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Yakovlev M. Yu., doctor of Technical Sciences, Professor, Chief Researcher of the Scientific-Research Center of the Service-Combat Activity of the National Guard of Ukraine.

ORCID ID: 0000-0002-3009-0719

Stryzhak O.Y., Doctor of Technical Sciences, Professor, Chief Researcher. Central Scientific Research Institute of Armament and Military Equipment of the Armed Forces of Ukraine, Kyiv

ORCID ID : 0000-0002-4954-3650

Semenko Y. Yu., adjunct. National Academy of the National Guard of Ukraine, Kharkiv.

ORCID ID : 0000-0001-8445-6707

Yevtushenko I. V., PhD of Legal Sciences Associate Professor of the Department Department of Tactics-Special, Fire and Special Physical Training Juridical Personnel Training Institute for the Security Service of Ukraine Yaroslav Mudryi National Law University

ORCID ID: 0000-0003-4299-6398

**CREATION AND APPLICATION OF INFORMATION AND
ANALYTICAL SYSTEMS FOR THE NATIONAL GUARD OF UKRAINE
IN THE INTERESTS OF THE CITIZENS SAFETY ENSURANCE**

The article analyzes the current state of the processes of creation and application of information and analytical systems in Ukraine, formulates the main problematic issues that need to be solved for the effective development and

implementation of information and analytical systems in the interests of ensuring the security of citizens. The specifics of the creation and application of information and analytical systems for the maintenance of decision-making on the use of the National Guard of Ukraine in the interests of ensuring the safety of the population of the state are defined and considered. The substantiation of the methodological bases of creation and use of information and analytical systems to maintain decision-making on the use of the National Guard of Ukraine in the interests of ensuring the safety of citizens is presented.

Keywords: *information and analytical system, National Guard of Ukraine, taxonomy, ontology, cognitive services, transdisciplinarity, safety of citizens, creation, application.*

Introduction. The right to the safety of life is an inalienable human right, so the duty of each state is to preserve the life and health of its citizens. Current legislation of Ukraine provides the implementation of citizens' rights and interests protection, as well as its citizens own security only by legal means [1]. Ensuring public safety is one of the most effective mechanisms for protecting the rights and freedoms of a person and a citizen. One of the main functions of the National Guard of Ukraine is to ensure public safety. The effectiveness of this function depends significantly on the level of information and analytical support of decision-making processes for the use of the National Guard of Ukraine (NGU). Further development of information and analytical support of the NGU involves the creation and application of modern information and analytical systems (IAS).

The aim of the article – is to reveal the peculiarities of creation and application of modern information and analytical systems for the National Guard of Ukraine in the interests of the citizens' safety.

The main task of the article. The NGU is a military formation with law enforcement functions, which is being a part of the Ministry of Internal Affairs of Ukraine (MIAU) system and is intended to perform tasks for the protection and protection of life, rights, freedoms and legitimate interests of citizens, society and

the state from criminal and other unlawful encroachments, protection of public safety and order and public safety, as well as in interaction with law enforcement agencies – to ensure state security and protection of the state border, termination of terrorist activities, activities of illegal militarized and armed formations (groups), terrorist organizations, organized groups and criminal organizations. Its activities are based on the principles of the rule of law, ensuring the observance of the rights and freedoms of a human and a citizen, non-partisanship, continuity, legality, openness for the democratic civil control, transparency, responsibility, centralized leadership and undivided authority.

The effectiveness of the use of the Guard during the implementation of its main functions related to ensuring the safety of citizens depends significantly on the effectiveness of the decision-making. Ensuring the efficiency of the NGU units control in modern conditions is a timely and essential task of military administration bodies. The main direction of its solution is the improvement of the NGU administrative processes through the introduction of modern IAS based on the use of a set of cognitive services and an ontological approach [2-5].

The basis of the experts analytical activity during the maintenance of decision-making on the application of the NGU is information resources, but without the presence of appropriate analytical services, these resources are a passive component of the general information space. The processing of these resources is partial and not integrative, which significantly reduces the efficiency of their use. Their processing requires the use of appropriate software and information support, which are able to implement intelligent cognitive services of integrated analytical processing of the entire narrative of the descriptions of service and combat tasks in the direction of ensuring security for the entire population of the state, that are also able to take into account the content of mass publications reflecting the social processes by which decisions are made. These services should implement linguistic and semantic and conceptual content analysis and structural display of its results for use by all system components.

