the management decision it is necessary to coordinate and coherence between business and government since there is currently no effective mechanism for integrating business into management decision making [8].

It is important to mention, that the current state of industrial production in the Russian regions does not objectively allow a quick transition to an innovative development path in the real sector of the economy. Under current conditions innovative development of regions should be based on modern management technologies. Management technologies at the regional level are understood as technologies that help reduce production costs in different sources of their occurrence but they are implemented through decision-making at the regional level.

From the point of view of management health care is one of the subsystems of the national economy [9]. By solving purely medical tasks it performs social and economic functions related to improving the quality of life of the economically active population and its well-being [10]. Health care also contributes to the implementation of social guarantees and forms the labor potential of society.

The health of the society and the individual must be considered not only as a medical category but also as a socio-economic category that has a direct impact on the efficiency of labor and production in the other spheres of the national economy [11].

In this case the relevance and complexity of health problems are significantly increased. Moreover, the increase of the cost of maintaining and strengthening the health of citizens leads to the need to determine the economic efficiency of the functioning of health care as well as the factors affecting its increasing [12]. This problem is one of the most important tasks in the medical field.

The effectiveness of health care is a complex concept that cannot be expressed by any indicator. It reflects all the aspects of the health care and it includes a number of parameters [13]. These parameters need to be focused on the final results of the medical services taking into the consideration the therapeutic, sanitary and preventive, socio-preventive, managerial and economic aspects [14].

II. PROJECT GOALS AND AIMS

The activity of the epidemiological department is focused on the following tasks:

- ensuring state supervision and control over compliance with the requirements of the legislation of the Russian Federation in the field of sanitary and epidemiological welfare of the population;
- prevention of infectious and parasitic diseases in accordance with the sanitary-epidemiological situation and the forecast of its change.

When studying the work of the epidemiological department, a number of shortcomings were identified, such as: manual generation of emergency notifications, time spent on performing the same actions, monotony of work, the possibility of error in the distribution of emergency notifications, and unsafe data storage.

The purpose of creating the configuration of an automated system for recording emergency notifications of the epidemiological department is to improve the quality of receiving, processing emergency notifications and receiving operational reports. To achieve the goal, it is necessary to solve the following tasks: analyze the activities of the epidemiological department; analyze systems-analogues in the epidemiological department; create requirements for the configuration of an automated system for recording emergency notifications of the epidemiological department; to design configuration; develop and implement a configuration; test configuration.

The 1C: Enterprise platform is used as a tool for developing the configuration of an automated system for recording emergency notifications, which, through the effective use of modern information technologies, helps automate the recording of the epidemiological department, reduce the time for receiving and processing emergency notifications, and ensure data storage safety.

III. OVERVIEW OF BUSINESS PROCESSES OF THE DEPARTMENT FOR THE PROVISION OF EPIDEMIOLOGICAL SURVEILLANCE THE EPIDEMIOLOGICAL DEPARTMENT OF THE FEDERAL "CENTER FOR HYGIENE AND EPIDEMIOLOGY IN THE VOLGOGRAD REGION"

The Division for Epidemiological Surveillance is one of the structural units of the Federal Budgetary Institution of Healthcare of the Center for Hygiene and Epidemiology. The epidemiological department is present in each subject of the Russian Federation; it plays an important role in the activities of sanitary-epidemiological institutions. Based on the sanitary analysis of the epidemiological situation, work is planned for the entire sanitary and epidemiological service.

The main functions of the epidemiological department are:

- collection and processing of statistical information and other information in the field of prevention of infectious and parasitic diseases;
- conducting sanitary and epidemiological investigations aimed at identifying the causes and identifying the conditions for the occurrence and spread of outbreaks of infectious diseases;
- coordination of the activities of the structural divisions, the epidemiological department of the Federal Center for Hygiene and Health of the Center for Hygiene and Epidemiology in the Volgograd Region.
- with other structural divisions of the organization, ensures their interconnection in the work on epidemiology;
- participation in the development of regulatory and methodological documentation;
- participation in the organization and holding of meetings, conferences on the issues of epidemiology and prevention of controlled infections;
- participation in scientific and practical, educational and publishing activities;
- participation in sanitary and epidemiological examinations, surveys (investigations), evaluations;
- preparation of reports, the formation of annual targets, information and analytical materials, references, government reports and other documents;

- Conducting work on the acquisition, storage, accounting and use of archival documents formed during the activities of the department.

