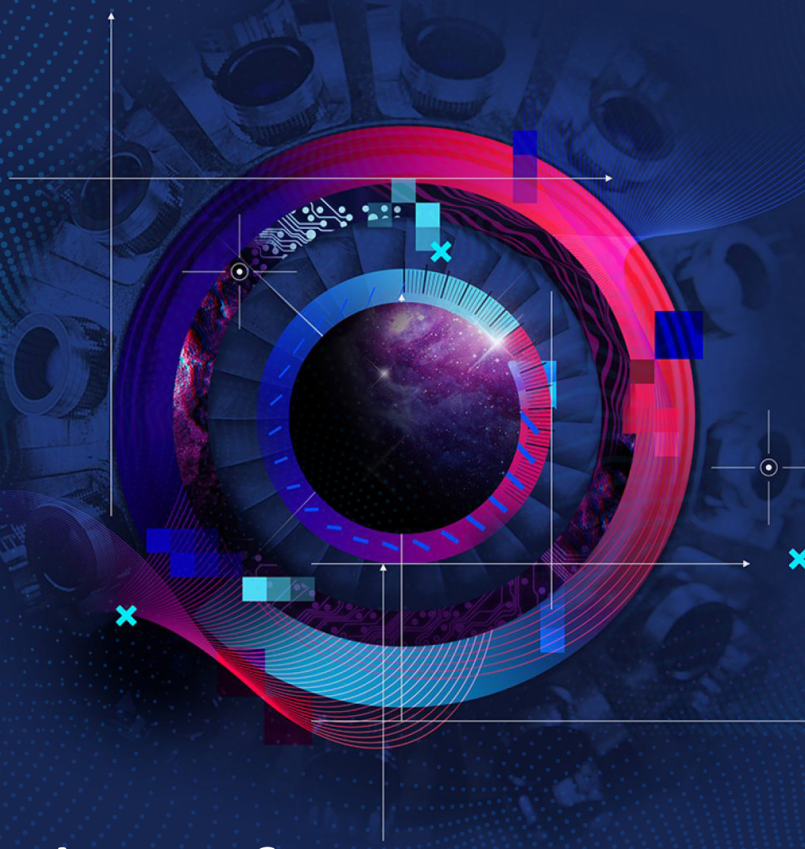

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FOREWORD

Esteemed colleagues!

On behalf of the Ministry of Education and Science of Ukraine, we extend a warm welcome to all participants of the IInd International Conference "Open Science and Innovation in Ukraine 2023." This conference, dedicated to Open Access Week and International Science Day, aims to bring together leading experts in open science and innovation, fostering collaboration for the development of project proposals related to the implementation of open science and innovation principles in Ukraine.

For the second year, the Ministry has organized this conference in support of Ukraine's commitment to open science. We express our gratitude to TIB - Leibniz Information Center for Science and Technology for joining us as organizers this year.

A significant milestone in Ukraine's integration into the global and European scientific landscape, promoting greater openness and facilitating information exchange was the adoption of the "National Plan for Open Science" by the Ukrainian Government in October 2022. The implementation of the National Plan will create conditions for Ukrainian research institutions to fulfill the agreement within the framework of the Horizon Europe Research and Innovation Framework Program and the EURATOM Research and Training Program (2021-2025). Article 6 of the agreement underscores the need to support open science practices in line with the Horizon Europe and EURATOM program rules.

As Ukraine progresses on the path of integration into the European and global scientific arena, it adapts the best practices of transparent science and innovation policies based on research efficiency indicators. The management of scientific activity data is becoming increasingly crucial, with comprehensive and high-quality analytical data serving as a primary source for assessing the outcomes of scientific research and making informed managerial decisions.

National policies and requirements from national grant foundations regarding open access, and research data management, combined with the wave of powerful global initiatives (Initiative for Open Citation, Initiative for Open Abstracts, Initiative of Open Infrastructures, FAIR principles), pose additional incentives and challenges for the Ukrainian scientific community.

Transparent science and innovation policy, based on research efficiency indicators, is particularly important for research communities in developing countries. These communities rely on state financial resources and must demonstrate significant achievements to secure grant support. Therefore, transparent allocation of funds, determination of research priorities, and reflection of scientific excellence are crucial for building and developing research activities.

Moreover, with the onset of the COVID-19 pandemic and subsequent challenges, such as preserving scientific potential and supporting researchers working in evacuation, the Ministry has faced new challenges. These challenges, including the search for resources to maintain the functioning of the scientific system, cannot be overcome without the implementation of open science principles.

The conditions of a pandemic and war demand rapid access to current information for making

crucial decisions in medicine, safety, humanitarian actions, and more. Open science contributes to the accessibility of scientific literature and data for all, which is essential for responding promptly to emergencies. Furthermore, the openness of the scientific process promotes ethical conduct and enhances trust in researchers and their studies. The pandemic and war conditions are often accompanied by the spread of misinformation, and open science can serve as a source of reliable information and evidence-based data.

In essence, the implementation of open science principles contributes to the improvement of research quality, increases the accessibility of scientific information, and promotes international cooperation and development, all of which are crucial for overcoming significant global challenges.

We extend our gratitude to all participants, sponsors, and organizers for their invaluable contributions to the IInd International Conference "Open Science and Innovation in Ukraine 2023." May this conference serve as a platform for fruitful discussions, collaborative initiatives, and the advancement of open science and innovation in Ukraine and beyond.

Best regards,

Denys Kurbatov
Deputy Minister of Education and Science of Ukraine
Ukraine

PREFACE

Last year, under the auspices of the Ministry of Education and Science of Ukraine, we successfully hosted the 1st International Conference "Open Science and Innovation in Ukraine 2022." Despite the challenging circumstances due to Russia's aggression, the conference took place, demonstrating the strong support of the Ukrainian scientific community for the concept of open science. It marked the beginning of an annual tradition coinciding with the International Open Access Week, symbolizing Ukraine's move towards the European scientific community.

It is symbolic that on the eve of the First International Conference "Open Science and Innovation in Ukraine 2022," the Cabinet of Ministers of Ukraine adopted a resolution on the implementation of the "National Plan for Open Science." This plan sets tasks for the Ukrainian scientific community in line with the agreement between Ukraine and the European Union and the European Atomic Energy Community regarding Ukraine's participation in the Horizon Europe Research and Innovation Framework Program and the EURATOM Research and Training Program (2021-2025).

Contemporary scientific communication undergoes numerous technological transformations driven by the rapid development of computer technologies and the global scientific community's commitment to implementing open science policy principles. Optimal online representation of research data, both obtained and associated with the research process (such as information on scientific equipment used or funding details), is a crucial issue requiring practical and timely solutions and the care of the entire academic community. Today, an increasing number of scientific stakeholders agree that key aspects of open science, such as research data storage, management, and exchange, should adhere to the FAIR principles (Findability, Accessibility, Interoperability, and Reusability) developed by experts responsible for integrating data on scientific activity into electronic information systems, making these data accessible, compatible, legally reusable, and facilitating information search on the internet.

Modern technological achievements are actively integrated into scientific practices, leading to the modernization of the entire system of scientific communications, including the implementation of scientific information systems, network versions of electronic publications, and cloud archives. Scientific information databases are an extremely important tool for scientists and researchers in the process of conducting scientific research.

Ukraine confidently strides towards the global and European scientific space, with the academic community actively supporting the paradigm of open science, and the government shaping national policy in accordance with the National Plan for Open Science. The Ministry of Education and Science implements open science principles, adheres to high standards of scientific ethics and responsibility, ensures data and research results openness, and oversees the creation and implementation of the National Electronic Scientific Information System, aiming to facilitate Ukrainian science's development in the field of research cooperation, knowledge exchange, and interaction of research information through open data exchange.

The System is based on international and national methodological and technical standards – the guiding principles of OpenAIRE, FAIR principles, and CERIF data format, collectively serving as a tool to achieve the Euro-integration of Ukrainian science into the global scientific space, implementing European standards in both educational and scientific environments to establish open science and open access principles. The System maintains a high level of

openness and transparency in matters of scientific information placement, allowing users to access scientific information freely and independently of their place of residence.

This approach ensures the maximum availability of scientific information for a wide range of users, contributing to the advancement of scientific research and the enhancement of its quality. In general, open scientific information databases are a vital tool for the development of open science, allowing researchers to quickly and efficiently search, track new research, and promote collaboration among researchers. The principles of open science, including accessibility, openness, transparency, and interaction, are crucial for ensuring the transformation of science and fostering the creation of new knowledge and innovations. Ensuring the openness and accessibility of scientific data and publications is the foundation of open science. The development and support of open scientific databases are essential steps in providing access to knowledge and supporting the scientific community in creating new research and advancing science.

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CHAPTER 1

GAI Openness: What's Behind the Curtain?

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Keywords: Academic integrity, ChatGPT-3.5, Generative AI, Open innovations, Open education.

INTRODUCTION

Generative artificial intelligence (GAI) has become an integral part of educational and scientific activity in universities since November 2022. It has simultaneously occupied several positions in the "umbrella" of open science. As an open educational resource, it provides the opportunity to study and prepare academic courses. As an open innovation and open access tool, it "donates" its algorithm for public use to search and organize information. However, the users themselves modified the original goal - processing data sets and forming a DIKW model for the user. GAI has also emerged as a (g)hostwriting tool. In both cases (used as a basis for analytics and as a tool for writing custom materials), the process and result ("product") of the work of generative artificial intelligence may be associated with violations of academic integrity. The topic "GAI – academic integrity" is gaining popularity [1, 2] with the release of specific recommendations for the use of generative artificial intelligence [3]. Understanding the dangers of using GAI in the context of identifying specific violations of academic integrity determined the relevance of further research.

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MATERIALS AND METHODS

This work uses general scientific methods of analysis-synthesis and deduction-induction. A tool for conducting "experimental" research is ChatGPT-3.5. The hypothesis is formulated as follows: "ChatGPT-3.5. generates content that contains violations of academic integrity". Verification or falsification of the hypothesis was carried out based on working with ChatGPT-3.5 in the "question-answer" mode with the analysis of answers in two directions: the presence of violations of academic integrity in the content and the "opinion" of ChatGPT-3.5 regarding violations of academic integrity in the "products" of its work. All research methods have no restrictions on their use and do not require approval from the ethics committee of a university or professional organization.

EXPERIMENTAL MATERIALS

The experimental materials are the ChatGPT-3.5 database of information and previously acquired knowledge, which it uses to generate content, and ChatGPT-3.5 responses to search queries (questions).

RESULTS

Identification of potential academic integrity violations from the GAI side must be carried out at three stages: the purpose of using GA, the GAI product, and the features of using the GAI "product". This paper examines the second stage. GAI received from the user an array of questions that, directly, indirectly, or through an incorrectly formed task, made it possible to identify several violations of academic integrity in "products" (an example of such questions is presented in Fig. (**1**)).

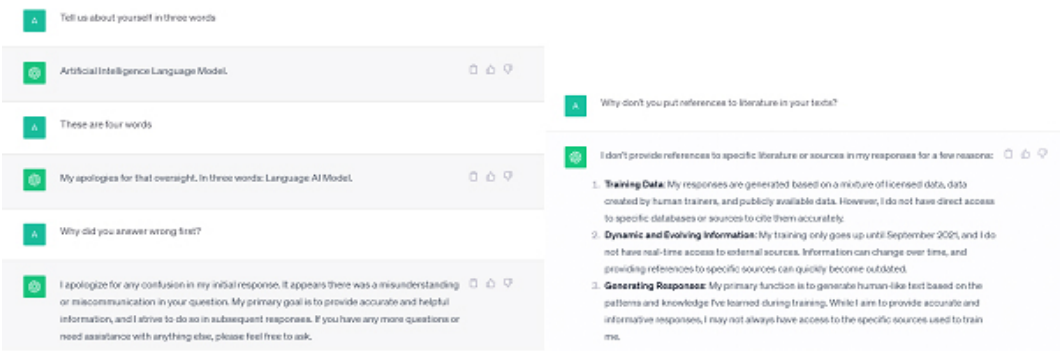

Fig. (1). Fragments of dialogue with generative artificial intelligence.

The result was a list of potential academic integrity violations in the GAI "product." Among them are plagiarism, fabrication, falsification of data and references, and misuse of CC licenses.

CONCLUSION

Generative AI does not warn the user about potential violations of academic integrity in its text "product." The reason for this is simple: the main task of generative artificial intelligence is to generate content for fact-checking and obtaining information about a process or phenomenon. Based on this, the user must generate knowledge for further use. However, due to the "distortion" of the user's understanding of the role of generative artificial intelligence as a knowledge generator or (g)hostwriter, it is necessary to show all potential violations of academic integrity. Dialogue with GAI provided answers to questions about violations of academic integrity. Some of these answers were received to the direct question "What violations of academic integrity can you commit?" and some were obtained using various tasks for ChatGPT-3.5.

FUNDING

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CHAPTER 2

Open Science and Academic Integrity: Meeting at the Crossroads

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Keywords: Academic integrity, Bibliometric analysis, Box approach, Content analysis, Modeling, Open science, White box.