Analysis of recent research and publications. Analysis of automation of decision-making processes on the operational application of the NGU groupings allowed to establish, that created separate components of information systems were created in each of the direction. However, they are heterogeneous due to the time of creation, the degree of completeness used by technology, the scope of coverage of processes, the scope of data deployment and filling, as well as the possibility of integration into a single information environment based on cognitive processing of information resources, taking into account the principles and standards of the European Union and the North Atlantic Treaty Organization [6-8].

The current state of information and analytical support (and the relevant infrastructure) aimed at realizing the needs of the NGU structural units administration does not meet modern challenges while maintaining decision-making on the NGU use. Integration of information systems in certain areas is absent or fragmented and does not take into account the current requirements for consolidation [7-8], which leads to duplication and insufficient authenticity and completeness of information on the complex administration of the processes of service and combat tasks in general.

Also, the following issues are unresolved: the absence of the unified methodological, scientific, technical and organizational principles and grounded approaches to the creation of the NGU IAS and the introduction of modern cognitive information technologies; lack of the unified data exchange standards between information systems to ensure interoperability; insufficient development of information protection issues (i.e. insufficient level of information security); insufficient branching of information and telecommunication networks and fast data transmission channels; organizational dispersion and functional disconnection of existing information systems; imperfection and incompleteness of legislative regulation of the information systems life cycle both in the MIAU and the NGU; lack of a single organizational and network-centric information-technology platform with a component architecture of cognitive services that implement semantic operability of interaction with information resources [9].

The solution of these problematic issues, which are characterized by the inconsistency of information and analytical support of the NGU, involves the development of a set of purposeful resource support measures, being coordinated both in their terms and volumes. These measures should be aimed at creating modern intelligent IAS in the interests of the NGU based on the component creation of aggregated cognitive decision support services, and the formation of unified information infrastructure of the MIAU in the future. This will ensure the necessary level of efficiency, accuracy and completeness of the information necessary for making administrative decisions on the NGU use in the interests of ensuring the safety of citizens.

Presentation of the main material of the study. 1. Review of the current state of processes of creation and application of information and analytical systems in Ukraine in the interests of ensuring the safety of citizens. Nowadays, for the needs of the NGU, there exist a number of partial automation software (automated, only individual stages) of the decision-making process during the use of the NGU, among which the local and network ones should be outlined.

Local software includes: software complexes "Search", "Dynamics", "Assessment", "Determination of the number of personnel for the protection of particularly important state objects", "Calculation of the group's personnel for military duties"; automated system "Support"; information and calculation systems "Oberig" and "Variant"; geoinformation systems "Tool" and "Argument"; regular mathematical model "Echelon."

Examples of network software complexes are the global automated information system "Hart" of the State Border Guard Service of Ukraine and the automated control system of the Ukrainian Naval Forces "Chersonesos", which allow to automate the collection, storage and initial processing of unstructured heterogeneous data [10]. Nowadays, the only security command center of the region that carries out video surveillance of its administrative borders and records all the cars crossing the borders of this region is located in the city of Dnipro, Ukraine [11].

The implementation of such systems created conditions for the rapid collection and processing of information, the formation and maintenance of general databases, directive information, and information necessary for the forces planning and the NGU use. According to the facts stated above, one of the urgent issues of joint effective use of such systems to maintain decision-making is the problem of forming a single information space.

Thus, the creation of the NGU IAS results both from the objective nature of the process of informatization of society and the development of the NGU, and the lag in the development of informatization tools and new information technologies in the NGU from the national level and the level of law enforcement agencies of the leading countries of the world [12].

Taking into account the practical experience and the information given above, the development of information and analytical support of the NGU is advisable to be carried out in the following areas [2-9]: the introduction of the latest information technologies for the decision-making during the execution of service and combat tasks of the NGU; creation of new technical solutions during the development (modernization) of the NGU IAS; development and improvement of information infrastructure of the MIAU and the NGU taking into account national and international standards; creation of IAS, taking into account the requirements for ensuring interaction between information systems existing and created in MIAU; the use of flexible technological platforms during the implementation of the developed NGU IAS; consideration of the requirements for fault tolerance and catastrophic resistance of the developed NGU IAS; implementation of automatic identification and authentication of users of the NGU IAS, regulated access and exchange of data, ensuring the necessary level of information protection from external and internal threats; improvement of the organizational structure of the NGU IAS, which are being developed.

