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## A FRAMEWORK FOR THE CREATION OF DISTRIBUTED INFORMATION TECHNOLOGY TO SUPPORT THE SCHOLARLY RESEARCH AND ORGANIZATIONAL ACTIVITIES OF THE NAS OF UKRAINE



**Introduction.** The development and implementation of distributed information technologies (DIT) in the operation of government bodies is in line with the Concept of e-Government Development widely recognized in the world and approved by the Cabinet of Ministers of Ukraine Decree No. 2250-p dated 13.12.2010.

**Problem Statement.** The development of DIT for supporting the research and organizational activities (DIT ROA) of the NAS of Ukraine is a priority among the tasks for computerization of managerial and administrative activities of the NAS of Ukraine.

**Purpose.** The purpose of the work under consideration is the development of DIT ROA of the NAS of Ukraine related to the processing of documents related to the commencement, execution, control, recording, and closure of research and development (R&D) works.

**Materials and Methods.** This research uses DIT creation methods based on the concept of lifecycle of processing a structured electronic document as basic information object for the design, development, operation, and maintenance of DIT.

**Results.** The application of DIT ROA of the NAS of Ukraine has enabled to speed up the processing of above-mentioned documents, to ensure correctness and completeness of information about R&D works and the correctness and efficiency of statistical reports on the implementation of R&D works in institutions of the NAS of Ukraine.

**Conclusion.** Creation of the Unified Distributed Information Technology for supporting the research and organizational activities of the NAS of Ukraine (UDIT ROA of the NAS of Ukraine) for the comprehensive informatization of research and organizational activities of the NAS of Ukraine has been proposed.

**Keywords:** distributed information technology, research and organizational activities, structured electronic document, and data bank.

In the recent decades the creation of state integrated information systems within the framework of Concept of e-Governance Development has become the main tendency of information and communication technologies development for the automation of management tasks in the leading countries of the world. The electronic governance is an instrument of increase in the efficiency and ra-

pid administrative decision-making, used in a wide range of managerial functions, and provides creation of centralized data bases with the distributed data processing technologies and organization of information interaction of state authorities on the basis of electronic document circulation with the use of electronic digital signature.

The Cabinet of Ministers by its Resolution No. 2250-p, of December 13, 2010, approved the Concept of electronic governance development in Ukraine which provides, in particular, the creation of qualitatively new forms of organizational ac-

tivities of state authorities and local self-government bodies on the basis of use of information-telecommunication technologies. A tendency of transition of state authorities to the document circulation using a system of electronic interaction will make the NAS of Ukraine to implement the electronic document circulation, as soon as possible.

Today, in the Presidium of the NAS of Ukraine there are a number of functionally oriented subsystems, a part of which has the interaction with the academician institutions by way of interchange of electronic forms through the electronic mail, in particular:

- ✦ Formation and control over the execution of estimates of the NAS of Ukraine;
- ✦ Formulation of financing proposals of institutions of the NAS of Ukraine for the next year;
- ✦ Analysis and use of salaries of the NAS of Ukraine;
- ✦ Research and managerial staff of the NAS of Ukraine;
- ✦ Integrated system of electronic document circulation of the Presidium of the NAS of Ukraine

The institutions of the NAS of Ukraine operate mainly the diverse information systems for accounting, planned economic work, personnel records management, etc. implemented in the file-server or client-server architecture. As a rule, these are either adapted known systems of the type of company "1C" products or own developments. Their use involves the acquisition and constant support of application and system software for each system separately, which requires constant considerable financial expenses, because of the lack of funding of the Academy.

The presence in the NAS of Ukraine of separate information systems that are not interconnected, the disparity, and sometimes the inconsistency of data, makes it impossible to create a unified system of electronic document circulation, leads to a significant loss of time and errors in the formation of aggregated or selected by certain parameters information, which ultimately impacts on the quality and speed of making the managerial decisions.

To date, the *Warnet* Academic Data Exchange Network, the corporate e-mail of the NAS of Ukraine and the Data Processing Center (DPC) of the Presidium of the NAS of Ukraine have been created and put into operation in the NAS of Ukraine, which make it possible to implement a unified policy in the development and implementation of modern corporate information systems and technologies for the Academy, with the requirements of information technology of state authorities of Ukraine taken into account.

The primary task of information technology of the activities of the institutions and the Presidium of the NAS of Ukraine is the automation of scholarly research and organizational activities related to the processing of documents, which accompany the opening, execution, control, recording, and close of scholarly research works and research and development works (R&D). To solve this problem, the Distributed Information Technology to support the scholarly research and organizational activities (DIT ROA) of the NAS of Ukraine was established, the purpose of which was the comprehensive information technology of scholarly research and organizational activities of the NAS of Ukraine, including the R&D institutions and the Presidium of the NAS of Ukraine.

The innovation component of this work is the creation of DIT using the concept of the lifecycle of structured electronic document processing (ED) as the basic information object for the design, development, operation and maintenance of DIT. The paper also uses an approach of gradual and iterative design, development and implementation of complex geographically distributed information technology, taking into account the terms and amount of its financing.

DIT ROA of the NAS of Ukraine is based on the corporate distributed information system, the components of which are the data processing center (server part of the system) and the information and communication infrastructure that provides connection of the institutions and the Presidium of the NAS of Ukraine to the data processing center, access to the resources of DIT ROA of the

NAS of Ukraine for work with the electronic documents, as well as for the interaction between the users (entities) of DIT ROA of the NAS of Ukraine.

Such structure provides the possibility of simultaneous processing of electronic documents by a large number of entities of DIT ROA of the NAS of Ukraine: about 200 R&D institutions, thousands of employees involved in the creation and processing of electronic documents related to the opening, execution, control, accounting, and closing of R&D works.