INTRODUCTION

Initiatives for the openness of various components of educational and scientific activities, for example, PlanS [1] or the Open-Source Science Initiative [2], will lead or have already led to a significant increase in the volume of information. At the same time, the correctness of information in the open scientific space is relevant. One of the reasons for the low quality of information is the violation of academic integrity during its creation. In addition, it is interesting to create a general approach to describing the dynamic interaction system between open science and academic (research) integrity.

MATERIALS AND METHODS

A bibliometric analysis for the query “academic integrity” is carried out using bibliometric analysis tools: VOSviwer (https://www.vosviewer.com/), and SciVal (https://www.scival.com/). To describe the dynamic system of interaction between open science and academic (research) integrity, a “white box” method is proposed, which has found wide application in technical systems. All research

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methods have no restrictions on their use and do not require approval from the ethics committee of a university or professional organization.

EXPERIMENTAL MATERIALS

Dataset of articles for bibliometric analysis - data from the Scopus database (more than 1000 articles for 2018-2022), content analysis was carried out based on a request for data from the Google search service. “Box” modeling of the dynamic system of interaction between open science and academic (research) integrity was carried out based on the approaches described in reference [3 - 5].

RESULTS

The results of a bibliometric analysis for the query “academic integrity” showed that the most popular topics in this direction include open science and responsible research (Fig. **1a**). The connection between research integrity and responsible research, as well as other keywords (reproducibility, reliability, data integrity), is confirmed by the keyword map (Fig. **1b**). Based on keywords, as well as recommendation documents on ensuring academic (research) integrity, a prototype of a “white” box is proposed (Fig. **2**). This prototype can become a tool for managing the quality of open science tools based on a systematic approach.

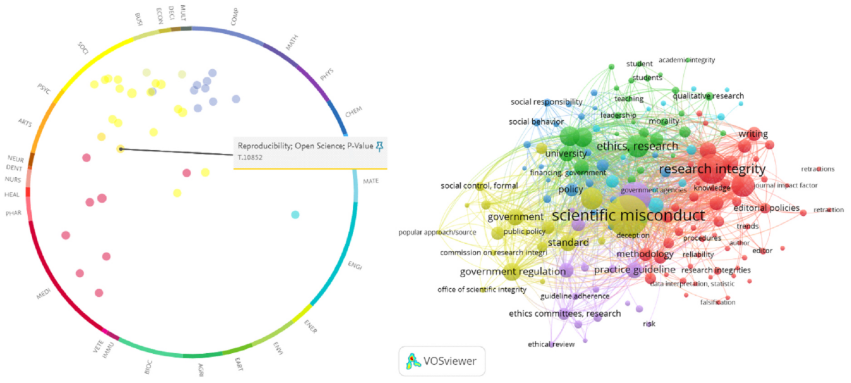

Fig. (1). Results of bibliometric analysis: a – request “academic integrity”, top 1% topics be prominence (SciVal); b – request “research integrity”, map of keywords (VOSviewer).

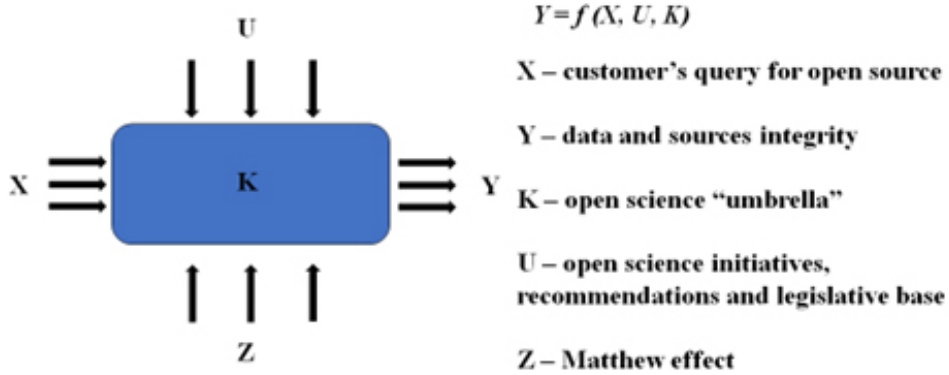

Fig. (2). A "white box" of the dynamic system of interaction between open science and academic (research) integrity.

CONCLUSION

Bibliometric analysis showed the relationship between open science and academic (research) integrity and the main aspects of maintaining academic integrity in the concept of open science. A "box" model of a dynamic system of interaction between open science and academic (research) integrity will be useful for finding optimal management methods at the stage of creating content for open systems under the "umbrella" of open science.

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CHAPTER 3

Electronic Preservation Project for Ukrainian Open Access Journals (EPP UA) to Safeguard Research Content during the War

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Keywords: Long-term digital preservation, Open Access Ukrainian journals, Webrecorder.

INTRODUCTION

There are various reasons why academic journals hosted on institutional platforms can disappear from the Internet. Such occurrences may stem from technical glitches, instances of hacking, or the straightforward loss of content during server updates [1]. The peril of losing invaluable research content increases dramatically due to the ongoing war in Ukraine, as Ukrainian libraries, archives, and universities contend with persistent threats of destruction and loss stemming from Russian rocket attacks [2]. The escalating hostilities not only jeopardize the physical infrastructure of academic institutions but also pose a significant risk to the accumulated scholarly knowledge housed on institutions' servers. As a consequence, concerted efforts are urgently required to implement robust measures for the protection and preservation of invaluable research materials, in particular national open access (OA) journals. This is also essential due to the fact that the Ukrainian repository "Scientific Periodicals of Ukraine (http://nbuv.gov.ua/) archives only PDFs and metadata, omitting the preservation of webpages. Furthermore, a considerable number of Ukrainian OA journals do

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not employ enduring preservation services such as LOCKSS, Portico, CLOCKS, etc. for long-term digital preservation. Due to these considerations, the EPP UA (Electronic Preservation Project for Ukrainian Open Access Journals of TIB Relevant Subjects) was initiated. The primary objective of the project is to safeguard Ukrainian OA journals and ensure their accessibility for future generations of scientists.

MATERIALS AND METHODS

This conference proceedings provide an overview of the Electronic Preservation Project for Ukrainian Open Access Journals. This encompasses a detailed account of the project's conceptualization, initiation, journal selection criteria, and web archiving software. Furthermore, challenges encountered in the course of project implementation will be systematically addressed, contributing to a thorough understanding of the current status of the initiative.

RESULTS

The Electronic Preservation Project for Ukrainian Open Access Journals was established in September 2022 under the auspices of the German National Library of Science and Technology (TIB). The collaborative development and refinement of the selection criteria were undertaken by the heads of the Scientific Service and the Media and License Management departments. Key information sources guiding this criteria development process included the UlrichsWeb journal database and the Directory of Open Access Journals (DOAJ). The criteria for journal inclusion were designed to align with research disciplines relevant to TIB's subject areas, specifically encompassing architecture, chemistry, computer science, engineering, mathematics, physics, technology, and the natural sciences. Additionally, considerations were given to the presence of articles in English and appropriate licensing practices. The project's methodology is inspired by the international initiative SUCHO - Saving Ukrainian Cultural Heritage Online [3].

Within the framework of the EPP project, we utilize the Webrecorder web archiving tool — an open source tool designed to capture interactive websites and replay them at a later time with utmost accuracy. As of July 2023, the project engages three members of Team East Asia/Eastern Europe, two project volunteers, and one student assistant. To date (October 2023), we have successfully preserved 47 journals, encompassing a total of 20,773 articles and exceeding 21 GB of content through collaborative efforts. Within the digital archive, the amassed WARC files offer versatile utility through two distinct modes of utilization: firstly, they can be rendered using specialized software like Replay-Webpage, preserving the original appearance of the journal webpage. Alternatively, these files can be extracted and locally displayed through standard

browser software. This ensures the faithful retention of the web page's visual and interactive elements. Moreover, all files, including content files such as PDFs, can be extracted from the WARC container within the archive and independently processed. It is important to note that various difficulties were encountered during the course of the project. These challenges included difficulties accessing journal websites, attributed to blackouts and power shortages in Ukraine. Additionally, the process proved time-consuming due to the substantial volume of journal issues involved. Moreover, a notable challenge arose from the lack of appropriate licensing for the content earmarked for preservation [4].

CONCLUSION

The Electronic Preservation Project for Ukrainian Open Access Journals has been instrumental in its commitment to safeguarding and preserving valuable scholarly content. Employing the Webrecorder tool, the project successfully web-recorded 47 journals. The ongoing efforts signify a collective commitment to overcoming challenges and ensuring the enduring accessibility of Ukrainian scholarly resources for future generations.

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CHAPTER 4

Towards ORCID API implementation in the Ukrainian Research Information System (URIS)

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Keywords: Academic system, CRIS, Open science, ORCID API, PIDs, Researchers module, Verification.

INTRODUCTION

Ukraine has emerged as a front runner in the promotion of open science principles, demonstrating a strong commitment to fostering greater accessibility to its research infrastructure. Since the year 2020, the State Scientific and Technical Library of Ukraine (SSTL), acting as the steward of this ambitious initiative on behalf of the Ukrainian government [1], has been diligently working on the development of the Ukrainian Research Information System (URIS), with its official launch slated for December 2023. URIS represents a pioneering endeavor in research information systems, as it has been meticulously crafted using in-house software and adheres to the Comprehensive European Research and Innovation Framework (CERIF) standards (https://eurocris.org/services/main-features-cerif). With the launch of URIS, Ukrainian researchers will have access to an innovation platform that will not only increase the visibility of their work but also facilitate closer collaboration within the global scholarly community. In 2022, SSTL started developing and integrating persistent identifiers (PIDs) into the URIS for tracking researchers, publications, and projects. Thus, the integration of ORCID identifiers has enabled the automation of the processes for verifying

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and updating data on scientists in the URIS system. The use of URIS PIDs serves as the primary methodology for ensuring data transparency and establishing accurate standards for the representation of research data in Ukraine.

MATERIALS AND METHODS

After the implementation of the CERIF specifications, it became possible to integrate ORCID through a standardized data exchange protocol with CERIF XML. This enables URIS to manage the ORCID registry in the same way as other Current Research Information Systems (CRIS). This research presents the rationale for choosing the ORCID system to ensure seamless data synchronization with URIS. The results demonstrate that the main criteria for selecting ORCID can be categorized into three major groups: general, functional, and technical. It is worth mentioning that the most important criteria were the availability of API and the completeness of researchers' profiles in the ORCID.

RESULTS

The research involved examining profiles related to Ukraine, including those associated with Ukrainian institutions (*e.g.*, places of work and study) and those associated with Ukrainian-language publications and records. To facilitate this study, we used data retrieved from ORCID through an application programming interface (API). After filtering the ORCID database, we identified 35,885 researchers who identified themselves as Ukrainian and provided information about their affiliation. In addition, a cursory review of the database revealed records of foreign scientists who were either interns or collaborators with Ukrainian scientists. Consequently, the initial dataset used to populate the system consisted of 34,113 profiles covering data on Ukrainian researchers [2]. Ongoing research is focused on developing an ORCID integration profile based on continuous database analysis [3]. In 2023, a roster of scientists was imported into the URIS system. At the same time, the data was loaded into the Scientist module using Member ORCID API keys. In the URIS system, after authorization through login and verification of scientists using information and telecommunication systems (ID.GOV.UA), the scientist gets to the personal cabinet (Fig. **1**). The URIS plans to integrate in 2023 user profiles through ORCID API and OAuth; which will facilitate authorization into ORCID from third-party systems. This experience will be useful to other developers of Current Research Information Management Systems (CRIS) at all levels, both institutional and national. To access the Scholar's Cabinet, a user must attach their ORCID profile by entering their ORCID and password. After confirming and receiving an access token from the ORCID, the user is automatically logged into the Scientist's Cabinet within their personal User Cabinet (Fig. **1**). In the Scientist's Cabinet, users can manage

their profiles and add and hide information. All changes are confirmed with a qualified electronic signature. Users also have the option to deactivate their ORCID profile, which will delete all associated data. This process is also confirmed with a qualified electronic signature.