IV. THE STRUCTURE OF THE EPIDEMIOLOGICAL DEPARTMENT

The epidemiological department consists of four departments, which are closely interrelated with each other. The epidemiological department includes: an infectious disease surveillance unit; a parasitic disease surveillance unit; department for providing supervision of especially dangerous and natural focal infections; a transport supervision office.

Each department performs its tasks and functions. They are divided into planned and unscheduled work. Planned work is performed daily, they consist of prescriptions and orders determined by the Federal bodies of sanitary-epidemiological services and the chief physician of the center of hygiene and epidemiology. Unscheduled work is carried out in the event of situations to be taken anti-epidemiological measures, based on epidemiological evidence (emergency notification).

V. REGISTRATION OF THE EMERGENCY NOTIFICATIONS

Emergency notifications is an operational accounting document that registers each case of an infectious disease (or suspicion of it) by a doctor or nursing staff on the list, as well as food and acute occupational poisoning. Emergency notification is handled by the division of the infectious disease ward, which consists of employees from 4 or more people, depending on the amount of information received about diseases. Emergency notification service is performed by qualified operators who filter and structure the received information in the form N60 / u. Reception of information is carried out by phone or fax 24 hours.

Emergency notice in the form of N60 / u, is formed in two stages. The first stage is the reception of information from doctors about a preliminary (primary) disease, where diseases are classified according to the ICD code10. The second stage is receiving information from doctors about a confirmed or not confirmed disease. Emergency notifications are numbered annually per year and are further identified during processing by the number and year. Operators perform work not only on accepting information about the disease, but also carry out a number of operational measures by the approved legislation and the deputy department in the instructions. At the end of the working day, forms the final report on the received emergency notifications in the context of nosologies approved by the deputy department.

VI. RESPONSIBILITIES OF THE OPERATOR TO RECEIVE EMERGENCY NOTIFICATIONS

The deputy department approves responsibilities of the operator. The operator must perform the following functions:

- keep records of the department;
- to carry out statistical monitoring in the field of ensuring sanitary and epidemiological well-being, including keeping disease registers, accounting and reporting;
- to organize the conduct of state registration of infectious, parasitic and occupational diseases, food poisoning, other diseases and poisoning of people associated with exposure to adverse environmental factors of the person;
- draw up reporting documentation in full of approved forms: No. 2, 5, 6, 68, etc. for the supervised area;
- receive and transmit emergency notification of infectious diseases on f. 60 / y;
- collect, summarize and statistically process the materials of hygienic monitoring: the state of public health, immunity, preventive examination coverage and other types of socio-hygienic monitoring;
- operates in accordance with the annual and quarterly work plans. It draws up an individual plan schedule for the month, approved by the head and agreed with the doctor, who keeps daily records of work;
- perform other types of work on the instructions of the epidemiologist and the head of the department;
- study and put into practice new forms and technologies on epidemiology issues;
- know the basics of cost accounting in the epidemiological department;
- participates in the development and updating of documents of the quality management system;
- complies with accreditation criteria, requirements of quality management system documents, information confidentiality, independence and impartiality in carrying out activities.

VII. DESCRIPTION OF BUSINESS PROCESSES

During the day, the operator receives information about diseases in accordance with management order No. 01/328 on the delimitation of powers in the investigation of infectious and parasitic diseases. In which the list of diseases that the operator accepts, and the list of diseases for which it is necessary to make immediate anti-epidemiological investigations.

This information the operator leads to an emergency notification in the form of N60 / u and generates a file of emergency notification program Microsoft Excel. The file of emergency notifications consists of tabs, by regions and characteristics. The areas are determined by the place of residence of the patient, and the characteristics are diseases within the competence of highly dangerous and parasitic departments, in which the division into areas is not required.

Also in the characteristics include additional information requiring prompt processing, for example, refugees in Ukraine. During the formation of an emergency notice in the Microsoft Excel file, the operator manually takes into account the received information, determining it by tabs (areas and characteristics). The operator during the day performs all the instructions for the initial processing of emergency notifications.

At the end of the working day, a report is generated on the received emergency notifications. The operator reports the approved form to the deputy department and the Federal Service for Oversight of Consumer Protection and Welfare.