Taking into account the scope of implementation and the complex nature of creation of DIT ROA of the NAS of Ukraine, as well as the possibilities of its financing and the necessity of continuous support of this technology exploitation, its development and implementation is carried out in stages.

Within the framework of the first stage of the creation of DIT ROA of the NAS of Ukraine, in 2014, the first stage of the system was developed that provides the information support for the processing of key documents related to the introduction of research projects of the NAS of Ukraine in the institutions and the Presidium of the NAS of Ukraine. The first stage of the system is based on the use of means of Intranet technologies, the Warnet network and the Data Processing Center of the Presidium of the NAS of Ukraine.

Introduction of research projects means planning, accounting, and control over the implementation of R&D works carried out by the institutions of the NAS of Ukraine within the framework of government, targeted and competitive, departmental, pilot, and contractual projects. The research projects are introduced by the entities of DIT ROA of the NAS of Ukraine.

In the framework of the second stage of creation of DIT ROA of the NAS of Ukraine in 2015, its second line was developed, which covered the expanded composition of entities and the expanded composition of documents. In accordance with the Order of the Presidium of the NAS of Ukraine No. 435, dated June 17, 2015, in the divisions of mathematics, computer science and mechanics of the NAS of Ukraine and in five R&D

institutions of the NAS of Ukraine, an experimental exploitation of the system was conducted.

Within the framework of the third stage of the creation of DIT ROA of the NAS of Ukraine in 2016, in accordance with the Orders of the Presidium of the NAS of Ukraine No. 58, dated 02.02.2016, and No. 219, dated April 8, 2016, a complex of works on the development and implementation of DIT ROA of the NAS of Ukraine in the institutions, divisions and separate structural subdivisions of the apparatus of the Presidium of the NAS of Ukraine was carried out, namely:

- ✦ Development and implementation of the software and information components of DIT ROA of the NAS of Ukraine to support the competitions and implementation of R&D projects of institutions of the NAS of Ukraine (R&DPC);
- ✦ Development of the information and software components of DIT ROA of the NAS of Ukraine, implementation of functional development and support;
- ✦ Implementation of the developed components of DIT ROA of the NAS of Ukraine in the institutions and divisions of the NAS of Ukraine.

Introduction in the industrial operation of DIT ROA of the NAS of Ukraine has showed that this technology is an effective tool for the formation and analysis of research projects. It significantly reduces the time of documents processing, allows you to create the electronic and printed versions of a number of documents, analytical and informational materials in accordance with the regulations, as well as to obtain accurate and qualitative statistical table and graphic reports on the various parameters at the level of institutions, divisions, sections and the NAS of Ukraine, as a whole.

Implementation of works at three stages of creation of DIT ROA of the NAS of Ukraine was carried out within the framework of R&D projects of the NAS of Ukraine for 2014–2016.

#### **CONCEPTUAL PROVISIONS FOR THE CREATION OF DIT ROA OF THE NAS OF UKRAINE**

The conceptual provisions for the creation of DIT ROA of the NAS of Ukraine are based on the

application of such modern methods of design and development of complex information systems:

- ✦ Principles of designing of the really effective automated systems of organizational management, as outlined by Glushkov in his monograph «Fundamentals of Paperless Informatics» [1, 407], remain crucial for the tasks of creating the modern complex DITs. Such principles are as follows: automation of document circulation, integral information base, single-data input, dynamic integrity, system unity, typicality (universality and unification) and modularity;
- ✦ Methodologies of Object-Oriented Programming and Modeling (based on standardized UML, BPEL4WS 1.1 specifications, etc.), system and structural-functional analysis as well as a modular approach to the software development (software) using the world-class standards and approaches (Structured Analysis & Design Technique – SADT, Service Oriented Architecture – SOA, Information Technology Infrastructure Libraries – IT Infrastructure Library – ITIL, etc.), Microsoft Methodologies (*Operations Framework – MOF, Solutions Framework – MSF, Windows Communication Foundation – WCF*), as well as domestic standards (in particular, the GOST 34 group for the development of automated control systems and the GOST 19 group of standards for a single software documentation system (SSDS,) etc.;
- ✦ Creation of informational and functional models and program components that are adequate to the objects of the SOA processes of the structural subdivisions of the Presidium's apparatus, the offices of divisions and institutions of the NAS of Ukraine in accordance with the norms of the current legislation and regulations of the normative legal acts regulating the relevant types of documentary management activities of the NAS of Ukraine;
- ✦ Use of modern service-oriented and cloudplatforms, architectures and technologies, methods and infrastructures of distance support and training, which, in particular, form the basis of system solutions of integrated platform (IP) of

the Presidium's Data Processing Center of the NAS of Ukraine;

- ✦ Orientation to the familiar and user-friendly *MS Office System* platform.

In order to accelerate design and development the authors used the methodology of iterative design, phasing of development and implementation of the system and its components, based on the experience of similar developments and on the demonstrations to users of existing prototypes of system for the purpose of early estimation of their consumer properties. Transfer of existing prototypes of the system into experimental and industrial samples with the pre-set scenarios of work stimulates early integration, more complete consciousness of compromises in design and early elimination of errors in the architecture of subsystems. Under such conditions, the design of information and software components is carried out in parallel with the development of existing prototypes of the system in order to reconcile with the users the necessary consumer properties of the information technology and to specify further steps relating their design, development and implementation.