The formation of the unified information infrastructure of the NGU and the MIAU in general, is advisable to be implemented according to the principles of open taxonomies [2; 5]. This will determine the technological conditions for

consolidated use in the decision-making processes of the entire range of information resources of the MIAU and those corresponding with them in the network space.

Taxonomic mapping of the content systematology of all information resources will ensure the objectivity and high validity of the obtained results of semantic processing of information, and will also ensure the creation of ontological expert platforms for evaluating the current states and making the appropriate decisions [2; 9].

The analysis of the state of development of information systems allows us to assert that today there are three main issues that need to be solved regarding the effective creation and implementation of IAS [9].

Firstly, this is the imperfection of mechanisms for the implementation of interactive services for expert users, where there is a very high heterogeneity of technical platforms on the one hand, and quite a different level of training (and different specializations) of decision-makers, operators and consumers of information on the other one.

Secondly, the lack of effective procedures (mechanisms, algorithms, methods and techniques) of the use of intelligent means of processing information resources in the domain, which, first of all, should include: content analysis and structuring of network information arrays, aggregation of their contexts to the contour of information processing; imperfection of mechanisms of integration of means of extraction and formation of knowledge about controlled processes; identification of latent objects and processes in the network-centric hyper information space.

Thirdly, the almost complete absence of mechanisms for consolidation of information resources and documents used in administrative decision-making processes.

2. Features of the information and analytical systems creation for maintaining decision-making on the use of the National Guard of Ukraine in the interests of ensuring the safety of the state the population. The field of application

of the NGU IAS is the automation of processes and functions of administrative bodies during decision-making on the application of the NGU. The NGU IAS is designed to automate the processes of information, analytical and scientific and methodological support and maintain the adoption of organizational and administrative decisions by the structural units of the NGU based on the network-centric cognitive IT tools, through the integrated use of the necessary information and calculation resources, which have a significant number of interdisciplinary relationships, and were created based on the use of various information technologies and standards, further network-centric management of them and their complex use.

The main purpose of the NGU IAS is to develop and practically implement the software and technical solutions for the creation of the full-scale information and analytical support for the activities of the structural units of the NGU while performing the tasks (functions) assigned to them.

The NGU IAS is created based on the use of ontological principles and technologies for the development of heterogeneous spatially distributed information, which characterizes the stages of the NGU units use. The technological basis of the NGU IAS is the intelligent network-centric cognitive services that can provide analysis, evaluation and selection of necessary information to maintain decision-making on the operational application of the NGU groupings. The NGU IAS is an innovative complex of network-centric software information and methodological means of integrated use of distributed information resources and corporate knowledge systems, reflecting military technologies.

The peculiarity of the NGU IAS, which is being created, is the consideration of a significant number of interdisciplinary relations in the processes of analytical activity and during decision-making, which characterize the descriptions of the processes of service and combat tasks implementation.

Cognitive services of the NGU IAS should provide: integrated processing of distributed information resources and corporate knowledge systems based on

various information technologies and standards; management of information resources with an integrated "single window" access point to the information and applications of the system; interactive interaction with users in the process of solving a wide range of analytical and expert tasks.

The implementation of the NGU IAS should allow structural units of the NGU to perform the functions assigned to them using a wide range of available information and data from various sources of information, their processing and output in the form of reports.

Information processing should be carried out using the means of computing and software means of maintaining information, information-analytical and calculation tasks, which are combined into separate local computer networks or in the form of separate automated workplaces (depending on the tasks performed), which are deployed in the structural units of the NGU in the network environment.

The means that can support the processes of constructive solution of these problems are cognitive and are determined based on the solution of the following categories of cognitive meta-tasking - structuring; analysis/selection of the problem; synthesis; choice. The technologies of solving these metadata implement the representation of narratives of all information resources of the MIAU and the presentation of any forms of interaction of specialized experts with them. Cognitive tools can perform implementation taking into account the full contextual connectivity of the integrated narrative of the information space, which reflects all the states of scientific and technical products. This interaction is carried out based on information processes implemented in different structures of the National Guard, providing transdisciplinary transformations of all documents that reflect them meaningfully. The assessment of their functionality and ability to solve problems that arise in the public life of the country is ensured being based on them.