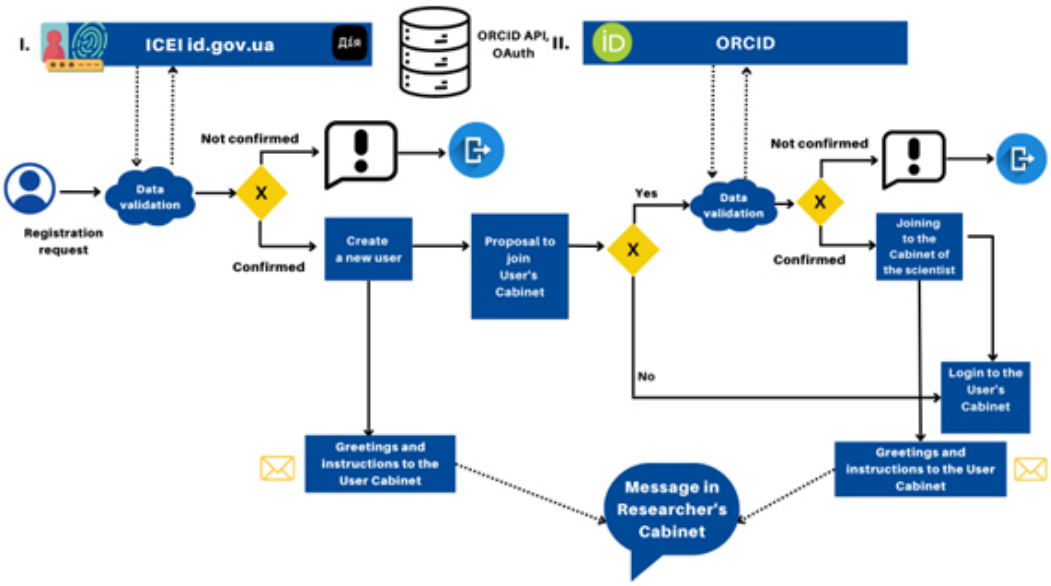

Fig. (1). Verification of researchers in the URIS

CONCLUSION

In fact, the decision to include ORCID in the URIS system as a methodological approach is due to a comprehensive assessment of its merits in many areas. In planned works in 2023, a system of verification of the scientist's profile in the jurisdiction using the ORCID identifier will be implemented. The process of profile integration and verification was subsequently followed by the integration of 34,113 researchers' profiles using ORCID into the system. The creation of the ORCID-Ukraine consortium in 2022 simplified the process of obtaining complete metadata on Ukrainian scientists for their integration into URIS. By implementing URIS identifiers and integrating ORCID, the Ukrainian research community is well-positioned to harness the full potential of open science, ensuring that the fruits of academic labor are easily accessible and contribute to the development of knowledge on a global scale.

FUNDING

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CHAPTER 5

LabsArena.com – Online Platform for Sharing Materials Research Facilities as a Tool for Open Access Research and Integration of Ukrainian R&D Ecosystem into EU Network

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Keywords: Equipment Sharing, Global Integration, Materials Research, R&D, Scientific Collaboration, Ukrainian R&D Infrastructure.

LabsArena.com is an online platform that unites researchers, laboratories, and manufacturers to improve materials research, R&D, and manufacturing processes. The platform provides a centralized materials research equipment sharing platform and marketplace, making it easy to search, share, and sell scientific equipment, consumables, and services.

The platform is driven by a mission to democratize European and Ukrainian R&D infrastructure and facilities in making them more accessible to all scientists, regardless of location, financial resources, or institutional affiliations. Globally, half of researchers face challenges when searching for scientific equipment or services, and every third of the researchers require such equipment or service immediately but struggle to locate it [1]. LabsArena.com stands as a solution to these challenges, fostering greater efficiency in the collective use of scientific equipment and expanding the horizons of scientific collaboration, both within Ukraine and across the globe. It plays a pivotal role in supporting Ukrainian R&D efforts, especially during the constraints of a full-scale Russian invasion, when circumstances grow increasingly complex. Furthermore, it shines a spotlight on Ukrainian equipment manufacturers, making their contributions more visible to

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the global community. On 26th February 2022 when the full-scale war began, the LabsArena.com team started a rapid initiative to help Ukrainian scientists and students [2] and received hundreds of offers and requests, showing strong interest and support.

On the 26th of February 2022, the LabsArena.com team initiated a rapid response effort to help Ukrainian scientists and students [2]. This initiative demonstrated a strong response with hundreds of offers and requests.

The platform also solves the important task of cataloging the Ukrainian research infrastructure, enabling the identification of strengths and weaknesses within the existing equipment system. This systematic approach enables the effective use of detailed analysis, and fosters interregional research cooperation. In doing so, it contributes significantly to ensuring the sustainable development of the country during and after the Victory of Ukraine.

In summary, LabsArena.com plays a vital role in maintaining the functionality of the Ukrainian R&D ecosystem, especially amidst resource limitations during times of war. Additionally, it acts as a catalyst for the integration of this ecosystem into the global and European scientific context, thereby strengthening ties with European science and infrastructure.

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CHAPTER 6

The Paradigm of Open Science Challenges

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Keywords: National Plan, Open Access Policy, Open Science, Research infrastructure, Ukraine.

INTRODUCTION

Today, with the development of the Internet and the availability of free access to information, significant changes have occurred in scientific communications. Social networks and other online platforms are widely used, altering the methods of communication among researchers of global caliber. Thematic web portals bring together scientists with common themes or scientific fields, facilitating the efficient dissemination of information about their research and thus increasing accessibility to scientific information for the entire scientific community, contributing to the global spread of knowledge worldwide.

The paradigm of open science represents a significant breakthrough in modern society, aiming to make scientific research and its results both qualitative and universally accessible. This is particularly crucial in fields where the overall progress depends on the free exchange of ideas, scientific data, and research methods. Open science promotes increased accountability and reliability of scientific data through open public discussions of research results, thereby enhancing the quality of scientific knowledge.

MATERIALS AND METHODS

Nevertheless, the transition to the new paradigm also involves addressing a range of challenges, such as establishing an effective model for funding open science, ensuring data confidentiality and security, adapting evaluation procedures, and traditional academic recognition. A key aspect of a successful shift towards open

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science is a balanced and thoughtful approach that takes into account the interests of all participants in the scientific process and society as a whole.

RESULTS

One of the main ideas of open science is open access to contemporary knowledge, which allows various interested parties, including ordinary citizens, scientists, entrepreneurs, and representatives of governmental and non-governmental organizations, to access scientific information, participate in discussions of scientific research, and contribute to the planning and development of scientific projects. Therefore, it is important to actively promote open access to scientific information, increase its accessibility, and make it understandable to the outside world. This may involve the development of publicly available educational materials, the publication and discussion of research on open forums, science popularization, and involving society in scientific events. Such an approach will make scientific knowledge more accessible, engaging, and influential for all members of society, contributing to the improvement of research quality and knowledge development.

The paradigm of open science, in addition to expanding access to scientific information, encompasses various resources and opportunities that enhance the more effective functioning of the scientific community and the advancement of knowledge as a whole. [Drach, I. (2021).]:

Open science promotes the development of interdisciplinary research, which plays a crucial role in defining the issues and challenges related to humanity, nature, and society. It leverages knowledge and expertise from various regions and fosters new perspectives and approaches to addressing complex problems.

Open science represents the advancement of scientific knowledge in the modern world. Providing access to data, research, and discussions, enables scientists to quickly analyze, scrutinize, and implement new knowledge, opportunities for progress, and innovations.

The paradigm of open science adheres to high standards of scientific ethics and responsibility. This is essential to ensure the quality and sustainability of open science. Therefore, the significance of scientific ethics within the open science paradigm cannot be overstated. The publication of data and research results with open access implies that scientists must strictly adhere to norms such as proper citation, avoiding plagiarism, safeguarding the confidentiality of personal data, providing honest and accurate data, and being open to public critique and discussion of their research.

Ethical and independent committees play a crucial role in assessing and monitoring the compliance of research projects and recommendations of scientific organizations. They help ensure adherence to norms and rules and protect the rights and interests of research participants.

The paradigm of open science serves as a tool for enhancing the quality and transparency of scientific research, but only under the condition of strict adherence to ethical norms and standards. It is also a social contract of trust in science and its outcomes, which is particularly crucial in the contemporary world.

CONCLUSION

Therefore, the approach to open science must be balanced, taking into account ethical norms, legal requirements, and the specific characteristics of each field of scientific research. This ensures not only free access to knowledge but also respect for the rights and safety of individuals. It is important to continue working on the development and implementation of standards and regulatory acts that consider these complex aspects and promote the harmonization of open scientific data with the protection of rights and the confidentiality of personal data. This will help advance towards open science while adhering to important ethical and legal principles.

Modern technological advancements are actively integrated into the practice of scientific activity, leading to the modernization of the entire system of scientific communications within the paradigms of open science. This includes scientific information systems, online versions of electronic publications, cloud archives enriched by artificial intelligence-based information retrieval systems, and more.

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CHAPTER 7

Modification of the Method as a Way of Obtaining Research Results

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Keywords: Allelopathy, Melaleuca alternifolia, Modification of the method, *Viscum album*.

INTRODUCTION

The objective of the research is to obtain scientific novelty by modifying the method. An example of the application of the modified allelopathy method and the results obtained are described. Generally accepted methods of botanical research were used to conduct research. Approbation took place during the research of the semi-parasites *Viscum album*.

MATERIALS AND METHODS

Modifications of allelopathy methods can be used to obtain scientific novelty by exploring new approaches, improving existing techniques, or applying them in novel contexts. Allelopathy refers to the chemical interactions between plants, where one plant species releases compounds that affect the growth, development, or survival of another plant species. To obtain scientific novelty in the study of allelopathy, revealing the following approaches of the known researchers in the field of allelopathy. Both articles with original research [2] and scientific manuals [1, 3] are devoted to allelopathy.

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EXPERIMENTAL MATERIALS

The present invention uses methods to combat semi-parasites *Viscum album*. Oleum Melaleuca alternifolia solution was used to destroy the *Viscum album* on trees. Oleum Melaleuca alternifolia is used in different concentrations depending on the degree of damage to the host tree. Essential oil contributes to the fall of leaves on the branches of the *Viscum album*. Concentrations were tested in laboratory conditions. After obtaining a positive result, a study was carried out in vivo (on tree branches). The use of the invention will help to destroy the *Viscum album* on trees, which will save tree plantations and natural biocenoses that suffer from the spread of semi-parasite.

RESULTS

The presented invention is a solution to the problem of spreading the *Viscum album*. Instead of mechanical destruction (cutting down) of infected branches, it is suggested to destroy the *Viscum album* with oleum Melaleuca alternifolia.

CONCLUSION

To obtain scientific novelty in allelopathy research, it is essential to stay updated with the latest scientific advancements, collaborate with experts in related fields, and be open to interdisciplinary approaches. By pushing the boundaries of allelopathy research through innovative methods and applications, you can contribute to the scientific understanding of plant-plant interactions and their broader ecological implications.

FUNDING

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CHAPTER 8

Trends in Cooperation between Ukrainian and Foreign Organizations within the Horizon Europe

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Keywords: CORDIS, Horizon Europe, International cooperation, Net EU Contribution, Project, Ukraine's participation.

INTRODUCTION

In the part of cooperation in the field of science and technology of the Agreement between the European Union (EU) and Ukraine, the integration of Ukraine into the European Research Area is laid down. Ukraine's participation in EU Research & Development projects is most widely implemented within the framework of Horizon Europe [1]. Among the indicators of the effectiveness of international cooperation in this field, there is an increase in the number of projects carried out by Ukrainian organizations and an increase in the share of grant funding in the total amount of funding for research and development. In such conditions, the relevance of the study of trends in the collaboration of Ukrainian organizations with European ones, the analysis of the participation of Ukrainian subjects in Research and Innovation funding programs, and its financial component is increasing.

MATERIALS AND METHODS

The paper proposes to consider the collaboration of Ukrainian subjects with European subjects under the EU's key funding programme for research and innovation Horizon Europe. In order to compare indicators, the analysis is carried out according to the regional division of European countries. The HORIZON dashboard [2] of The Community Research and Development Information Service

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(CORDIS) serves as a data source for the analysis of cooperation between Ukrainian and European organizations, in particular, the latest added data was used: August 28, 2023. CORDIS contains information on Research & Development projects funded by the EU framework programs for research and innovation and their results under the programs from FP1 to Horizon Europe. For the analysis, a general map of cooperation with European countries was built. A box plot was chosen for the study of the financial component; in descriptive statistics, such a visualization tool is convenient for comparing groups of data through their quantiles [3]. Quantitative data of connections in projects are presented in graphic mode.

EXPERIMENTAL MATERIALS

Fig. (**1**) shows the directions of cooperation under the Horizon Europe program with European countries, the thickness of the defined lines corresponds to the values from the interval [1; 180] by growth. In particular, within the framework of this international cooperation, the Ukrainian side cooperates with 7 countries of Western Europe in 68 projects.

Fig. (1). Map of collaboration by European countries in Horizon Europe.

Fig. (**2**) shows the results of the statistical analysis of the net financial contribution EU of the projects of the Horizon Europe program with the participation of Ukrainian organizations based on data sets of European regions. The maximum value of the Net EU Contribution is about € 80.5 million for the project in which the Ukrainian participant accounts for € 602.3 thousand. The minimum is more than 925.6 thousand euros, while the Ukrainian share is € 46.9 thousand.