DIT ROA of the NAS of Ukraine is based on the approach developed by Glushkov Institute of Cybernetics of the NAS of Ukraine regarding the creation of DIT using the concept of life cycle of the processing of a structured electronic document as the basic information object for the design, development, operation and maintenance of DIT [2–5], namely:

- ✦ The life cycle of ED processing is a set of all interconnected stages of ED processing from the moment of its creation, processing and consideration till the termination of existence (deposit in the archives).
- ✦ Structured ED is the main informational object of the system, which is an indivisible set of information, practiced by the user in the form of electronic (EF) or paper forms, and it is used for the regulated arrangement of work and interaction between different users of DIT.

The following concepts [2–3] are used to describe the design decisions, tasks of the types of

provision of DIT ROA of the NAS of Ukraine (information, software, methodological, technological, etc.):

- ✦ Technological processing of ED is an indivisible ED processing operation performed by the user, and it converts ED from one state of the processing life cycle to another;
- ✦ Technological processing of ED is a set of technologically interrelated ED processing operations performed by the user. The technological procedure corresponds to the stage of the life cycle of ED processing, it also implements the processing of ED at a certain stage and ensures the transition of ED to another stage of processing. The main technological processes performed by users are as follows: creation of ED, ED registration, ED coordination, ED approval, transfer or delegation of rights to access and processing of electronic document to another user;
- ✦ Classifier of the state of ED processing life cycle is a code task of all states and stages of ED that provides a unique code for any state and stage of ED throughout its life cycle. It is intended for the maintenance of technological schemes of ED processing, monitoring of ED processing states and monitoring of user activity;
- ✦ Technological scheme of ED processing is a set of technologically interconnected ED processing procedures executed by different users using the various automated workstations (AWs);
- ✦ Regulations define a set of interconnected technological schemes of ED processing by DIT entities with the use of automation means and definition of functional obligations of all IT entities of;
- ✦ User profile is a digital account in domain nas.gov.ua, namely, the minimum information about the user (name, information about the official status: place of work, position, science degree, etc., an account in the domain nas.gov.ua, etc.), as well as information about the available corporate system and information resources as a part of DPC of the Presidium of the NAS of Ukraine (e-mail, communication tools, database system, etc.) and possible joint activity;
- ✦ User role consists of the following set: user profile, available document space (types, lists, groups of documents, individual documents, etc.) or parts of documents available to the user, as well as technological operations and technological processes which the user can carry out with the specified documents. Roles are assigned to the user automatically when he is registered in the system based on his position and may later be changed by the system administrator or by the user who has a corresponding role in the management of the access of subordinate users;
- ✦ The virtual automated workstation (AW) of a specialist consists of a set of role or several roles of the user, which he performs within DIT framework, provided by a web browser using the web services.

#### **ARCHITECTURE OF DIT ROA OF THE NAS OF UKRAINE**

For creating the system the authors choose a model for multi-level service-oriented architecture (SOA) with the use of web services aimed at widespread involvement of Intranet technologies, which enables to effectively solve the data exchange tasks both between the R&D institutions of the NAS of Ukraine and their actual interaction with the external correspondents, for example, with the government bodies, foreign research institutions, libraries, etc., as well as with a variety of system platforms (*MS Windows, UNIX, Linux, MAC*, etc.).

The client part of DIT ROA of the NAS of Ukraine consists of specialists' AWs provided by a web browser, using the web services, and determined by the user's role assigned to him when registering in the system or by an administrator responsible for the appointment. The server part includes a web server and database server (DB).

The structure of the components of DIT ROA of the NAS of Ukraine is as follows (Fig. 1):

- ✦ Intranet site for the staff of the Presidium of the NAS of Ukraine;
- ✦ Intranet site for the R&D institutions of the NAS of Ukraine;