The requirements for the operational processing of large volumes of dispersed and heterogeneous information resources, mainly represented in the hyper information environment of the MIAU and the NGU, provide for the uniformity and understandability of the information presentation for all consumers

of information. Nowadays, the most effective means of such representation and information processing is ontological engineering. It ensures an effective transition in the field of information management from the data management, characterizing the quantitative aspect of information processes, to the knowledge management, reflecting the qualitative component of these processes. The effectiveness of ontologies is provided by special operations that ensure their complex and repeated use within the framework of the use of various information sources, documentation and information systems created according to various technologies and standards. The following technical problems of representation of different forms of realization of ontologies to the general form are solved: definition of identical terms in different ontologies; ensuring the possibility of adequate transformation of different formalisms of knowledge representation into one, and into other formalisms; organization of knowledge broadcasting, presented in one format, into another one.

The general scheme of interaction with information resources based on cognitive services to ensure the security of citizens of the state is given in Figure 1.

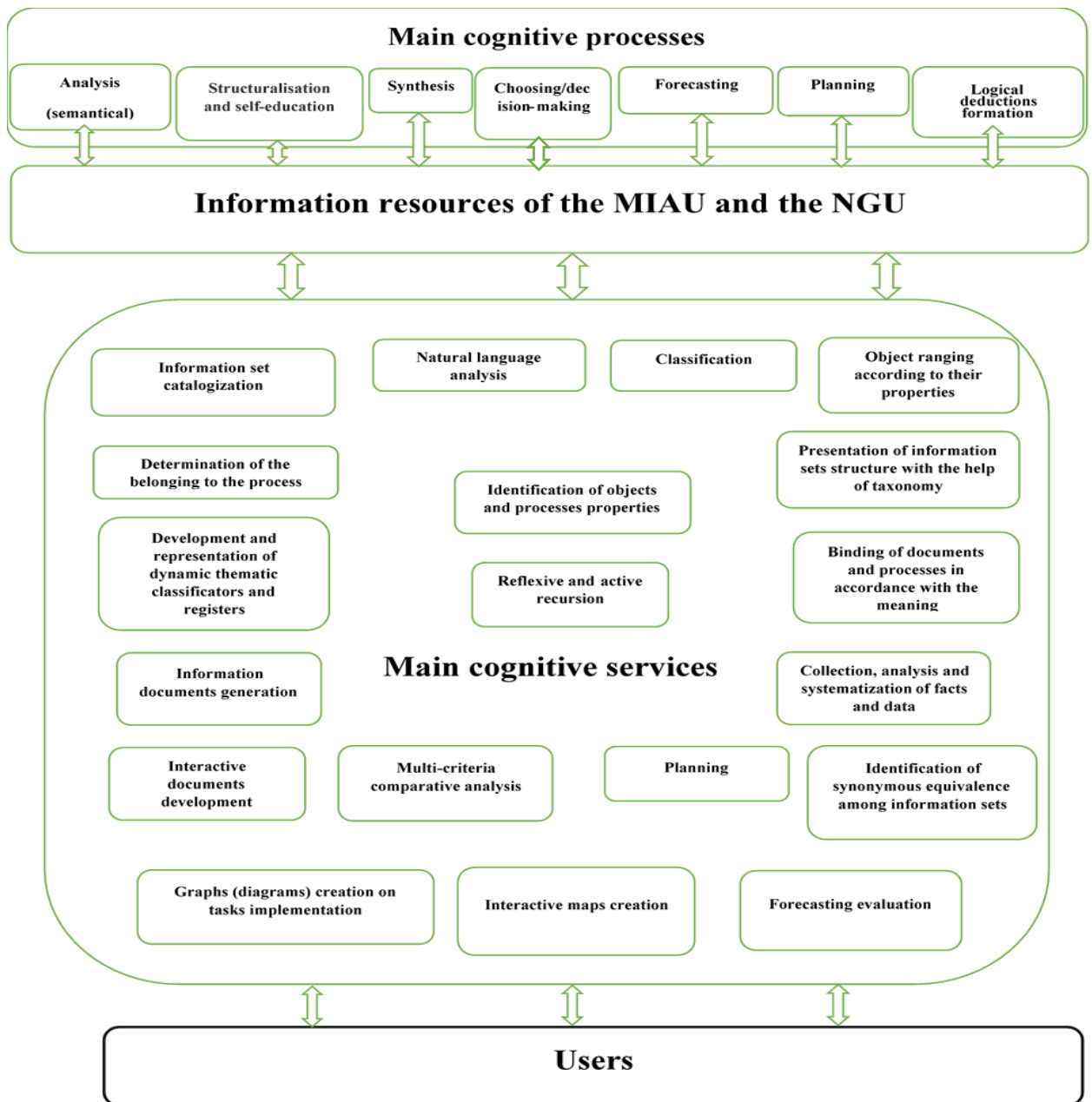


Figure. 1. General scheme of interaction with information resources based on cognitive services to ensure the safety of citizens of the state.