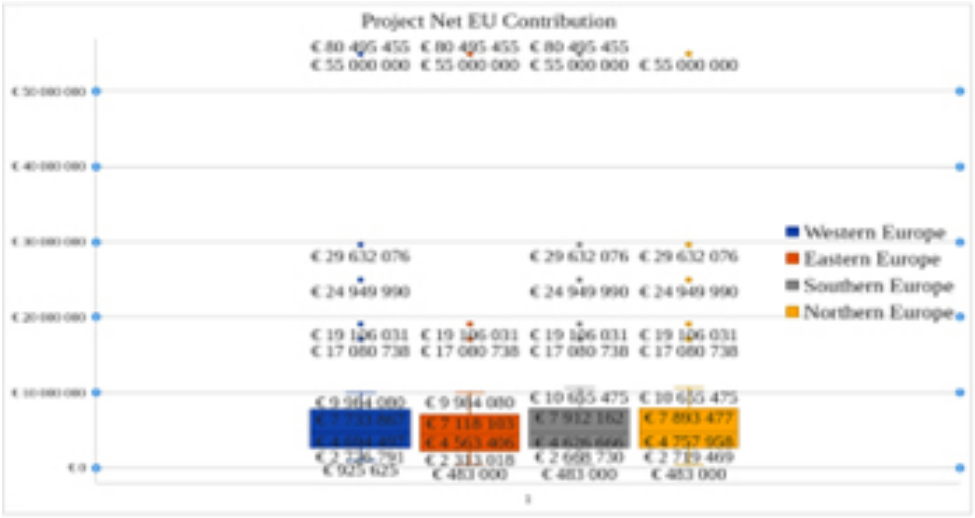

Fig. (2). Statistical analysis of the Net EU Contribution of the projects Horizon Europe in collaboration with European organizations of the program.

Fig. (**3**) shows regionally by country the quantitative indicators of connections between Ukrainian and European organizations in the projects of Horizon Europe. The values of such connections with the countries of Western Europe range from 7 (Luxembourg) to 136 (Germany). The indicators of Belgium (73) and the Netherlands (74) turned out to be somewhat higher than the average value.

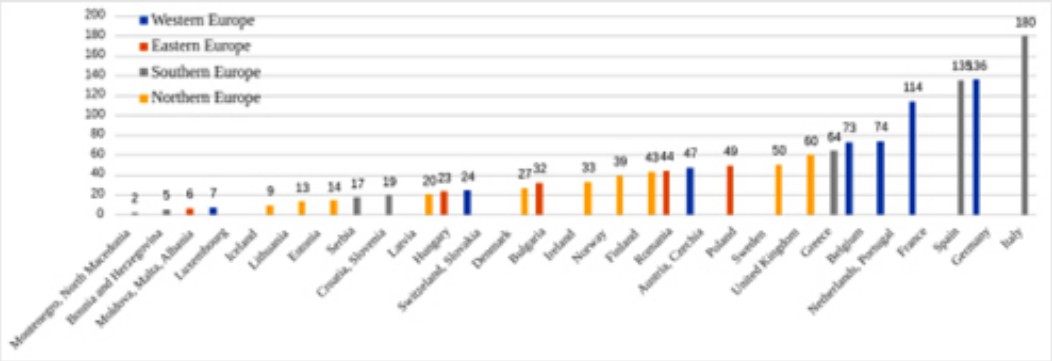

Fig. (3). Quantitative diagram of connections in Horizon Europe projects with European countries.

The data of cooperation in Eastern Europe (Fig. **1**) in 51 projects indicate the same number of countries as in the region of Western Europe. Active cooperation is observed by the following number of connections in the projects (Fig. **3**): 49 (Poland), 47 (Czech Republic) and 44 (Romania). The largest value of the Net EU Contribution to the project is recorded by the maximum indicator of cooperation

with the countries of Western Europe, where the Ukrainian participant accounts for only 0.7%. The lowest amount is € 483.0 thousand, and 2 Ukrainian participants account for € 156.4 thousand, that is, almost a third.

In general, in Europe, the highest value of connections between Ukrainian and European participants in Horizon Europe projects is 180 (Italy) and the lowest is 2 (Montenegro, North Macedonia) (Fig. **3**). Such indicators are recorded for the countries of Southern Europe within the framework of 70 projects. The extreme data of the Net EU Contribution projects is similar to the financial data of cooperation in Eastern Europe.

Cooperation with all Northern European countries in 63 projects of Horizon Europe was recorded (Fig. **1**). € 55.0 million of the Net EU Contribution falls on the project with the greatest value in which the Ukrainian side acts as a partner. The smallest Net EU Contribution to the project with the lowest indicator in cooperation with the countries of Eastern and Southern Europe. The level of collaboration varies from 9 (Iceland) to 60 (Great Britain), around the average value 30±3: 33 (Ireland) and 27 (Denmark).

RESULTS

The proposed geographical analysis of collaboration, firstly, allows to determine geographical directions for strengthening cooperation, secondly, to establish zones that require the creation of prerequisites for cooperation in order to expand geography. Reducing the scale of such maps brings to the surface information for establishing contacts, which in the future can influence the development of other ways of international scientific and scientific-technical cooperation, in particular, conducting research and development on the basis of cooperation, under joint coordination agreements. Quantitative indicators of connections provide information on the level of involvement of Ukrainian subjects in projects, and the intensity of participation in international scientific programs. The financial component allows you to determine the amount of total grant funding for projects with the participation of Ukrainian organizations, the scope of joint research and development.

CONCLUSION

Increasing indicators of international cooperation contribute to the dissemination of knowledge and technologies, strengthening the impact of research and innovation, stimulating economic growth, promoting competitiveness and optimizing investment impact, ensuring response to global challenges.

FUNDING

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CHAPTER 9

Implementation of Innovative Technologies in Crop Production as a Key to the State's Food Security

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Keywords: Climate change, Cultivar, Food security, Innovations, Resource-saving technologies, Winter wheat, Yield.

INTRODUCTION

Today's challenges and problems, namely, changes in weather and climate conditions, and economic, political, and food crises caused by the Russian war in Ukraine, are becoming a trigger for qualitative changes in the Ukrainian agricultural sector. The successful and cost-effective functioning of the agro-industrial complex is a key to food security at both the national and global levels [1].

The constant increase in the price policy for fuels and lubricants, fertilizers, chemical plant protection products, seeds, *etc*. forces rural producers to use them more rationally and is an incentive for Ukrainian agricultural companies to quickly introduce innovations in the industry. It is no longer a secret that their use in farming allows agricultural producers to increase their profitability per hectare of grown products by combining the optimization of costs for inputs included in the cost of agricultural production and maximizing the result of yield increase. The generation of new technologies would bring Ukraine's economy closer to the level of highly developed countries. Innovation and competitiveness are now real tools for overcoming the negative effects of military aggression and related factors [2, 3].

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Improving crop cultivation technologies plays an important role in increasing yields and improving product quality. Success in obtaining high and stable yields in the face of rising energy prices can be achieved through the introduction of resource-saving technologies, which include a high level of agricultural technology, the application of optimal fertilizer rates and doses, an integrated system of plant protection against diseases, weeds, and pests, and the introduction of modern high-intensity cultivars and hybrids. The current weather as well as climatic, environmental, and economic conditions of agricultural production require measures that ensure the most feasible level of crop productivity and high grain and seed quality while reducing the cost of their cultivation [4]. One of the effective measures to solve these problems in growing crops is the introduction of the latest resource-saving technology MZURI PRO-TIL, which combines elements of traditional and no-til farming technologies.

MATERIALS AND METHODS

Planting, field experiments, and all records and observations were carried out from September 2022-July 2023 at the experimental field of Mykolaiv National Agrarian University (GPS: 46.933339, 31.649625 Mykolaiv, Ukraine). The soil of the experimental field is a typical southern residual slightly saline chernozem with a humus content (0-30 cm) of 3.1% and a neutral reaction of the soil solution (pH 6.8-7.2). The field experiment studied Duma Odeska winter wheat (originator - Plant Breeding and Genetics Institute – National Center of Seed and Cultivar Investigation, Odesa), which was sown on September 25, 2022, after the winter rape as a forecrop, at a rate of 3 million germinating seeds/ha using the classical cultivation technology and the innovative resource-saving MZURI PRO-Til technology. The conventional winter wheat cultivation technology involved sowing grain with a row spacing of 15 cm into the soil prepared after harvesting the predecessor with a disc tillage tool to a depth of 18-20 cm, pre-sowing cultivation to the depth of seed placement, and post-sowing rolling with ring-spur rollers. As for the innovative MZURI PRO-Til technology, sowing was carried out without preliminary tillage and grinding of the previous crop residues. Minimum narrow strip tillage is carried out simultaneously with the sowing of the main crop with a seeding rate of 3 million germinating seeds/ha, as in the classical cultivation technology. Subsequent care of the crops did not differ between the two technologies under study. All records and observations of plants were carried out in accordance with the methods of state variety testing, yield accounting, and evaluation of the crop structure were carried out by direct combining and recalculation of grain moisture by 14%, taking into account the presence of impurities. Experimental data were processed by multivariate analysis of variance according to V.O. Ushkarenko [5].

RESULTS

The main constraint on the realization of the genetic potential of winter wheat agrocenosis in the Ukrainian Steppe is the soil and air moisture deficit. The analysis of weather conditions during the growing season of winter wheat can be classified as favorable and slightly arid, except for October 2022, January, and June 2023, when the amount of precipitation was significantly lower than the long-term average. As for the temperature regime, it was significantly higher than the long-term average throughout the growing season, with temperature fluctuations within short periods typical of recent years. Such frequent and significant temperature changes caused stress conditions in winter wheat plants, which negatively affected the productivity and realization of the genetic potential of agrocenosis in the future.

Changes in climatic conditions in southern Ukraine in recent years have further highlighted the problem of higher frequency of droughts, especially during critical periods of the crop's growing season. The harmful effects of drought can be altered and minimized to some extent by water retention mechanisms of the plant leaves. Drought tolerance of cereal plants, in most cases, is caused by the ability of plants to preserve water content. In the experiment, a moisture loss analysis was performed on the leaves of winter wheat plants over a period of 6 and 10 hours. Water loss in a day in plants grown using both technologies was almost at the same level, but water loss was less by 8.9% in 6 hours and by 8.2% in 10 hours in plants grown with MZURI technology compared to the classical technology. This indicates that the innovative technology showed greater resilience to stress factors caused by drought and high temperature compared to the conventional technology.

The yield of winter wheat is determined by the characteristics of its components and subcomponents, which are significantly modified under the influence of abiotic and biotic environmental factors. Elements of winter wheat productivity are to some extent balanced by other components that are formed under more favorable conditions during the crop's growing season. The grain yield largely depends on the formation of the components of the ear quality, with grain weight per ear being one of the main factors of winter wheat productivity. The formation of ear productivity is significantly influenced by environmental conditions and agro technological approaches that can modify plant life conditions. Thus, the “productivity” integrates the effect of all factors on the plant organism during its growth and development, and the yield is always the result of a compromise between productivity and resistance to unfavorable environmental conditions. The research clearly shows the influence of different agricultural technologies on crop productivity and the formation of elements of the crop structure (Table **1**).

Table 1. Yield and grain quality of winter wheat under different cultivation technologies.

Indicator	MZURI PRO-Til Technology	Conventional Technology
Ear length, cm	10,2	9,4
Ear weight, g	3,49	2,65
Number of spikelets per ear	21,0	17,3
Number of grains per ear	56,3	50,0
Grain weight per ear, g	2,54	1,63
Weight of 1000 grains, g	45,1	38,3
Yield, t/ha	7,1	6,3

From the results of the field experiment, it was found that the yield of winter wheat was 0.6 t/ha higher with the latest Mzuri PRO-Til technology compared to the conventional cultivation one. It is characteristic that the productivity of the ear was higher with the latest technology. Thus, the weight of grain per ear was 2.54 g with Mzuri technology, and 1.63 g with the conventional one; the number of spikelets per ear was also higher - 21.0 pcs, compared to 17.3 pcs with the conventional technology.

CONCLUSION

Field research conducted in the arid conditions of southern Ukraine proves the superiority of the latest MZURI PRO-Til winter wheat cultivation technology compared to the conventional one. The introduction of this resource-saving technology allows the formation of larger and fuller grains with maximum weight, to obtain higher ear productivity and to increase the yield of agrocenosis by 12% compared to the conventional cultivation technology. Winter wheat plants grown using the innovative technology were more resistant to stress factors caused by drought and high temperatures.

FUNDING

This area of research is being implemented within the framework of the budget project “Development of biologized technologies for growing grain crops in the period of post-war reconstruction of Ukraine” (state registration number 0123U101865); 2023-2024.

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CHAPTER 10

FAIR Principles in Accounting Research Data Management

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Keywords: Accounting, Data management, FAIR Principles, Research data.

INTRODUCTION

In today's data-driven world, the field of accounting research is no exception to the increasing importance of data management. The FAIR principles, an acronym for Findable, Accessible, Interoperable, and Reusable, have gained significant attention as a guiding framework for ensuring high-quality data management practices in various domains, including accounting research. These principles are instrumental in maintaining data integrity, enhancing collaboration, and facilitating reproducibility in the world of financial data analysis.

MATERIALS AND METHODS

These principles are instrumental in maintaining data integrity, enhancing collaboration, and facilitating reproducibility in the world of financial data analysis.