During working hours, the heads of departments and executors perform the processing of the received emergency notifications for the last day in accordance with the work situation in the epidemiological department. Managers conduct additional control by performing partial processing on the basis of the adopted primary emergency announcements, which are subject to the conduct of operational anti-epidemiological measures. The performers of the departments process primary and approved emergency notices in accordance with the general requirements for the prevention of infectious and parasitic diseases. Primary emergency announcements are either under investigation or recorded until the disease is confirmed. Additional confirmed investigations may also be conducted on confirmed emergency notifications. During each month, all processed emergency notifications will be counted in Form No. 2. Form number 2 is a document approved by the Federal Center for Hygiene and Epidemiology, which takes into account information about diseases in quantitative terms.

The managers and employees of the departments, monthly and weekly, generate various reports based on the received emergency notifications. To do this, managers need to access the Microsoft Excel file, where they manually filter and sort the information.

VIII. DEFICIENCIES IN THE WORK OF THE EPIDEMIOLOGICAL DEPARTMENT

Heads of departments, employees, in particular, operators perform a certain type of work on handling emergency notifications that require all attentiveness. A large amount of work related to the collection and processing of information takes a lot of time, which can lead to errors. As a result of the analysis of the business process model of the epidemiological department, the following shortcomings were identified:

- maintaining emergency notifications in software that does not provide automated accounting and does not allow generating reports automatically;
- time spent on performing the same actions, the monotony of work;
- manual generation of emergency notifications without using various reference types of information that simplify data entry;
- the possibility of error in the distribution of emergency notice by area and characteristics; unsafe data storage;
- the complexity of working with the file, in view of the features of the software.

In connection with the above disadvantages, the goal of this work is to improve the quality of reception, processing of emergency notifications and receiving operational reports.

IX. DESIGNING THE CONFIGURATION OF AN AUTOMATED SYSTEM FOR RECORDING EMERGENCY NOTIFICATIONS

The developers faced the task of developing a program for recording emergency notifications in order to automate the work of the epidemiological department. The program should be implemented as a configuration on the 1C: Enterprise 8 platform, since the organization already keeps records in 1C: Enterprise 8 and has a 1C: Accounting configuration available.

The configuration of the automated system "Accounting for emergency notification" should provide: minimal processing time for emergency announcements; minimum time to generate reports; automatic distribution of emergency alerts by area and characteristics; unified form of handling emergency notifications; quick search in the database.

The To – Be diagram of the process for recording emergency notifications in the epidemiological department (As will be) (in IDEF0 notation) is presented in Figure 1.

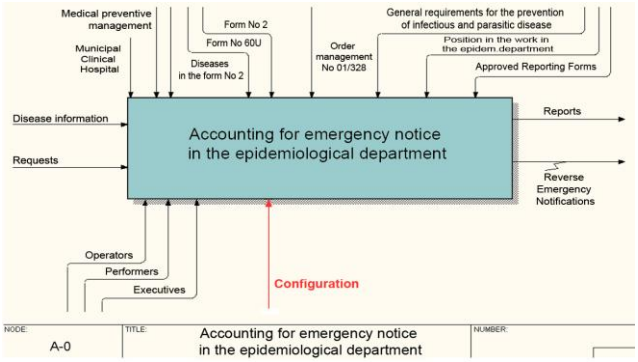

Fig. 1 The context diagram "Accounting for emergency notification in the epidemiological department (As will be)"

The first level of decomposition of the contextual diagram “Library work (How it will be)” is shown in Figure 2.

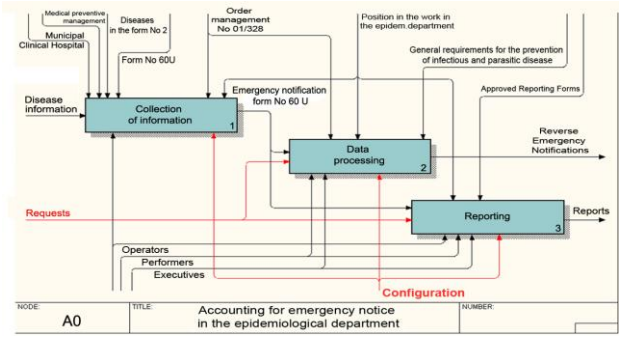

Fig. 2 The first level of decomposition

The decomposition of the process of “collecting information” is presented in Figure 3.