3. *Methodological basis for the creation and use of information and analytical systems to maintain decision-making on the use of the National Guard of Ukraine in the interests of ensuring the safety of citizens.* The methodological basis for the creation and application of the NGU IAS should comprise the following categories: Big Data; transdisciplinary; Data Mining; dynamic programming; lexicography; indicators of service and combat tasks; expert evaluation (including the forecast one); rational choice; decision trees;

multicriterial optimization; machine learning and recognition, etc. Their implementation is based on the principles of transdisciplinary analysis and research, providing integrated use of large volumes of multi-thematic spatially distributed network information resources.

Transdisciplinarity is a meta category based on the ontological representation of the formal relationship between the understanding of individual subject areas of knowledge regarding the application of the NGU. At the same time, there is ensured the formation of logical meta-frames through which the knowledge reflecting the thematic profiles of these subject areas can be integrated at a higher level of abstraction. This integration is used for the information and analytical support of decision-making systems and various expert systems and expert groups. This approach creates conditions for effective consolidated interaction between all system components of the information infrastructure of the MIAU and the NGU, including both units and experts on the one hand and information processes and resources on the other one.

Transdisciplinary ontologies provide and implement the synergy of the perspectives of scientific, technical, expert (academic) and everyday production and user types of knowledge in solving problems regarding the operational use of the NGU groupings. This allows to form information and analytical working environments that interact with each other and in which the interaction of experts and relevant knowledge systems is ensured while maintaining decision-making on the application of the NSU to ensure the safety of the state population [3-4].

Thus, the transdisciplinary approach to the creation of the NGU IAS implements systematization, contextual and structural analysis of subject knowledge, as well as the study of information considering the risks of decision-making in their development. The NGU IAS is created taking into account the necessity to meet the needs of the MIAU and the NGU in the object-oriented development of information infrastructure, taking into account the prospects and tasks for effective management of complex operational tasks and making appropriate management decisions, based on knowledge. Cognitive services of the

IAS fully provide the following functional solutions: semantic and linguistic content analysis of the entire information space of the MIAU and the NGU; establishment of intercontextual links of analyzed information resources; integration of information resources on various thematic profiles; dynamic categorization, ensuring information completeness and relevance of the search; maintaining decision-making using an ontology of rational choice; forecast evaluation of the MIAU and the NGU resource support; management of business processes on creation, modernization and evaluation of armaments of the MIAU and the NGU units; feedback and development, etc.

The main components and constituent parts of transdisciplinary information and analytical environments are shown in Fig. 2. It presents the component architecture of transdisciplinary ontology, which forms the IAS to maintain decision-making on the application of the NGU.

The component architecture of cognitive services ensures the formation of network-centric processes of integrative use of all information resources in the form of a virtual narrative. This creates conditions for the transformation of each scientific, technical and technological documentation of the information space of the MIAU and the NGU into an interactive form.

The main feature that characterizes the transdisciplinary services of the NGU IAS is the organization of expert interaction between themselves and with the information resources of the MIAU and the NGU and other structures that participate in the processes of maintaining decision-making on the operational application of the NGU groups. This is provided based on integrated interaction and sharing of ontologies that reflect the whole set of knowledge that meaningfully describe the processes of maintaining decision-making on the operational application of the NGU groups. Ontology of documents is being the methodological and technological basis of this interaction. Moreover, ontologies directly represent the relevant documents in a network interactive form [2].