FAIR Principles Explained:

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1. Findable: The first step in effective data management is ensuring that research data is discernable. Researchers should create a system where data sets and associated metadata are easy to locate. This can be achieved by assigning unique identifiers to datasets, providing clear and concise descriptions, and making data discoverable through searchable databases or repositories. For accounting research, this means that datasets related to financial transactions, reports, and records should be organized and cataloged in a manner that allows easy access.
2. Accessible: Accessibility is crucial to ensure that accounting research data is readily available to those who need it. To adhere to FAIR principles, researchers should establish policies for data access and sharing. This may involve setting permissions, embarking on data-sharing agreements, or utilizing secure data repositories. Ensuring data accessibility not only enhances transparency but also promotes collaboration and validation of research findings.
3. Interoperable: Accounting research often involves data from various sources and formats. Ensuring interoperability means that data can be seamlessly integrated and used together. Researchers should use standardized data formats, taxonomies, and ontologies to enhance data compatibility. Interoperability is particularly relevant in accounting when dealing with diverse financial systems, software tools, and data sources.

Applying FAIR Principles in Accounting Research

1. Data Management Planning: Researchers should develop clear data management plans that outline how data will be collected, organized, and shared throughout the research process. This plan should specify data formats, metadata standards, and data access protocols.
2. Metadata Standards: Standardizing metadata for financial data sets is essential. This includes clear documentation of variables, units of measurement, data sources, and any transformations applied to the data.
3. Data Repositories: Utilize reputable data repositories or archives that comply with FAIR principles to store and share accounting research data. This ensures data longevity and accessibility.
4. Collaboration and Communication: Collaboration among researchers, institutions, and stakeholders is key to promoting FAIR data practices. Encourage transparent communication and data sharing among the accounting research community.
5. Ethical Considerations: Ensure that data management practices comply with ethical and legal standards, including data privacy and security regulations, which are particularly important when dealing with financial data.

EXPERIMENTAL MATERIALS

Experimental materials are an essential component of many types of research, including accounting research. While the FAIR principles primarily focus on data management, it is crucial to address the management of experimental materials as well to ensure the overall integrity and reproducibility of research findings. Here are some considerations for applying FAIR principles to experimental materials in accounting research:

Findable

- Maintain a clear and organized inventory of all experimental materials used in your research, such as questionnaires, surveys, or interview scripts.
- Assign unique identifiers or names to each set of experimental materials and document them in a way that makes them easy to find for both yourself and potential collaborators or reviewers.

Accessible

- Store experimental materials in a secure location with controlled access to ensure their protection and availability when needed.
- Clearly outline access policies for experimental materials, including who can access them and under what conditions. Consider using secure file-sharing platforms or repositories.

Interoperable

- Standardize the format and structure of experimental materials to ensure compatibility with data collection tools, analysis software, and reporting frameworks.
- Document any changes or adaptations made to the experimental materials during the research process, along with the rationale for these modifications.

Incorporating FAIR principles into the management of experimental materials will help ensure that other researchers can replicate your experiments accurately, validate your results, and build upon your work. Additionally, it promotes transparency and trust within the accounting research community, contributing to the overall advancement of the field.

RESULTS

The important and main findings of the study should come in the results Section. The tables, figures, and references should be presented in sequence to emphasize the important information or observations related to the research. Results should

be precise.

CONCLUSION

The FAIR principles provide a robust framework for enhancing data management practices in accounting research. Implementing these principles not only improves the quality of research but also fosters collaboration and transparency within the accounting research community. As financial data continues to grow in complexity and importance, adhering to FAIR principles will be essential for advancing the field and ensuring the integrity of financial research outcomes.

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CHAPTER 11

Defense Management and its Impact on the Development of the Military-Industrial Complex in Ukraine

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Keywords: Costs, Defense complex, Efficiency, Management, Provision, Resources.

INTRODUCTION

Today, national security issues are being actualized not only in connection with military threats but also with information and globalization cybersecurity. Each country, depending on its political course, main threats and challenges, and geopolitical situation, solves the problems of ensuring national security in different ways by adopting strategic documents, forming specially authorized bodies, and determining state policy priorities. This raises the question of implementing the postulates of defense management to support the national security of the state.

MATERIALS AND METHODS

The methodological basis of the study was general scientific principles of objectivity and systematic approach, research of events, including their emergence and development, interconnection, interdependence, and complexity. In preparing the study, the following general scientific methods of scientific knowledge were used: analysis and synthesis (the object-subject sphere of defense management development in Ukraine and the results of its application at different levels were

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studied), and retrospective (the tendency of using defense management tools in the process of activity of defense industry enterprises is revealed). Through the use of the logical method, the author identified trends in the development of defense management under martial law, and ways to solve problematic issues in the defense industry using defense management tools were also identified.

RESULTS

Defense management is a system of activities of the Armed Forces of Ukraine and other components of the defense forces based on democratic civilian control. It is a new military command and control system in accordance with NATO principles and standards to ensure an effective mechanism for achieving the defined goals of military and defense policy, integration of defense, and budget planning and management for the efficient use of limited resources (material and financial), balanced budget expenditures for development, maintenance of the Armed Forces of Ukraine and other components of the defense forces [1].

Researchers identify four main components of defense management as a tool for the development of the defense industry. (Fig. **1**)

Fig. 1. The structure of defense management.

Defense management should be considered within the framework of national security policy, based on a specific context, taking into account specific circumstances and in accordance with international standards of good governance. That is, specific goals should be set based on real security needs. Efficient and cost-effective mechanisms/methods for achieving these goals should be identified and resources allocated accordingly. Outputs and outcomes should be measured, monitored, and evaluated to improve overall performance and to detect/prevent deviations [2].

Due to the new requirements in Ukraine's legal acts on implementation of capability-based defense planning based on the experience of NATO member states, amendments to the system of long-term planning documents and the procedure for their development, as well as insufficient knowledge of the methodology of strategic planning for the development of the Armed Forces faced problems in the process of planning based on capabilities of the Armed Forces and other components of the defense forces [3].

Finding resources and implementing the best practices of partner countries and international organizations can ensure the growth of our potential. Moreover, this not only strengthens relations, but also makes a significant step towards the realization of Ukraine's European and Euro-Atlantic aspirations, which is why it is important to introduce effective defense management in the country.

Defense planning involves the development of relevant concepts, programs, and plans, taking into account real and potential threats in the military sphere and the financial and economic capabilities of the state [4].

The principles of defense planning in Ukraine were first defined at the legislative level in 2004. The Law of Ukraine “On the Organization of Defense Planning” defined the tasks, principles, content and procedure of defense planning and coordination of state authorities in this area. Since then, the practice of defense planning in both Ukraine and NATO member states has been further developed and has come a long way [5].

Capability-based defense planning in Ukraine is one of the modern methods of defense planning, which is widespread in the security and defense sector of NATO member states. It is the most versatile, as it deals with most of the factors that are taken into account when conducting defense planning [6].

Thus, under current conditions, not only real threats but also potential scenarios of long-term crisis development should be taken into account, which is key to the qualitative development of the capabilities of the troops (forces) that will most effectively solve the tasks of the state defense in a dynamically changing security environment.

The Armed Forces of Ukraine effectively use Soviet, modern Ukrainian and foreign equipment on the battlefield. Unmanned aerial vehicles, anti-aircraft missile systems, tanks, armored vehicles, and more - Ukraine has the potential to become a top competitive manufacturer, as it partially meets the needs of its army even in a full-scale war, in extremely difficult conditions.

Therefore, there is an urgent issue of effective organization of the management

system at the enterprises included in the Ukrainian Defense Industry Joint Stock Company, which are directly involved in the production of defense products, in order to provide the Armed Forces with the necessary military equipment and weapons.

In addition, the use of defense management tools in the activities of defense enterprises will allow attracting students of higher education and vocational education to further employment in the defense industry under the Memorandum of Partnership and Cooperation signed between the Ministry of Education and Science of Ukraine and the State Concern "Ukroboronprom". This, in turn, will help popularize the defense sector profession and, in the long run, ensure the rejuvenation of teams and the modernization of production.

CONCLUSION

From the perspective of Ukraine's post-war recovery, the development of the defense industry (high-tech products, defense technologies, arms exports) is capable of meeting the future needs of the security and defense forces, so defense management will play an important role in this process. It will shape key aspects of the activities of defense industry enterprises and create conditions for attracting highly qualified personnel.

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CHAPTER 12

Participatory Model of Development of Scientific and Scientific-Technical Activities in Ukraine

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Keywords: Business, Cooperation, Innovation, Implementation, Projects, Participation, Scientific activity, University.

INTRODUCTION

The need to improve the quality of scientific research, to achieve greater compliance with the needs of society, and transition to a knowledge economy based on innovative development are new requirements for scientific activity. Therefore, the application of a participatory approach, which is based on the involvement of the general public, and representatives of various spheres of interest in the processes of creation and implementation of scientific and technical solutions, becomes relevant. This approach in Ukraine is at an initial stage and requires further research.

MATERIALS AND METHODS

The research materials are the data obtained from the universities of the South of Ukraine, regarding the cooperation between different branches of science and different sectors of society, which contributes to the emergence of new innovative ideas. The study of reports on the scientific activity of the specified institutions of higher education provided an opportunity to assess the development of scientific and scientific- technical activities in the context of cooperation with representatives of business communities. The information was obtained by monitoring university websites and their official pages in social networks;

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summarizing the results of the publication activity of higher education institutions in Google Scholar, scientific metric databases such as Scopus, and Web of Science on the topic of establishing cooperation between universities and business; analysis of the development of scientific and scientific-technical activities in Ukraine. Also, the legislative framework was analyzed.

The research experiment aimed at substantiating the model of openness, cooperation, and interaction between different groups of society to achieve common scientific and technological goals.

RESULTS

Institutions of higher education at all times were considered centers of preservation and transmission of knowledge, in which the elite class of society studied, and thus they took an active part in modeling the development of both individual territories and the world. At the beginning of the XIX century. Humboldt reforms marked the beginning of the first academic revolution in 1960–1970 in Germany. The University of Berlin combined teaching with research [1], which changed its mission. Gradually, institutions of higher education began to assume the dual role of education and research. Since the end of the 1980s, a second academic revolution was defined, as a result of which educational institutions took on the function of supplying knowledge and forming intellectual properties [2]. The transition from a research university to an entrepreneurial one has become widespread in the United States. The condition for such a transition was the inclusion of more applied research with a commercial focus, which received significant support from stakeholders. H. Etzkowitz described the following stages of transition to an entrepreneurial university, during which the university determines its ability to set priorities and formulate a strategic view of its direction; receives financial resources from various sources; forms a scientific environment that plays an important role in the commercialization of intellectual property; focuses on interaction with stakeholders to participate in the development of the regional innovation environment [3].

New technologies such as artificial intelligence, robotics, blockchain, cloud computing, or virtual reality are fundamentally changing the way business is conducted, and collaboration with different stakeholders is an opportunity to overcome emerging strategic constraints. Most researchers argue that the knowledge needed for economic development is generated, implemented, and disseminated within the knowledge ecosystem. Knowledge ecosystems are created at the national level in the context of economic, social, cultural, legal, and political systems and form a national knowledge ecosystem [4]. Given the high

importance of universities as sources of knowledge, their cooperation with business will provide significant opportunities for the use of academic research, support for innovation, and organization of "higher education institution - company" interaction. The movement of university startups, which is currently actively supported by the business community, plays an important role in the implementation of the acquired knowledge into practice.

The participatory model of the development of scientific and scientific-technical activities in Ukraine takes into account the active participation of various subjects of society in scientific research, technological innovations, and development. This model is designed to facilitate greater interaction between scientists, citizens, public organizations, businesses, and government institutions for the joint creation and use of knowledge and technology. The main aspects of the participatory model of the development of scientific and scientific and technical activities in Ukraine may include the following: civic participation (involvement of public organizations, activists, and other members of the public in working on specific projects, promoting open debate and discussion of scientific issues); academic cooperation (cooperation between universities, scientific institutions and the private sector for joint research, technology development and commercialization of scientific achievements); technology transfer (ensuring rapid transfer of scientific research results to production and economic sectors); grants and funding (providing access to funding for scientific research and projects of various subjects, including scientists, students of higher education, entrepreneurs, *etc*.); regulatory policy (development and implementation of policies that promote the participatory development of the scientific and technical sphere, including reforms in the sphere of education and science [5 - 7]. The government of Ukraine has taken the first steps, namely, it has implemented regulatory documents regarding the activities of higher education institutions (licensing requirements, criteria for evaluating the quality of their activities, *etc*.) and ratings. There is a need for cooperation with stakeholders, to take participation in international scientific projects, and receiving grants.

CONCLUSION

Therefore, in today's conditions, the participatory model of the development of scientific and scientific and technical activity in Ukraine is an important element in ensuring close interaction of educational and research processes and a demonstration of possible ways of real use of the obtained scientific results or acquired knowledge, which will actively influence the growth of the economy and the standard of living of the population. In addition, this model is aimed at creating a favorable environment for the development of innovations and increasing the competitiveness of Ukraine in the world market. It supports

openness, cooperation, and interaction between different groups of society to achieve common scientific and technological goals.

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CHAPTER 13

Development and Deployment of the "Arxiv Academy" Archive of Pre-Prints for Ukrainian Scientists

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Keywords: Archive of preprints, Digital libraries, Distributed systems, Open science, Open research infrastructure, Open-source software.