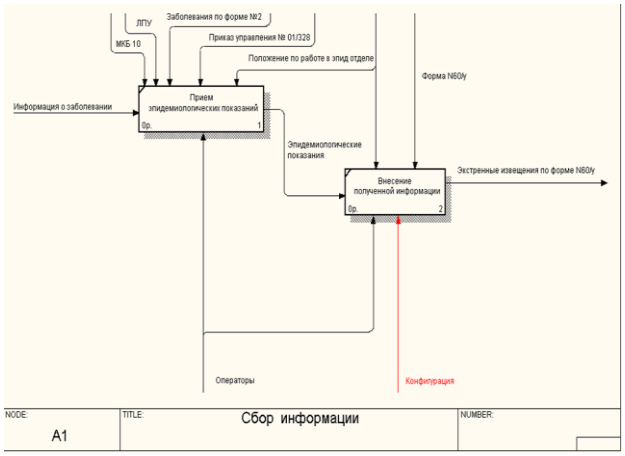

Fig. 3 Decomposition of the process of "collecting information"

The decomposition of the process "Information processing" is presented in Figure 4.

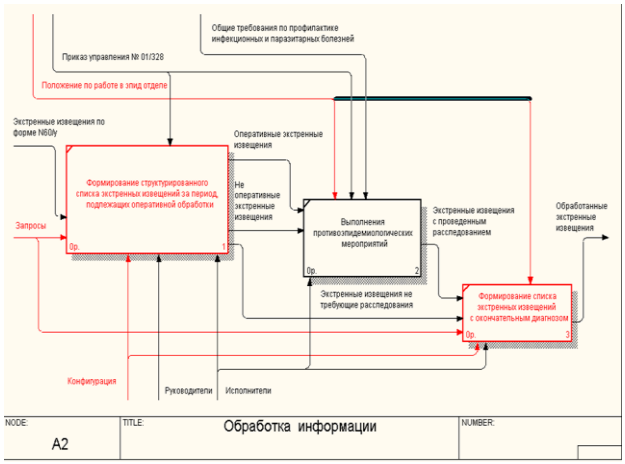

Fig. 4 Decomposition of the process "Information processing".

The decomposition of the "Report generation" process is presented in Figure 5.

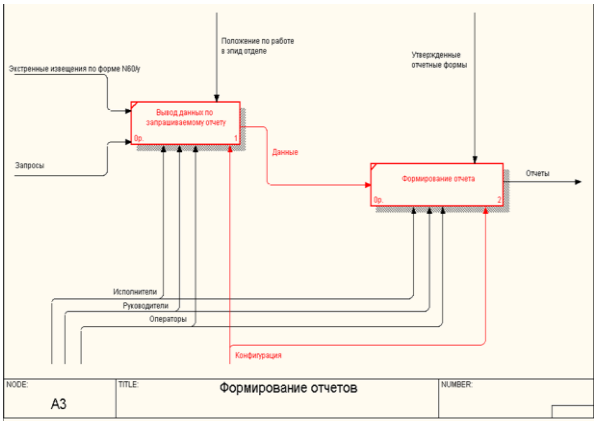

Fig. 5 Decomposition of the process "Reporting".

The UseCase diagram is shown in Figure 6.

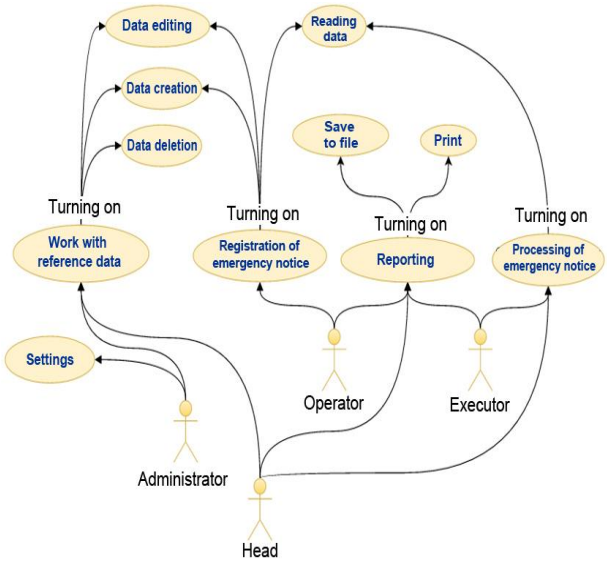

Fig. 6 Use Case Diagram

X. SCREEN FORMS OF THE CONFIGURATION OF THE AUTOMATED SYSTEM "ACCOUNTING FOR EMERGENCY ANNOUNCEMENTS"

The main screen form is the initial page of the form list of the document "Form 60" presented in Figure 7 and the form presented in Figure 8.