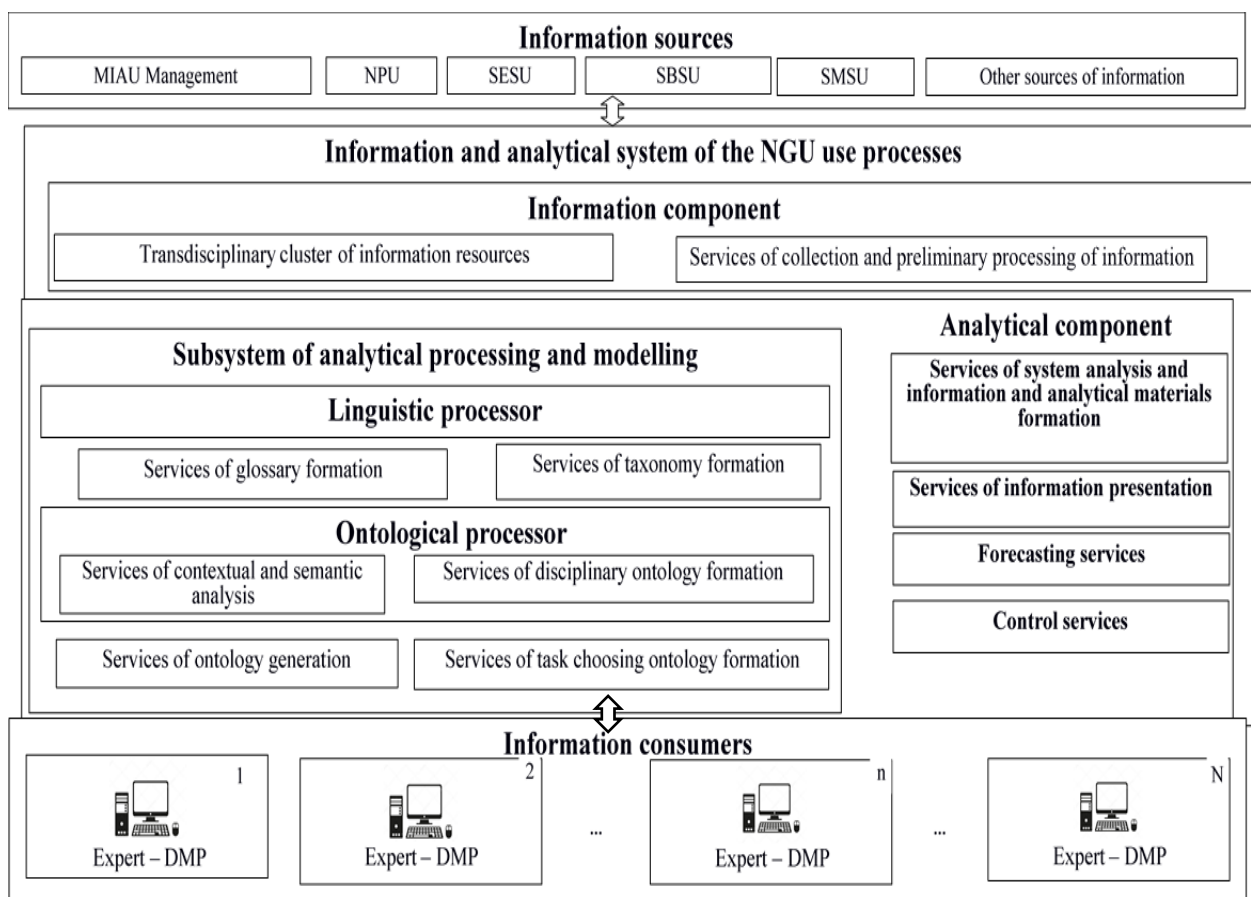


Figure 2. Generalized component architecture of transdisciplinary services in the NGU IAS environment during public safety insurance (NPU – National Police of Ukraine; SESU – State Emergency Service of Ukraine; SBSU – State Border Service of Ukraine; SMSU – State Migration Service of Ukraine; DMP – decision-making person).

Thus, transdisciplinary ontologies as a methodological basis for the creation and application of the NGU IAS are the technological basis for the formation of the unified information space of information resources of the MIAU and the NGU. All the interaction with and between them is implemented based on transdisciplinary services that integrate not only documents but also information systems and databases and knowledge that can reflect the descriptions and state of the processes of execution of military missions within the framework of ensuring the safety of citizens.

Conclusions of the research. The peculiarities of the creation and application of information and analytical systems for the maintenance of decision-making on the use of the National Guard of Ukraine in the interests of ensuring the safety of the population of the state are revealed in the article. The methodological

basis of the creation and use of information and analytical systems for maintaining decision-making on the use of the National Guard of Ukraine in the interests of ensuring the safety of citizens is substantiated. It is shown that transdisciplinary ontologies are the technological basis for the formation of the unified information space of information resources of the Ministry of Internal Affairs of Ukraine and the National Guard of Ukraine to ensure the safety of citizens. *The directions of further research* are the improvement of the method of forming the architecture of the information and analytical system to maintain decision-making on the use of units of the National Guard of Ukraine.

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