INTRODUCTION

The Open Science paradigm is a global trend that fosters scientific collaboration and free access to scientific research results and knowledge sharing. The National Academy of Sciences (NAS) of Ukraine has initiated a target scientific and technical project named "Development and Implementation of Open Science Infrastructure in the NAS of Ukraine (OPENS)", which aims to develop and implement a comprehensive infrastructure for open access publishing, data sharing, and research evaluation.

One of the objectives of this project is to create and operate an archive of preprints for the NAS of Ukraine scholars, called Arxiv Academy. This archive will allow the scholars to publish their preprints online for free and obtain internationally recognized DOIs (Digital Object Identifiers) for their papers. The archive will also integrate with the global open research community and facilitate the dissemination and discovery of the publications.

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MATERIALS AND METHODS

The OPENS project required us to provide unified and centralized login and authentication exclusively for NAS employees with sharing personal and institutional profiles of the users from NAS and their external co-authors among the components of the open research infrastructure of the NAS of Ukraine. We implemented it in the form of a common open research REST API to DIT ROA [1], a platform that supports the scientific and organizational activities of the NAS of Ukraine, and by further integration of the Arxiv Academy with the DIT ROA (Fig. **1**).

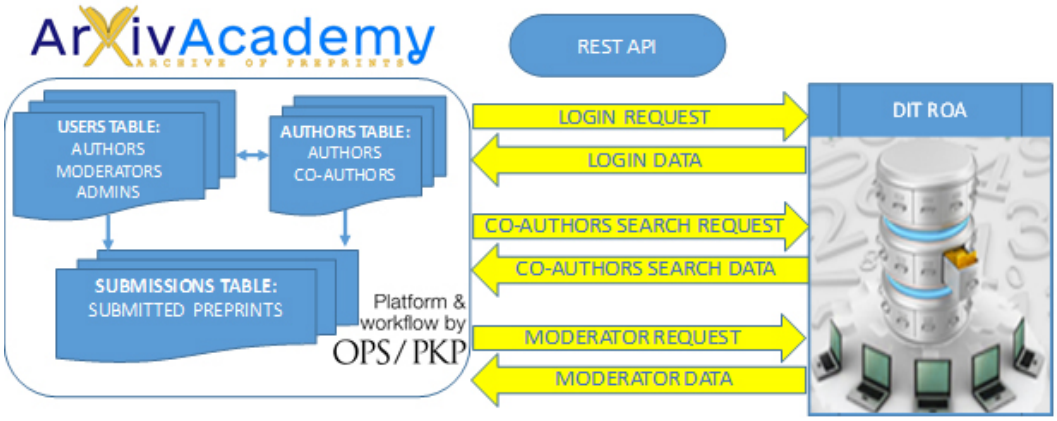

Fig. (1). The interaction diagram between *ArxivAcademy* and DIT ROA.

Our development approach was to find a reliable and open-source project that we could adapt to our local infrastructure and use as the foundation of our Arxiv Academy archive of preprints. We chose the Open Preprint Systems (OPS) platform from the Public Knowledge Project (PKP) [2], a research and development initiative at Simon Fraser University in Canada. The PKP is a flexible and powerful open source and open access platform, written in PHP, that also supports the Open Journal Systems (OJS) used for the Unified Editorial Platform in the OPENS project.

EXPERIMENTAL MATERIALS

We leveraged the OPS's localization and customization abilities to design a bilingual user interface (UI) and to modify the logo, color scheme, server name, and menu layout. We created the OPS localization files for Ukraine and we plan to share them with the original software repository in the future.

We had to make major adjustments to the UI and the underlying algorithms for the preprints submission procedure, to ensure the required integration with the DIT ROA platform. To achieve this, we carried out the following steps:

- When an author logs in to Arxiv Academy, our custom-built authentication plugin obtains the author's user profile data from DIT ROA. When the author later submits a preprint, the submission record automatically gets the necessary data points such as author name, email, affiliation, etc. from the user profile.
- When a submission has co-authors, we offer the user a way to look up the co-author in the DIT ROA. The user can input some partial information about the co-author, and all the relevant profile data is automatically retrieved. This method simplifies the submission process for the user, helps avoid typos and errors, and supports consistency and integration with the wider open science infrastructure in Ukraine.
- If the DIT ROA records do not contain a co-author so the search query does not give the correct result, the author can either enter the co-author profile details manually or modify the data from a previous search.
- If a publication has a co-author who does not have a profile in the DIT ROA database, this usually indicates that they are not affiliated with the NAS of Ukraine, or they are a foreign researcher. In the future, Arxiv Academy users will be able to request the creation of profile records in DIT ROA for such co-authors. In the meantime, the user can proceed with their preprint submission in Arxiv Academy.
- To make the preprint public on the website, the Arxiv Academy system requires a moderator to approve it after the author submits it. The author can choose a moderator from a list that is obtained by a special request to DIT ROA. This list has different moderators for each institution. This ensures that the author can select a suitable moderator to review their submission. The submission process is completed when the author picks a moderator.
- The moderator gets a notification when a submission is awaiting a review. Arxiv Academy provides a messaging system that enables communication between the author, co-authors, and moderators during the review process. The submission can be modified as needed based on the feedback before it is finally approved.

RESULTS

The Arxiv Academy archive of preprints is a system that will allow NAS of Ukraine scholars to submit, review, and publish their preprints. The system will provide free access to the publications without registration, including the full texts of the preprints under Creative Commons licenses, and search and discovery of the preprints according to various criteria.

The system also supports the OAI-PMH protocol for transferring the preprint metadata to higher-level open research repositories in Ukraine, Europe, and internationally (such as DOAJ, OpenDOAR, CORE, BASE, OpenAIRE). The Arxiv Academy archive of preprints should become a valuable platform for making the preprints of NAS of Ukraine scholars accessible to the global research community.

CONCLUSION

The architecture, functionality, and implementation of the Arxiv Academy, along with the institutional archive of preprints for the NAS of Ukraine are presented.

FUNDING

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CHAPTER 14

Principles and Criteria of using the Teacher's Digital Competence Self-Assessment Tool

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Keywords: Assessment, Competencies, Criteria, Digital technologies, Evaluation, Indicators, Teachers.

INTRODUCTION

The development of a modern educational environment of general secondary education institutions is an important task of the education system. Digital technologies are the foundation of such an environment today. Teachers play an important role in the organization and implementation of distance/blended learning, and therefore today there is a need to increase the level of their digital competence as a key one. Digital competence today is key according to a number of important European documents and acts: White Paper on Education and Training (European Commission, 1995), Memorandum on Lifelong Learning (European Commission, 2000), e-Europe 2005: Information Society for All, Action Plan Commission on Skills and Mobility (European Commission, 2002), Key Competences: A Developing Concept for Universal Compulsory Education (European Information and Documentation Network, 2002) and others [3]. In order to create conditions and implement tasks to increase the level of digital competence of teachers, first of all, it is necessary to identify their attitude and readiness to use digital tools and ICT, identify problems and risks faced by schools and pedagogical teams, find options for solving these problems, and also find out the possibilities of involving interested parties. All this requires the development of tools for assessing the level of competence of teachers, which

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allows for determining the general level of professional readiness and ability to use information and communication technologies in work.

MATERIALS AND METHODS

During the study, the approaches and principles of using the teacher's digital competence self-assessment tool were applied and developed to assess teachers' attitudes towards the use of information and communication technologies. Methods of analysis and generalization of existing experience in Ukraine and abroad, methods of comparative analysis, classification of principles and approaches, theoretical generalization and development of recommendations for domestic specialists were applied.

RESULTS

The self-assessment tool of the teacher's digital competence should be used in the form of an online survey, which allows remote interviewing of a large number of respondents. An online survey is a quantitative method of information collection, the most modern way of obtaining and processing data, that is, research carried out online. The main advantage of online research is the speed of obtaining data. Most often today, online surveys are used to study the attitudes of consumers in the service market, and citizens in social and political research. Online polls have become especially relevant after restrictions related to the COVID-19 virus pandemic and the introduction of martial law in Ukraine after February 24, 2022. Online surveys are well-suited for industry research. Today, online surveys are widely used in the educational field, in general, to reveal the opinions of the subjects of the educational process on various educational issues, as well as to assess the level of knowledge and skills of those who study [1].

The self-assessment tool is a broad concept that is used in this study as a means of measuring the level of competence of pedagogical workers. Forms of using such a tool can be questionnaires, focus group discussions, portfolios, interviews, observations, etc. A combination of different forms of self-assessment tools can provide more reliable and in-depth information about the subjects and the subject of the study. Online self-assessment tools allow you to get quick results from a large group of respondents and effectively process the received data [2].

The field of application of the tool is the system of postgraduate pedagogical education, institutions of general secondary education, centers for the professional development of teachers, and scientific institutions investigating the problems of developing the professional competencies of pedagogical workers.

During the development of the tools for self-assessment of the teacher's digital competence, the following set of criteria can be applied:

− Relevance and perspective, which means the presence of an actual problem related to the need to increase the level of digital competence of teachers, which corresponds to the requests, and interests of teachers and teams of general secondary education institutions, the possibilities of practical use of the digital competence self-assessment toolkit presented by teachers and lecturers of the VET system;
− Sufficient theoretical and research level means the topic of assessing the digital competence of a teacher is considered at the current level of development of pedagogical science in Ukraine and European countries, a sufficient number of sources are presented, including framework documents of the European Union, UNESCO, and other international organizations;
− Novelty and progressiveness - introduction of new, original elements into the organization of the process of professional self-improvement of teachers, effective application of progressive models of self-assessment of key competencies of teachers, related to the use of ICT and methods of organizing pedagogical activity;
− Compliance with the professional characteristics of the audience – compliance of the submitted material with teacher training programs and standards of professional competence;
− Effectiveness and efficiency aiming at a consistently high level of development of digital competence of teachers and education of participants regarding the use of ICT in professional activities, significant changes in the development of digital competence of teachers;
− Practical application that means the presence of analysis and generalizations regarding proposals for the application of the presented toolkit of self-assessment of the teacher's digital competence in the system of improving the qualifications of teachers, the predictability of the result regarding the professional growth of teachers.

It is proposed to take the following approaches as a basis for the online survey of teachers' competencies:

− Novelty and relevance;
− Compliance with state policy priorities and thematic areas of scientific research and scientific and technical development;
− Practical usefulness, the possibility of implementing the provided recommendations and conclusions;
− Availability of previous experience and training of scientists in carrying out scientific research.

Principles of conducting a survey that contributes to obtaining reliable data:

− Voluntariness;
− Anonymity and confidentiality;
− Lack of administrative influence;
− Openness and accessibility for teachers (distribution through online communities, pages of postgraduate education institutions and professional development centers);
− Responsibility for providing answers;
− Focus on the urgent needs and problems of the respondents;
− Availability of open questions for expressing personal attitudes to the researched problems;
− Taking into account the conditions in which the respondents are;
− Observance of professional ethics, etc.

CONCLUSION

The proposed principles and criteria are the result of an analysis of the existing domestic and foreign practice of the use of indicators of digital competence based on European framework documents. The principles and approaches presented in the work can be used in the development of a survey and a tool for self-assessment of a teacher's digital competence. It is also important in further research to study the experience of measuring educational results based on the competence approach.

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CHAPTER 15

Unification of Evaluation of Scientific Activity Fields in CRIS Systems

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Keywords: CRIS, Institution of higher education, Scientific institution, Evaluation indicators, Unification of fields, Entity.

INTRODUCTION

Research information is of strategic importance in the field of science. The implementation of effective processing of such data is possible through the development and implementation of CRIS systems that cover a vast number of documents and data. However, the task of the automation process in science has not yet been solved without constant manual input of duplicate fields.

In developed countries, CRIS systems cover a huge number of documents. Thus, the Slovak new information system R&D SK CRIS is focused on effective work with research projects, including communication with other information systems [1]. Some researchers of CRIS systems are guided by its basic principles to provide joint management of scientific data [2]. Others investigate systems for automatically extracting metadata from scientific papers in PDF format for the Research Activities Monitoring Information System (CRIS UNS) [3]. For the joint adoption of current CRIS systems and open access repositories (OARs), the factors that facilitate or hinder this process are systematized [4].

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Several studies are devoted to classification management as a prerequisite for establishing true semantic compatibility of CRIS systems in interorganizational contexts [5]. Ye. Shapovalov [6] developed an approach to the automatic generation of statistics and dashboards for monitoring publishing activity in real-time; and S. Zharinov [7] proposed to develop a Ukrainian CRIS called URIS. Narayanan (2003) [8], in order to support a database for applications using scientific datasets in Grid, developed a corresponding software system.

The solution to the problem of automating the input of repeating fields in CRIS systems is relevant, especially when working with significant arrays of documents. This work aims to develop the concept of field unification from different documents. This concept could be decisive for CRIS systems based on systematization and unification of the fields of the studied documents for each entity.