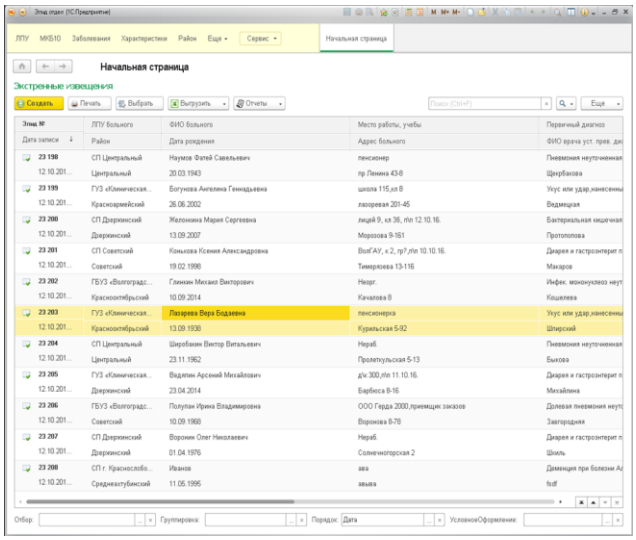

Fig. 7 List Form of the Document "Form60".

In this form there is a list of information about received (registered) emergency notifications in the program. If necessary, you can use the tools of search, selection, grouping, sorting and conditional formatting. Also in the form of a list is a command panel for printing, uploading to an Excel document and receiving required reports on emergency notifications.

The form element of the document "Form 60" is intended for the receipt (registration) of emergency notifications. The form is divided into blocks of types of information.

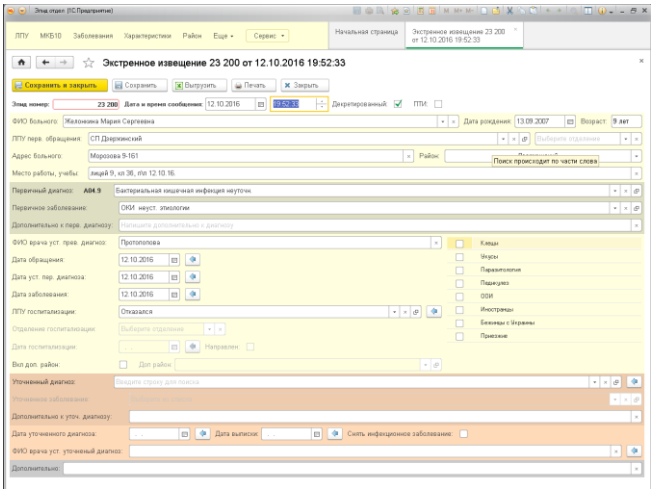

Fig. 8 Form element of the document "Form60".

XI. CONCLUSION

The result of this project was the development of the configuration of an automated workflow system in the epidemiological department. When designing an automated system, the following tasks were performed:

- a unified interface was developed for receiving and processing emergency notifications;
- developed reference books for reference information;
- a module was developed for automatic distribution of emergency notifications by area and characteristics;
- developed reports.

The developed configuration of the automated system "Accounting for emergency notifications" is intended for automation of accounting in the epidemiological department and complex support of the following processes: receiving emergency notices; handling emergency notices; formation of reporting documentation.

The configuration of the automated system "Accounting for emergency notifications" was introduced into the epidemiological department of the Federal Center of Institution of Health of the Center for Hygiene Epidemiology in the Volgograd Region.