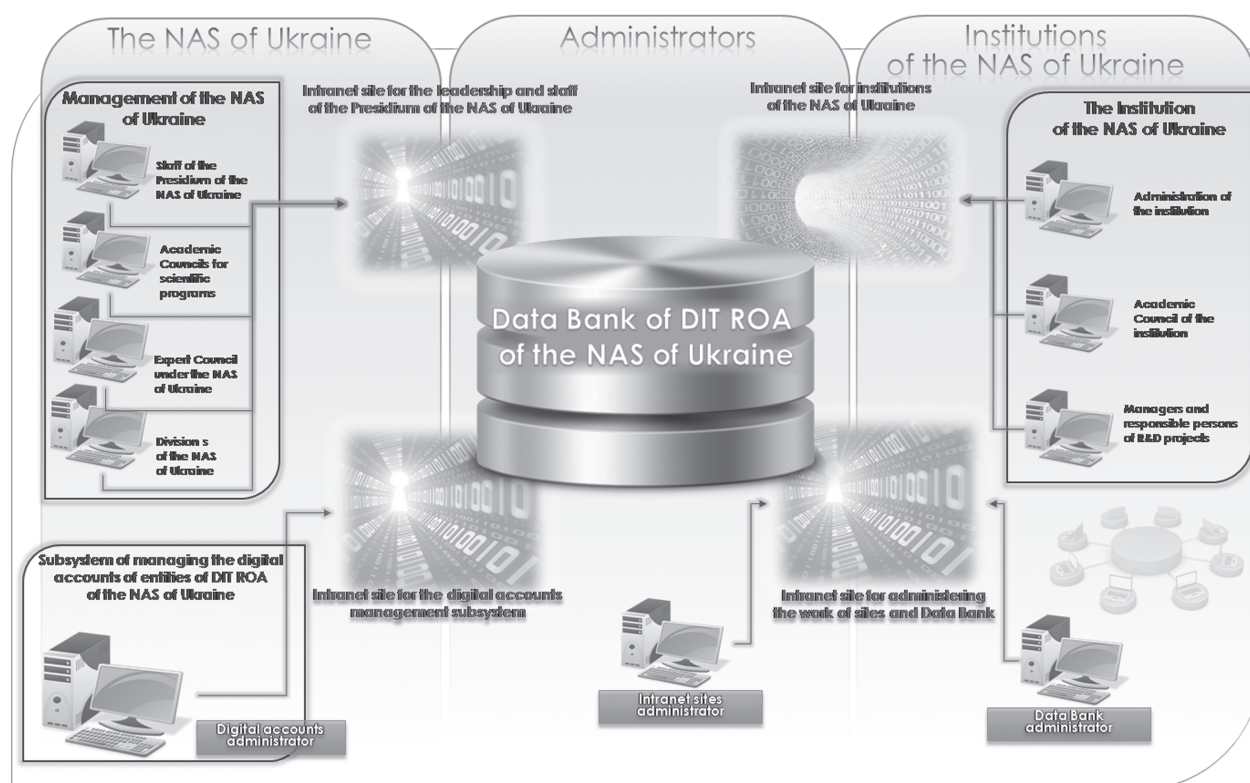


Fig. 1. Structural and functional scheme of DIT ROA of the NAS of Ukraine

- ✦ Data bank of DIT ROA of the NAS of Ukraine in the database: «Normative Reference Information», «Institutions of the NAS of Ukraine», «Directors of Institutions, Members of the Directorate, Directors for Research Issues and Responsible Executives of the R&Ds of the NAS of Ukraine», «State Target and Competition Programs of the NAS of Ukraine», «Research Works of the NAS of Ukraine»;
- ✦ Subsystem of managing the digital accounts of entities of DIT ROA of the NAS of Ukraine (services of synchronization with the system of managing the digital accounts of users of the domain nas.gov.ua, as a part of the Data Processing Center of the Presidium of the NAS of Ukraine), which is provided by the Center of Practical Informatics of the NAS of Ukraine;
- ✦ An administrative Intranet-site for administering the work of two sites mentioned above and the DIT ROA of the Databank of the NAS of Ukraine.

The databank of DIT ROA of the NAS of Ukraine was developed using the database management system *MS SQL Server 2008 R2* or higher versions. It consists of the above databases. Intranet-sites are based on *MS Internet Information Server v. 7.0* using the following software technologies, platforms and their components:

- ✦ *Microsoft.NET Framework*, version 4.5 or higher (including *Windows Communication Foundation*) – software technology as a platform for creating the ordinary programs and Web applications;
- ✦ *ASP.NET MVC 5* – a platform for creating the Web-applications implementing the *Model-view-controller* template;
- ✦ *Nhibernate*, version 3.0 and higher, *Log4Net*;
- ✦ *Jquery*, version 8 and higher.

Information interaction between the users of DIT ROA of the NAS of Ukraine is realized with the help of Intranet-sites and the data bank of the system.

# COMPOSITION OF ENTITIES AND DOCUMENTS OF DIT ROA OF THE NAS OF UKRAINE

The organizational structure of DIT ROA of the NAS of Ukraine generally reflects the organizational structure of the processes of formation and control over the execution of scholarly research in the NAS of Ukraine and includes different levels and entities (see Table 1).

From a technological point of view, the documents of DIT ROA of the NAS of Ukraine are conditionally divided into original, derivative and reporting documents.

The original documents include documents that are entered and corrected in the automated mode by the entities of information technology and stored in the database.

The derivative documents are formed automatically on the basis of original documents data, then supplemented with the necessary data, corrected in the automated mode by the entities of information technology and stored in the database.

The reporting documents are formed automatically on the basis of the data of original documents.

The organizational structure and the entities of DIT ROA of the NAS of Ukraine are given in Table 1.

DIT ROA of the NAS of Ukraine provides support for the users with the following list of original documents:

- ✦ Card of the R&D institution;
- ✦ Card of the R&D unit of the institution;
- ✦ Card of the R&D program;
- ✦ Card of the division of the NAS of Ukraine;
- ✦ Questionnaire of a member of the directorship of the institution, research team leader and responsible person;
- ✦ R&D card;
- ✦ Request for the opening of R&D;
- ✦ Decision of the Expert Council on the evaluation of the topics of the fundamental research works at the NAS of Ukraine;
- ✦ Protocol of acceptance and evaluation of R&D works (for the departmental research projects of the NAS of Ukraine).