MATERIALS AND METHODS

In order to accomplish the objectives of our research, we employed the dialectical methodology of scientific inquiry. We utilized the abstract-logical method to consolidate various perspectives on the automation process using databases, facilitate data interchange, and pinpoint redundant fields. Additionally, we applied synthesis and comparative methods to harmonize the criteria used to assess the scientific performance of universities and research institutions. Furthermore, we conducted economic and statistical analyses to devise an all-encompassing evaluative framework for the fields under investigation.

RESULTS

The analysis of regulatory documents of the Ministry of Education and Science of Ukraine and Cabinet of Ministers of Ukraine related to reporting in science [9 - 12] allowed to systematize required fields and make them unified. The trend of duplication of document indicators and different assessments in institutions of higher education (HEIs) and scientific institutions (SI) was traced. For example, all reporting in HEIs covers five years and three years in SI. Most indicators concern scientific workers, but they are evaluated differently in HEIs and SI. This applies to the following concepts: the composition of research workers, the number of doctors of science among full-time researchers under the age of 40, the number of candidates of science (doctors of philosophy) under the age of 35, the number and percentage of women, etc. In HEIs, the number of full-time scientific-pedagogical and scientific employees of scientific research units, sectors, and other research units is demarcated. In contrast, in SI, there are only other research units. In addition, the scientific institute records the researchers by staff categories, while the HEIs do not.

Significant discrepancies were found in the assessment of publication activity. Publications in Scopus and Web of Science are prioritized in HEI and SI. However, SI has a much wider range of assessments of publication activity. These are monographs, encyclopedias, dictionaries, textbooks, collections of scientific works, scientific directories, etc. The number and share of publications are estimated in the HEI. In that case, only their quantitative indexes are determined in the scientific institutions, complicating the formation of a single information database.

The results of scientific activity also have differences in their assessment. Thus, fundamental, applied, and completed applied research are evaluated on approximately the same indicators. But in the SI, for example, indicators are calculated: the presence of scientific objects that constitute a national treasure and the presence of modern high-tech scientific equipment, while in the assessment in the HEIs, there are no such indicators.

The study made it possible to unify the main fields for each entity, which is a real or imaginary object in the database, which can be unified based on the studied subject area for which the database is being developed.

For the future, we consider it reasonable to analyze the array of document fields more systematically, for which we made their unification using spreadsheets. The ultimate goal is to create such a database structure that would allow their automatic use within the main scientific entities and automate scientific activity.

CONCLUSION

Our research allowed us to substantiate the concept of a single field for CRIS systems by systematizing and unifying the fields of the studied documents by entities. We adapted the interpretations of the most problematic entities in the normative documents of Ukraine to form a database. It is revealed that many indicators in the normative documents of HEI and scientific publications are duplicated, and some of them are evaluated differently. We defined the difference between reporting scientific activities in HEIs and scientific institutions.

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CHAPTER 16

Scientometrics of Open Access Journal Fizyka Nyzkykh Temperatur and Journal of Mathematical Physics, Analysis, Geometry

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Keywords: Cite Score, Open Access models, Publishing practice, Scientometrics, Science journal, SJR.

INTRODUCTION

On the basis of long-term experience of scientific publications of the journal Fizyka Nyzkykh Temperatur (FNT) and Journal of Mathematical Physics, Analysis, Geometry (JMPAG), as well as continuous monitoring and comparison of scientometric data of domestic and foreign journals, strategies and ways of more effective development of Ukrainian publications are considered. Examples of implementation of Open Access models are given, and their impact on scientometric indicators, and further progress of scientific publications is indicated.

MATERIALS AND METHODS

Open Access models for the journal Fizyka Nyzkykh Temperatur and the Journal Mathematical Physics, Analysis, Geometry are given.The experience of many years of scientific publications in FNT and JMAFG journals, constant observations, and participation in the process of registration of the flow of articles, their review, publication, and subsequent citation research, as well as statistical data from the annual reports of the editors on the activities of the journals, give reasons and a basis for comparison of some Open Access models.

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Comparative analyses and comparisons with domestic and foreign Open Access models of natural science journals allow us to make assumptions about current trends in the innovative development of Open Access models.

The publisher of the journal Fizyka Nyzkykh Temperatur and the Journal of Mathematical Physics, Analysis, and Geometry is the B. Verkin Institute for Low-Temperature Physics and Engineering of the National Academy of Sciences of Ukraine.

The monthly scientific journal Fizyka Nyzkykh Temperatur (Editor-in-Chief, Corresponding Member of the National Academy of Sciences of Ukraine Y. G. Naidyuk) [1] has been published since January 1975 and simultaneously in English, it is published by the American Institute of Physics under the title Low-Temperature Physics [2]. The journals Fizyka Nyzkykh Temperatur and Low-Temperature Physics are included in the scientometric databases Web of Science (since 1975) and Scopus (since 1996). While the Ukrainian version of the journal Fizyka Nyzkykh Temperatur is publicly available for the domestic audience, the English-language version, i.e., the journal Low-Temperature Physics, provides free access to current issues within two weeks from the date of publication on its website. Subsequently, the download of one article is paid and access to the archive is granted by a subscription. In turn, the publisher, the American Institute of Physics, strongly supports the publications of special issues, constantly updates and publishes lists of the most read and cited articles, and draws attention to interesting reviews and quick publications on its website. Scopus provides significantly different characteristics for both journals. Fig. (**1** and **2**) show the cite score data of the Scopus resource for the journals Fizyka Nyzkykh Temperatur [3] and Low-Temperature Physics [4].

Fig. (1). Cite score trend of fizyka nyzkykh temperatur.

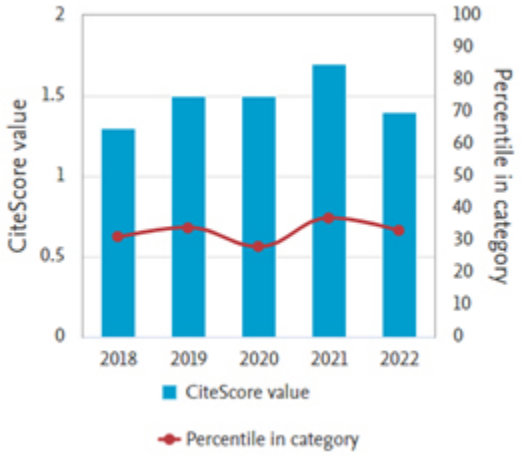

Fig. (2). Cite score trend of low temperature physics.

The quarterly Journal of Mathematical Physics, Analysis, Geometry (Editor-i--Chief, Academician of the National Academy of Sciences of Ukraine L. O. Pastur) [5] has been published since 1994. Under the name, Journal of Mathematical Physics, Analysis, Geometry, it is included in the Scopus (since 2008) and Web of Science (since 2010). The published data of statistical parameters of journals presented in Scopus and Web of Science demonstrate the progress of open-access publications. This is evident not only from the increase in impact factors but also from the movement of journals in the quartile from Q3 to Q2. This positive trend has been observed especially in recent years, which indicates both a well-thought-out editorial policy and the success of the existing open-access model. Fig. (**3**) shows the cite score data of the Scopus resource for the Journal of Mathematical Physics, Analysis, Geometry [6].

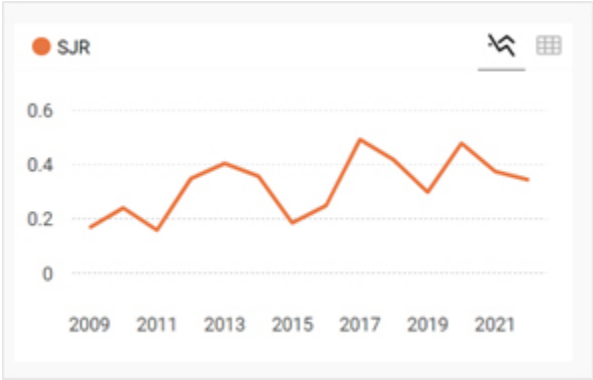

Fig. (3). SCImago journal rank (SJR) of journal of mathematical physics, analysis, geometry.

While a comparison of the scientific metric data for different Open Access models for Ukrainian journals may be accompanied by discussions about the superiority of one or another approach, an examination of the aims, objectives, and publication strategies of Open Access journals reveals an important difference between some models. In the case of fully Open Access journals, journal publishers generally consider their primary responsibility to promote the dissemination of scientific excellence. At the same time, thanks to a long-term partnership and cooperation with a foreign publisher, journal authors, and contributors can receive an annual honorarium for the right to translate and publish the English-language version of the journal. Most importantly, their articles have the best distribution of the journal among the world scientific community, which should increase the impact factor of articles, personal scientometric data of authors, and Ukrainian journals, in general.

RESULTS

Scientific institutions pursue in their activities not only research and educational goals, but also set themselves the task of disseminating fundamental scientific data, including through the publication of periodicals, in order to bring the best achievements of domestic science to the scientific community. The optimistic data on scientometric parameters of Ukrainian journals of different Open Access models confirm the conclusion that the path of scientific periodicals to Open Access innovations is a priority for the coming years and will be the best realization of scientific publishing practice.

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CHAPTER 17

Review of Statistical Methods Application and Reporting Results in Ukrainian Medical Peer-Reviewed Journals

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Keywords: Biostatistics, Medical research, Medical statistics, Medical research, Peer-reviewed journals, Statistics, Statistical methods, Statistical inference.

INTRODUCTION

The paper concerns the peer review culture in Ukrainian professional scientific publications, namely the culture of reporting statistical methods application and results in Ukrainian peer-reviewed journals in medical and biological sciences. There is no doubt that statistical approval of results of experimental, retrospective, and prospective research in medicine is of great importance because it allows justification of conclusions driven from obtained data that can guide medical practice, treatment protocols, and further scientific investigations, and, when talking about the medicine, on the top of this are patients' lives and health. This is why inappropriate use of statistical methods, as well as fallacious interpretations of their results when analyzing medical data, that led to wrong conclusions, can cause the same harm as data fabrication or falsification. The International Committee of Medical Journals Editors (ICMJE) in their Recommendations advises to "describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to judge its appropriateness for the study and to verify the reported results" [1]. Most Ukrainian medical journals repost this statement on their websites as guidelines for authors, however

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in many cases it remains just a formal declaration, and no appropriate reviews in this direction are made, so they publish papers that report results that are not supported by the statistical methods applied.

The objective of the research is to study the actual state of statistical methods application and reporting in Ukrainian medical peer-reviewed journals in the aspect of how they comply with ICMJE Recommendations cited above.

MATERIALS AND METHODS

Publications in the Ukrainian scientific journals indexed by Scopus and/or Web of Science (according to [2]) were studied. In this study from the list of 170 journals mentioned above, we included only journals in medical sciences that have free access to the published articles from their websites (32 journals). The issues published as the current issues for the period of observation (September 15—18, 2023) were reviewed, and papers that do not use statistical methods (case reports, literature reviews, *etc*.) were excluded from further consideration. The rest of the publications were read and analyzed to understand the main tasks, for which statistics is used in current medical scientific research, the most widely used methods and techniques (including software), the clarity of the statistical methods explanation in "materials and methods" section of a paper along with their respect to study design and data properties. The confidence interval for the prevalence of publications with reports about statistical methods applied in their research is estimated by Wald's method with the help of the software tool available [3].

RESULTS

Among 413 studied publications in the current issues of Ukrainian medical scientific journals indexed by Scopus or Web of Science, 287 articles were observed to use statistical methods, which allowed estimating the prevalence of tasks in actual medical research, which need statistical methods application as 69.49% with 95%-confidence interval (65.05;73.93)%. First of all, this includes descriptive statistics, which in the majority of cases, is reported in "M±m"-style for quantitative variables, and in "n(%)"-style for qualitative ones. Under the "M±m"-style, we mean that averages and certain characteristics of deviation from the average were calculated, however, it is worth noticing that it was not always clear which characteristic of deviation was reported (standard deviation or standard error of mean), because this was explained neither in the "materials and methods" section nor in headers or notes for tables given in the "results" section. Confidence intervals for means were reported very rarely; medians with interquartile ranges – a little more often. In almost all the cases when medians and quartiles were reported, this was accompanied by the phrase like "for the variables which do not follow the normal distribution", sometimes with no information, on

how the normality of distribution was tested, or without results of the statistical tests for normality applied. It is also worth noticing that including mentioning testing distributions for normality and using non-parametric statistical procedures for non-normally distributed quantitative variables has become a good practice in recent medical publications. However, in many cases, it remains just a declaration, and no signs of real application of non-parametric statistics were found in the "results" section while it was announced in "materials and methods". Most of the reviewed publications would use statistical inference, which is directly or indirectly indicated by the use of "$p<0.05$" phrases for confirming their conclusions when presenting and discussing the obtained results. At the same time in many cases, they did not provide the exact p-levels obtained, and information enough to understand which statistical test was applied to calculate the p-values reported in the paper. Most researchers applied methods of statistical inference to the tasks of comparisons between several groups. The most frequent mistakes associated with this task were: disregarding the multiple comparisons effect, lack of verification of the basic conditions for applying the method (like homogeneity of variances and normality of distribution when using parametric ANOVA), choosing methods for comparison of independent measurements when study design requires to apply paired tests for dependent samples. There was also a series of papers that shifted attention toward how the statistical methods were described in their "materials and methods" sections, pointing out the authors' illiteracy in this domain and the lack of qualified review from the engaged reviewers and editors, who accepted such nonsenses and doubtful statements to be published. Examples include cases: when p-level is referred to as "reliability/validity of results" or "the reliability of laparoscopy was $p<0.05$", or "the probability of a difference between groups"; using such phrases such as "Student-Fisher's method", "correlations were calculated by Pearson-Spearman method", "t – is the reliability criterion for the normality of distribution", "the reliability coefficient was determined by Student's criterion"; along with doubtful statements that to conduct Shapiro-Wilk's, Mann-Whitney, and/or Kruskal-Wallis tests, the bare Excel was used, or other software that does not support the methods declared.