REFERENCES

1. M.A. Al-Gunaid, M.V. Shcherbakov, V.A. Kamaev, O.M. Gerget, and A.P. Tyukov, "Decision Trees based Fuzzy Rules, Information Technologies in Science, Management, Social Sphere and Medicine," ITSMSSM 2016, Atlantis Press, Proceedings of III International Scientific Conference, Tomsk, Russian Federation, pp. 502-508, 2016.
2. Alla G. Kravets, Andrei D. Kravets, and Aleksander A. Korotkov, "Intelligent Multi-Agent Systems Generation," World Applied Sciences Journal 24 (Information Technologies in Modern Industry, Education & Society), pp. 98-104, 2013.
3. I.P. Mikhnev, N.A. Salnikova, and M.B. Lempert, Modern Condition of Dose Loads from Construction Materials and Main Sources of Ionizing Impact on the Population of the Volgograd Region, Materials and Technologies in Construction and Architecture, Materials Science Forum, vol. 931, 2018, pp. 1007-1012.
4. Natalia Sadovnikova, Danila Parygin, Elena Gnedkova, Alla Kravets, Alexey Kizim and Sergey Ukustov, "Scenario forecasting of sustainable urban development based on cognitive model," Proceedings of the IADIS international conference ICT, society and human beings, pp. 115-119, 2013.
5. A.G. Kravets, M.A. Kanavina, and N.A. Salnikova, "Development of an Integrated Method of Placement of Solar and Wind Energy Objects in the Lower Volga," International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM), pp.1-5, 2017.
6. Ilya P. Mikhnev, Svetlana V. Mikhneva, and Natalia A. Salnikova, Studies of radon activity in civil engineering and environmental objects, International Journal of Engineering and Technology, S. l, vol. 7, No. 2.23, 2018, pp. 162-166.
7. Valery A. Kamaev, Natalia A. Salnikova, Suleiman A. Akhmedov, and Anatoliy M. Likhter, "The Formalized Representation of the Structures of Complex Technical Devices Using Context-Free Plex Grammars," Communications in Computer and Information Science (CCIS), vol. 535, Springer, Volgograd; Russia Federation, pp. 268-277, 2015.
8. Ilya P. Mikhnev, Natalia A. Salnikova, Mikhail B. Lempert, and Kirill Yu. Dmitrenko, The Biological Effects of Natural Radionuclides from the Construction Materials on the Population of the Volgograd Region, In Proceedings of the 8th International Conference on Information, Intelligence, Systems and Applications, IEEE, 2017, pp. 1-6.
9. Nazim Y. Orudjev, Olga V. Poplavskaya, Lev B. Lempert, and Natalia A. Salnikova, "Problems of Medical Confidentiality While Using Electronic Documents in Psychiatric Practice," Atlantis Press, Proceedings of the 2016 conference on Information Technologies in Science, Management, Social Sphere and Medicine (ITSMSSM), vol.51, pp. 120-125, 2016.
10. Natalia A. Salnikova, Boris A. Lempert, and Mikhail B. Lempert, "Integration of Methods to Quantify the Quality of Medical Care in the Automated Processing Systems of Medical and Economic Information," Communications in Computer and Information Science (CCIS), vol. 535, Springer, Volgograd; Russia Federation, pp. 307-319, 2015.
11. Valery A. Kamaev, Ilya P. Mikhnev, and Natalia A. Salnikova, "Natural Radionuclides as a Source of Background Irradiation Affecting People Inside Buildings," Procedia Engineering, vol. 150, pp. 1663-1672, 2016.
12. Nazim Y. Orudjev, Mikhail B. Lempert, Ivan Osaulenko, Natalia A. Salnikova, Andrew A. Kuzmichev, and Alla G. Kravets, "Computer - Based Visual Analysis of Ecology Influence on Human Mental Health," 7th International Conference on Information, Intelligence, Systems and Applications (IISA 2016), pp.1-6, 2016.
13. Nazim Y. Orudjev, Olga V. Poplavskaya, Lev B. Lempert, Salnikova Natalia A., Marina B. Kultsova, "Problems of Introducing Information technologies in Practice of Psychiatric Service," 7th International Conference on Information, Intelligence, Systems and Applications (IISA 2016), pp.1-6, 2016.
14. Alla G. Kravets, Ngoc Duong Bui, and Mohammed Al-Ashval, "Mobile security solution for enterprise network. Knowledge - based software engineering," Communications in Computer and Information Science (CCIS), vol. 466, Springer, pp. 371 – 382, 2014.