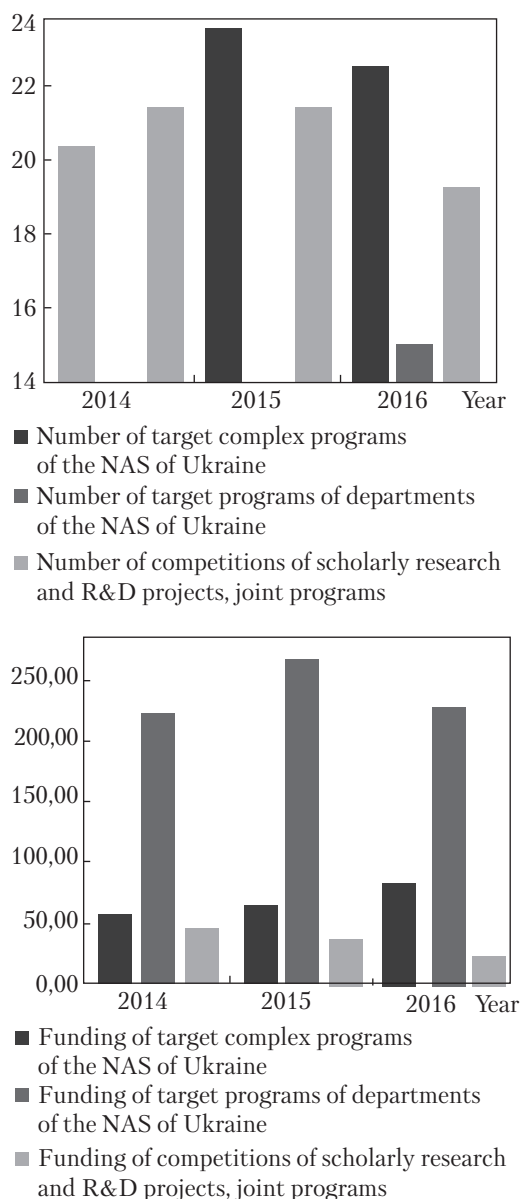
Table 1

## Organizational Structure and the Entities of DIT ROA of the NAS of Ukraine

№	Level	Entities of DIT ROA of the NAS of Ukraine
I	Departments of R&D institutions	Responsible person of R&D; R&D Chief; Head of department of R&D institution.
II	Administration of R&D institutions	Staff of Scientific Secretary Office of R&D institution; Scientific Secretary of R&D institution; Director of R&D institution.
III	Division of the NAS of Ukraine	Division staff; Scientific Secretary of Divi- sion; Academic Secretary of Divi- sion.
IV	Scientific councils of target and competition programs of the NAS of Ukraine	Secretary ofScientific Cou- ncil; Chairman of the Scientific Council.
V	Expert Council on the evaluation of topics of fundamental research in the NAS of Ukraine	Secretary of Expert Council; Chairman of the Expert Co- uncil.
VI	Research-organizational department of the Presidium of the NAS of Ukraine	Sector staff; Scientific Secretary of the Sector; Head of the Sector; Head of Research-Organ- izational Department.
VII	The NAS of Ukraine	Chief Scientific Secretary of the NAS of Ukraine; Vice-President of the NAS of Ukraine; President of the NAS of Uk- raine.

DIT ROA of the NAS of Ukraine provides support for the users with the following list of derivative documents:

- ✦ Registration card of R&D;
- ✦ Information card of R&D products (RDP);
- ✦ Account card for R&D;
- ✦ Working plan for the execution of R&D works.



**Fig. 2.** Statistical indicators of software-oriented projects of the NAS of Ukraine

In DIT ROA of the NAS of Ukraine there are 12 types of reporting documents, each of them can be presented in several ways: reporting data relating the institution, division of the NAS of Ukraine, departments in the institutions, section of the NAS of Ukraine, and relating the NAS of Ukraine. In total, the formation of accounting documents includes 39 options given in Table. 2

*Table 2*

**List of Reporting Documents of DIT ROA of the NAS of Ukraine**

Name of reporting document	Reporting data on options*				
	1	2	3	4	5
Thematic plan of scholarly research of the institution of the NAS of Ukraine	+				
Table 1. General data relating the topics of R&D institutions of Divisions of the NAS of Ukraine		+		+	+
Table 1 (extended). General data relating the topics of R&D institutions of Divisions of the NAS of Ukraine (detailed information relating the fundamental, applied topics) and fund (general, special).		+		+	+
Table II. Data on topics and volume of research works executed by the institution.	+	+	+	+	+
Table II-1. Data relating the volumes of financing on the topics of fundamental, applied research and on the themes executed on the order of state target programs from the General Fund of the State Budget.	+	+	+	+	+
Table III-1. Data relating the execution of R&D on the order of external organizations (under the contracts, including the foreign economic contracts).	+		+	+	+
Table IV. Use of research results in the state economy.	+	+		+	+
Information on the results of expertise of the fundamental work topics.		+		+	+
Software-targeted and competitive topics of the NAS of Ukraine		+		+	+
State topics of the NAS of Ukraine		+		+	+
Competitions on the departmental topics of the NAS of Ukraine		+		+	+
Register of R&D projects of the NAS of Ukraine.		+		+	+
In all:	5	13		11	11
TOTAL:		39			

\* 1 – institution; 2 – division; 3 – departments in the institutions; 4 – section; 5 – the NAS of Ukraine.

In addition, the AW of the Head of the Sector of the Research-Organizational Department of the Presidium and the AW of the Chief Academic Secretary of the NAS of Ukraine implemented forms for submitting the analytical information in the form of different diagrams, which are dynamically formed on the basis of the database of DIT ROA of the NAS of Ukraine in different segments and time ranges. Fig. 2 shows the structural-functional scheme of DIT ROA in the NAS of Ukraine.

### MAIN AW AND TECHNOLOGICAL SCHEMES OF DIT ROA OF THE NAS OF UKRAINE

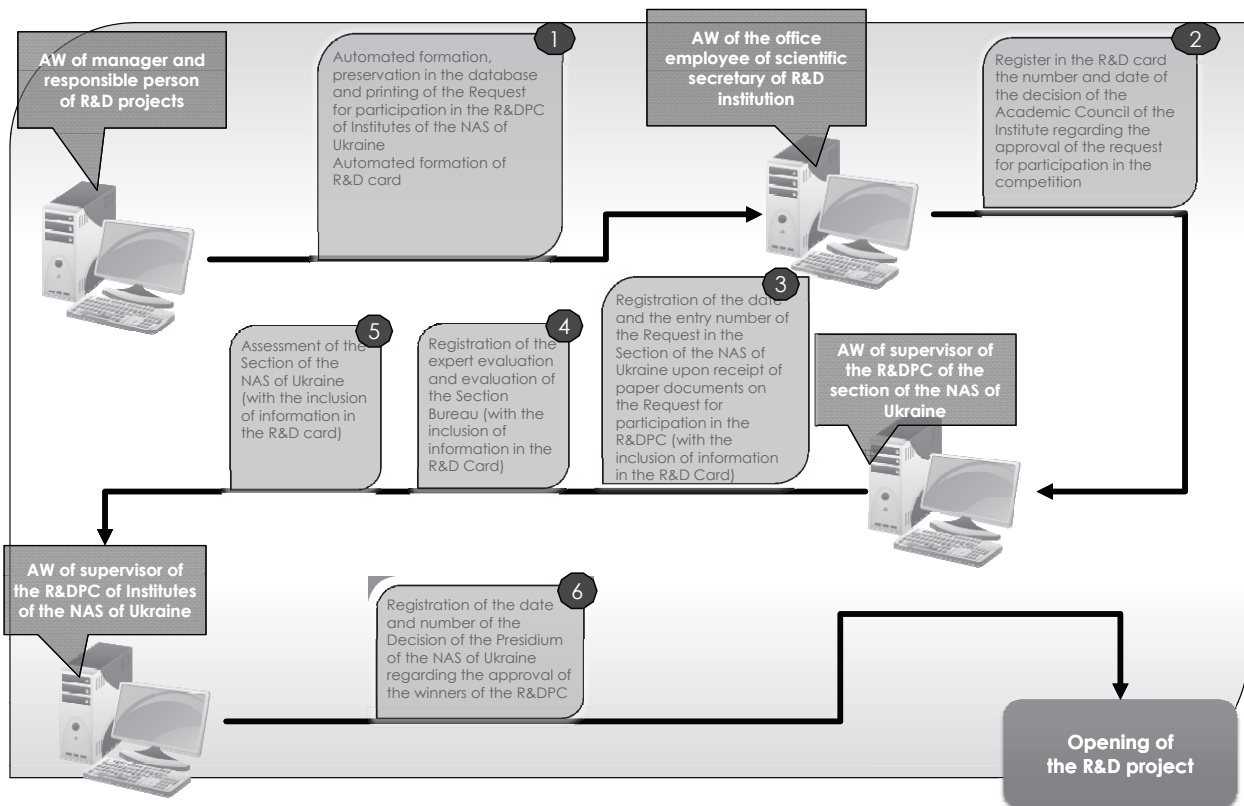
Technological and functional capabilities of DIT ROA of the NAS of Ukraine were provided to the users in the AWs of eight types:

- ✦ AW of manager and responsible person of R&D project;

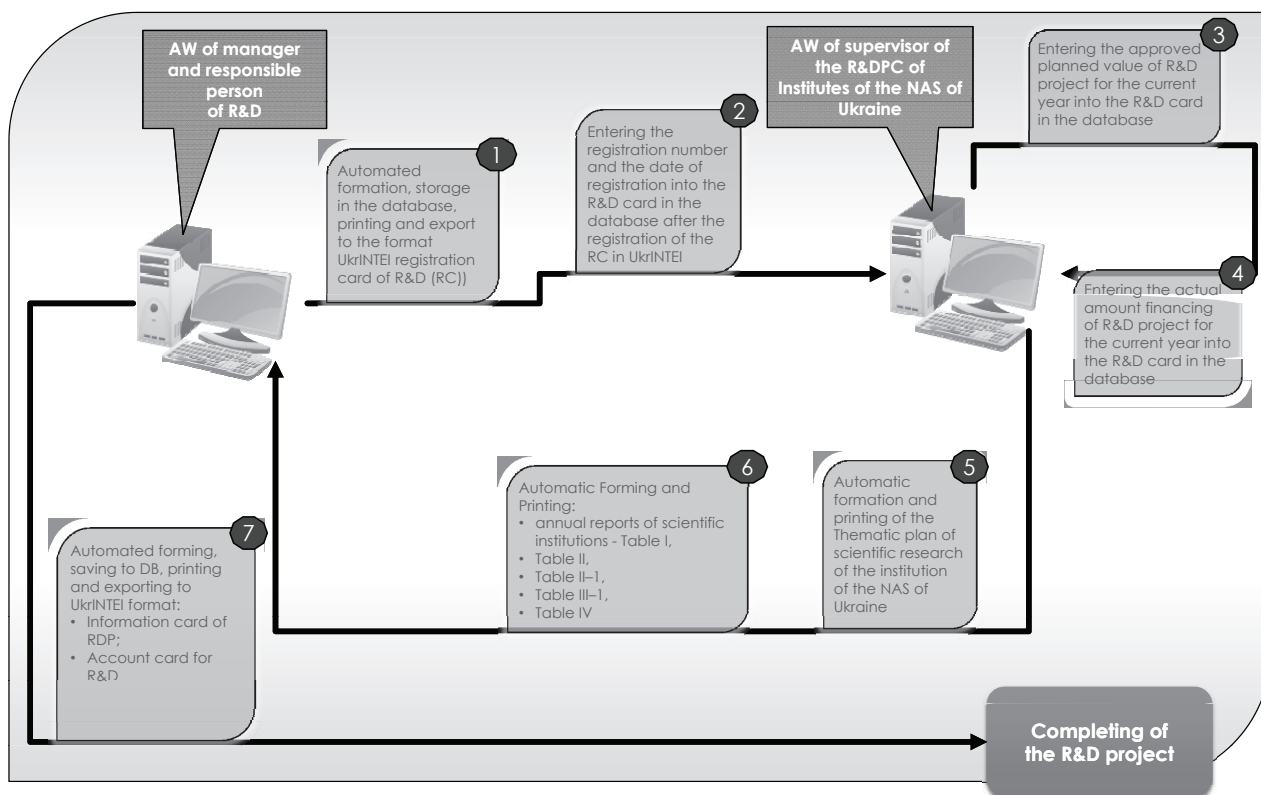
- ✦ AW of the staff of Scientific Secretary office of R&D institution;
- ✦ AW of the supervisor of the R&DPC of the section of the NAS of Ukraine;
- ✦ AW of the supervisor of the R&DPC of the NAS of Ukraine;
- ✦ AW of the Academic Secretary of the Division of the NAS of Ukraine;
- ✦ AW of Secretary of the Expert Council of the NAS of Ukraine;
- ✦ AW of the Head of the Sector of the Research and Organizational Department of the Presidium of the NAS of Ukraine;
- ✦ AW of the Chief Scientific Secretary of the NAS of Ukraine.

DIT ROA of the NAS of Ukraine supports the following main technological schemes:

- ✦ Opening a new topic on the departmental themes of scholarly research of the NAS of Ukraine;



**Fig. 3.** Technological scheme of opening of R&D project which is submitted for the competition using the means of DIT ROA of the NAS of Ukraine



**Fig. 4.** Technological scheme of execution and completion of the R&D project using the means of DIT ROA of the NAS of Ukraine

- ✦ Opening a project submitted to R&DPC of the NAS of Ukraine;
- ✦ Opening a new topic on the state, targeted, competition, search and contractual projects of scholarly research of the NAS of Ukraine;
- ✦ Execution and completion of the topic on all types of scholarly research themes of the NAS of Ukraine.

The execution of the specified technological schemes by all entities of the NAS of Ukraine ensures the automatic formation of all 39 reports with the reliable information at any given time.

Technological support of DIT ROA of the NAS of Ukraine is defined as a set of technological schemes, according to which the collective, regulated and interconnected work with the typical objects — structured electronic documents — is carried out. This work is carried out by the staff of R&D institutions, organizations and the Pre-

sidium of the NAS of Ukraine located throughout Ukraine.

Figs. 3—4 show the technological schemes for the opening a R&D project, which is submitted to the competition, its implementation and completion using the facilities of DIT ROA of the NAS of Ukraine.

The list of information technology entities involved in the implementation of the indicated technological schemes was given above. The main technological operations carried out within these schemes are performed with the help of such AWs:

- ✦ AW of manager and responsible person of R&D;
- ✦ AW of the office employee of scientific secretariat of R&D institution;
- ✦ AW of supervisor of the R&DPC of the section of the NAS of Ukraine;
- ✦ AW of supervisor of the R&DPC of the NAS of Ukraine.

## **CONCLUSIONS AND PROSPECTS FOR FURTHER DEVELOPMENT OF THE SYSTEM**

Thanks to the well-grounded comprehensive implementation strategy of DIT ROA of the NAS of Ukraine in 2016, the database was significantly (close to 100 percent) filled with the information on the R&D works carried out during the specified time period. System resources allow to quickly receive the indicators of the state of filling the database for different levels of the organizational structure (institution, division, section of the NAS of Ukraine), on a certain date, on different types of research project, by types and kinds of documents according to the stage of their life cycle. A significant result was the ability to receive and print the analytical information in the form of diagrams. A large-scale work was done on the registration of the system entities and their training. As of December 30, 2016, 8427 entities of the system were registered, namely, research team leaders, responsible persons of the R&D, directors of R&D institutions, members of the Presidium and Administration of the NAS of Ukraine. Each of the entities of DIT ROA of the NAS of Ukraine was provided with a digital account at the domain [nas.gov.ua](http://nas.gov.ua), the user profile and a role (or several roles) with the corresponding rights of access to the software and information resources of DIT.

Introduction into the industrial operation of DIT ROA of the NAS of Ukraine has shown that this technology is an effective tool for the formation and analysis of research project.

The main results and advantages of using the DIT ROA system of the NAS of Ukraine are as follows:

- ✦ Creation and technological management of information resources on the scholarly research and organizational activity for their use by the responsible persons and research team leaders of the topics, staff of sub-units of R&D institutions of the NAS of Ukraine, directors of R&D institutions, divisions of the NAS of Ukraine, staff of the sectors of the Research and Organizational Department of the Presidium of the

NAS of Ukraine, the Administration of the NAS of Ukraine;

- ✦ Significant reduction in the time of the leading researchers of the NAS of Ukraine to perform routine work related to the registration of documents that accompany the opening, execution and completion of research projects;
- ✦ Increasing the validity and efficiency of making management decisions on the SOA at all levels of the organizational structure of the NAS of Ukraine at the expense of ensuring the completeness and reliability of information;
- ✦ Substantial reduction in the capital and operating costs for the informational support of scholarly research and organizational activity of the NAS of Ukraine due to the creation of the Unified Distributed Information Technology of the NAS of Ukraine;
- ✦ Accelerated introduction of new approaches to the organization and possible reformation of scholarly research and organizational activities of the NAS of Ukraine due to the use of information resources and the unified information technology of the NAS of Ukraine.

Presidium of the NAS of Ukraine by its Resolution No. 145 dated 07.07.2016 «On the State of Implementation of the Concept for the Development of the NAS of Ukraine and measures to implement the Resolution of the General Meeting of the NAS of Ukraine № 3 dated 14.04.2016», approved the plan of measures, which includes the following direction: «To start the implementation of the Distributed Information Support Technology of research and organizational activity of the NAS of Ukraine, as well as to work on the expansion of its functional» [6].

As a result of the implementation of the developed DIT ROAs of the NAS of Ukraine in 2016, within the framework of this direction, the plan of measures of the Presidium of the NAS of Ukraine includes a proposal to create the Unified Distributed Information Technology Support for scholarly research and Organizational Activities of the NAS of Ukraine (UDIT ROA, the NAS of Ukraine). Such a system should provide the com-

prehensive information support of research and organizational activities at the levels of institutions, divisions, sections and the Presidium of the NAS of Ukraine. It is justified that it makes sense to create the UDIT ROA of the NAS of Ukraine within the framework of the research-oriented-project of the NAS of Ukraine. This approach will ensure the balance and consistency of decision-making, the appropriate allocation of priorities and the creation of an effective work coordination mechanism. Within the framework of the research-oriented project on the creation of the UDIT ROA of the NAS of Ukraine it is proposed to perform the following tasks:

- + Creation and development of functional and technological capabilities of the full set of the specialists' AWs, as well as ensuring the support of a complete list of documents for the formation, control and evaluation of the execution of research projects in the NAS of Ukraine;
- + Creation of a number of the following subsystems:

1) Supporting the competitions and the R&D works on the targeted programs for scholarly research and targeted projects of the NAS of Ukraine;

2) Keeping the register of publishing products of the institutions of the NAS of Ukraine, providing information support of control over the issue of these products;

3) Conducting the activities of R&D institutions of the NAS of Ukraine on the creation, protection, and on the use of intellectual property rights objects;

4) Electronic document circulation based on the use of electronic digital signature;

5) Software and hardware complex of the server part;

6) Accredited certification center of electronic keys of the NAS of Ukraine;

7) Complex of information protection means of UDIT ROA of the NAS of Ukraine;

8) Support of information and software components of UDIT ROA of the NAS of Ukraine.

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## ОСНОВИ СТВОРЕННЯ РОЗПОДІЛЕНОЇ ІНФОРМАЦІЙНОЇ ТЕХНОЛОГІЇ ПІДТРИМКИ НАУКОВО-ОРГАНІЗАЦІЙНОЇ ДІЯЛЬНОСТІ НАН УКРАЇНИ

**Вступ.** Розробка і впровадження розподілених інформаційних технологій (РІТ) у діяльність органів влади є потребою часу й відповідає Концепції розвитку електронного урядування, широко визнаної у світі та схваленої Розпорядженням Кабінету Міністрів України № 2250-р від 13.12.2010.

**Постановка задачі.** Розробка РІТ підтримки науково-організаційної діяльності (РІТ НОД) НАН України є першочерговим завданням серед завдань інформатизації керування діяльністю НАН України.

**Мета.** Розробка РІТ НОД НАН України, пов'язаної з обробкою документів, які супроводжують відкриття, виконання, контроль, облік, закриття науково-дослідних (НДР) і дослідно-конструкторських робіт (ДКР).

**Матеріали і методи.** У роботі застосовано методи створення РІТ з використанням концепції життєвого циклу обробки структурованого електронного документу як базового інформаційного об'єкту проектування, розробки, функціонування та супроводження РІТ.

**Результати.** Застосування РІТ НОД НАН України дозволило суттєво прискорити обробку зазначених вище документів, забезпечити коректність і повноту інформації щодо НДР та ДКР, коректність й оперативність статистичних звітів про виконання НДР і ДКР установ НАН України.

**Висновки.** Запропоновано створити Єдину розподілену інформаційну технологію підтримки науково-організаційної діяльності НАН України (ЄРІТ НОД НАН України) для комплексної інформатизації науково-організаційної діяльності НАН України.

**Ключові слова:** розподілена інформаційна технологія, науково-організаційна діяльність, структурований електронний документ, банк даних.

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## ОСНОВЫ СОЗДАНИЯ РАСПРЕДЕЛЕННОЙ ИНФОРМАЦИОННОЙ ТЕХНОЛОГИИ ПОДДЕРЖКИ НАУЧНО-ОРГАНИЗАЦИОННОЙ ДЕЯТЕЛЬНОСТИ НАН УКРАИНЫ

**Введение.** Разработка и внедрение распределенных информационных технологий (РИТ) в деятельность органов власти является требованием времени и соответствует Концепции формирования электронного правительства, широко признанной в мире и утвержденной Распоряжением Кабинета Министров Украины №2250-р от 13.12.2010.

**Постановка задачи.** Разработка РИТ поддержки научно-организационной деятельности (РИТ НОД) НАН Украины является первоочередной задачей среди задач информатизации управления деятельностью НАН Украины.

**Цель.** Целью работы является создание РИТ НОД НАН Украины для информатизации обработки документов, сопровождающих открытие, выполнение, контроль, учет, закрытие научно-исследовательских (НИР) и опытно-конструкторских работ (ОКР).

**Материалы и методы.** В работе применены методы создания РИТ, основанные на концепции жизненного цикла обработки структурированного электронного документа, как базового информационного объекта проектирования, разработки, функционирования и сопровождения РИТ.

**Результаты.** Применение РИТ НОД НАН Украины позволило намного ускорить обработку перечисленных выше документов, обеспечить корректность и полноту информации о НИР и ОКР, корректность и оперативность статистических отчетов о выполнении НИР и ОКР институтами НАН Украины.

**Выводы.** Предложено создать Единую распределенную информационную технологию поддержки научно-организационной деятельности НАН Украины (ЕРИТ НОД НАН Украины) для комплексной информатизации научно-организационной деятельности НАН Украины.

**Ключевые слова:** распределенная информационная технология, научно-организационная деятельность, структурированный электронный документ, банк данных.