CONCLUSION

Thus, one of the ways to improve the quality of publications and to increase the international rating of Ukrainian medical peer-reviewed journals is to improve the approach to the reporting results of statistical data processing and statistical inference in the papers accepted for publication. Several aids should be suggested in this direction. First, to introduce the practice of an independent review focused on statistical methods used and reported in the research papers (either an additional reviewer may be engaged, or the editorial board should be confident

enough in the competence of the already involved reviewers towards the statistical aspects of data analysis). Second, to make it a mandatory condition for authors to provide open access to the research data so that the results reported in the paper can be reproduced by an independent person in accordance with the statistical methods enlisted in the published paper. And the last but not the least, it is necessary to update the healthcare institutions' educational programs by the implementation of the actual statistical methods description into the normative educational components content, as well as by providing elective courses on different aspects of applied statistics in medicine, biology, and healthcare.

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CHAPTER 18

The Approach to Minimizing the Conflict of Interests in the IT System for Competitive Selection of Scientific Projects

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Keywords: Conflict of interest, Competition, Experts, Ethics commission, Scientific research.

INTRODUCTION

In the modern world of information technology and scientific research, the process of competitive selection of scientific projects is becoming more and more important, but at the same time, it may face problems of conflict of interest [1, 2]. Conflicts of interest can lead to the concealment of information or targeted influence on the evaluation process [3]. In order to ensure objectivity and transparency and minimize the risk of interference of people with subjective interests in this process, it is important to research and implement information technology based on the principles of transparency and ethics, which will minimize the occurrence of a possible conflict of interest. This will ensure the efficiency and reliability of project evaluation, which is essential for the research industry and society as a whole.

MATERIALS AND METHODS

During the competitive evaluation of scientific projects, the main conflicts of interest arise at the stage of decision-making regarding funding. Subjects of conflict of interest are scientists (who have different roles in competitive evaluation), administrators and ethicists. Scientists perform two diametrically

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opposed roles. On the one hand, there are scientists who submit the project. On the other hand, there are scientists who carry out the examination of these projects. The area of conflicts of interest between these roles is very large. There are localized contradictions between scientific schools, the level of importance of project goals, both personal and scientific interests, different levels of competence of scientists, etc. There is also a distinct area of conflict of interest between academics (from both roles) and administrators. The administrators located in the "Science Section" evaluate projects based on the interests of the financing party. The task of coordinating all possible conflicts of interest is performed by the Ethics Commission. It carries out its activities taking into account the entire spectrum of the environment in which scientific activity in Ukraine is immersed, as well as world trends and international cooperation.

In Fig. (**1**), the green rectangle marks the area of possible conflict of interest: 1: Head of project → Experts. 2: Experts → Head of project. 3: Head of project → Members of Section. 4: Members of Section → Head of project. 5: Members of Section → Experts. 6: Experts → Members of Section. As can be seen from Fig. (**1**), in the field of possible conflict of interest, 6 main directions are allocated. Outside the field, external sources of information on the occurrence of a possible conflict of interest, which are accumulated by the Committee, are taken into account. The main subjects of the developed model are the Head of the project, Expert, Section/Sections and Committee.

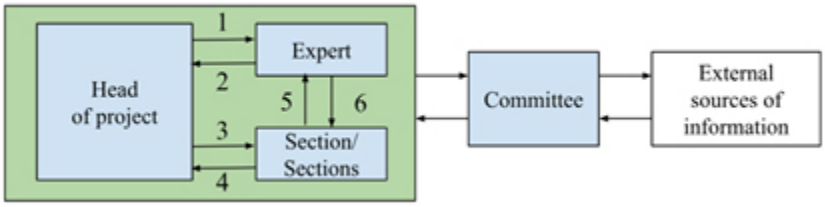

Fig. (1). Model of possible conflict of interest when submitting grant projects for competitive selection.

RESULTS

Taking into account the model presented in Fig. (**1**), an information technology system is developed, which takes into account all possible directions (bilateral flows) of the emergence of a conflict of interest. The developed System, based on mathematical tools, automatically minimizes possible areas of conflict of interest on the basis of initial information received from all subjects of the process. Fig. (**2**) presents a fragment of the business process (BPMN 2.0 notation) on minimizing the possible conflict of interest between the subjects of the 2nd stage of the competitive selection of research projects and scientific and technical (experimental) developments, the executors of which are higher education

institutions and scientific institutions belonging to the sphere of management of the Ministry of Education and Science of Ukraine.

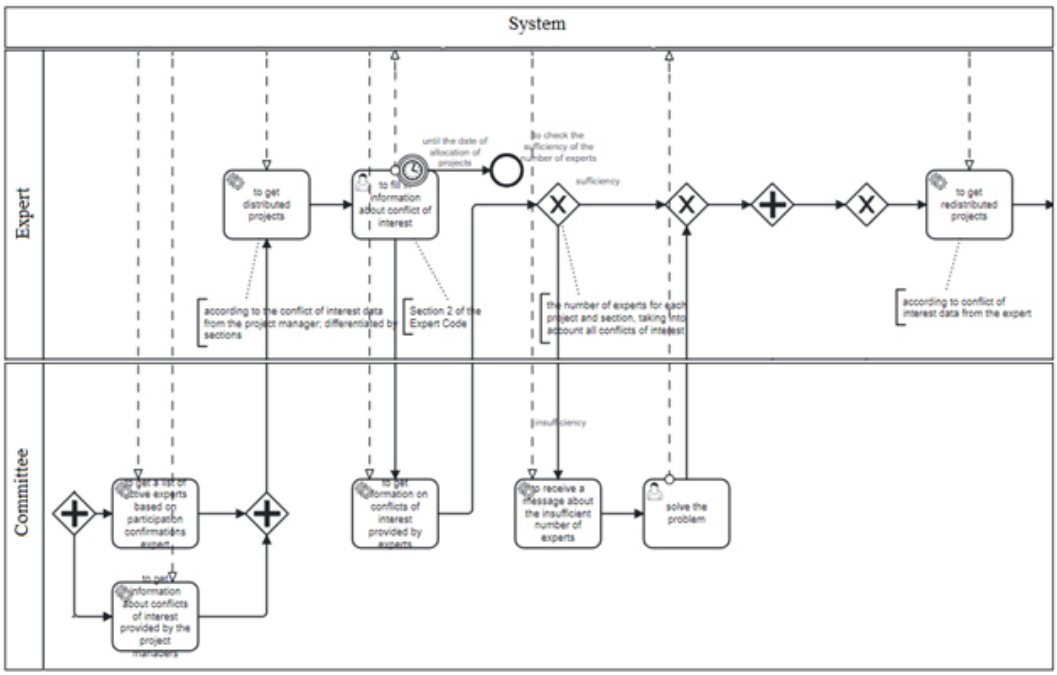

Fig. (2). Fragment of a business process to minimize the possible occurrence of a conflict of interest.

Fig. (**2**) shows three main roles: System, Committee, and Expert. For the System, within the framework of the conceptual model, a collapsed pool is used, unlike other roles. The developed information technology makes it impossible to assign projects to experts, in which, according to the information received by the System, there may be a conflict of interest with the managers of the submitted competitive projects. In the event of a non-standard situation that requires the redistribution of projects between experts for a number of objective reasons, the System provides information to the Committee, which makes the final decision, which is reflected by the corresponding tasks in Fig. (**2**).

CONCLUSION

Thus, the development of information technology based on transparency to minimize the reduction of conflicts of interest is a prerequisite for improving the objectivity, transparency and reliability of the process of evaluating competitive projects, which will allow for objective decision-making and will contribute to greater trust on the part of stakeholders.

FUNDING

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CHAPTER 19

Implementation of Modern Digitalization Technologies in the Military Sphere

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Keywords: Communications, Control, Digitalization, Information environment, Management, Technical development.

INTRODUCTION

The intensive development of digital technologies is forcing all areas of activity to be involved in the digitalization process. At the current stage of industrial development, more and more institutions, enterprises, organizations of all forms of ownership, and individual entrepreneurs are introducing advanced knowledge-intensive technologies that allow for the production of high-tech dual-use products in a relatively short time. This requires a change in the decision-making system in the military sphere to determine the technological sophistication of the developed samples.

MATERIALS AND METHODS

Achieving the goal involved the use of the following methods: a formal and logical method aimed at studying the basic concepts. The logical method of research determined the sequence of judgments and conclusions. Its application made it possible to formulate basic concepts such as “digitalization”, “technical development”, “sample”, etc. The use of dialectical and structural-logical methods made it possible to study an algorithm that is automated and aimed at confirming the level of technological readiness of the sample for its use in the military sphere.

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Modeling and forecasting methods were used in the development and formulation of areas for improvement and practical principles for increasing the efficiency of technical development in the field of digital transformation in Ukraine.

RESULTS

Decision making on the technical level of a sample and the possibility of its application in the military sphere should be based on the principle of impartiality, reliability of results, effectiveness of its application and use for the intended purpose.

Today, the military is actively developing a system for assessing the technical readiness of a proposed sample using integration platforms. Automated evaluation of a new model, the ability to confirm its technological readiness and the organization of its acceptance for operation can be carried out according to the following algorithm.

The developers of a new design submit information on the design's technical characteristics, the enterprise's capabilities, and the results of tests already performed on the integration platforms for automated design evaluation. Based on the information provided, the level of technological readiness of the proposed design is assessed.

The assessment of the technological readiness of a sample should include several levels that will determine its further use in the military sphere [2]. The assessment levels may be as follows: high, sufficient, medium and low. The unilateral criterion for evaluation is the need for this sample in the military sphere.

A high level of technological readiness of the sample should include the availability of the necessary documentation, the determined capacities of the enterprise, the existing sample and the results of its tests in conditions that are close to the requirements of real use or actual operating conditions. In this case, the prototype is considered promising for use in the military sphere.

The level of technological readiness of a design characterized as sufficient implies that the design (documentation, manufacturing process, etc.) requires minor improvements and can be recommended for use in the military sphere. All measures to finalize the design are carried out by the developer.

The assessment of the design's manufacturability as low indicates that further consideration of the developer's request is inappropriate. In this case, the developer is automatically notified, and the submitted materials are returned [5].

When assessing the level of technological readiness of a design as an average, the further processing of a developer's application may be as follows. If there is a need or interest in the use of this design in the military sphere, the developer may be offered to finalize the documentation (production) and the design itself and conduct additional testing of the design. The further procedure for finalizing the design by the developer should be aimed at fulfilling the requirements of the customer of this design in the military sphere [4]. The developer may carry out the above activities using the capabilities and means of its own enterprise. Upon reaching the level of readiness specified by the customer, the developer may re-submit the sample to the integration platforms for a repeated evaluation procedure.

If the developer has insufficient capabilities to finalize the sample, he may correspond with the customer for scientific, technical and material assistance. The customer's scientific organizations may be involved in providing mentoring assistance in finalizing the documentation, conducting additional tests and evaluating their results. Technical assistance and material resources are provided by the customer solely for the purpose of further use of the sample in the military sphere. The totality of these measures is aimed at increasing the level of manufacturability of the sample to a high level.

CONCLUSION

The above algorithm is automated and is aimed at confirming the level of technological readiness of the sample for its use in the military sphere.

The use of modern digitalization technologies in the military sphere can have a significant positive effect on the procedure for the approval and use of developed high-tech samples in the military sphere. First, it will allow developers to raise awareness of the current state of development in a particular area, mentoring and the presence of partners and competitors, etc. Secondly, the use of modern digitalization technologies will make the procedure for applying a design in the military sphere even more transparent and accessible to institutions, enterprises, organizations of all forms of ownership, and individual entrepreneurs. Thirdly, it will allow to simplify this procedure while ensuring the reliability of the assessment of the level of technological readiness of the sample. Fourthly, this procedure will significantly speed up the process of delivering high-tech samples to consumers in the military sphere.

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CHAPTER 20

The Study of Ukrainian and Lithuanian Ethnographic Textile: the Experience of Bilaterian Cooperation

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Keywords: Cooperation, Décor, Lithuania, Techniques, Ukraine, Weaving.

INTRODUCTION

Ethnographic textiles, both in the past and in the present, are a multi-faceted and multi-level phenomenon, have a long history and rich technological developments and artistic experience of masters, which is valuable for descendants. The study of a large layer of old technologies for making different functional types of textiles helps expand the understanding of ethnographic textiles in the modern culture not only as an object of decorative, and artistic but also for utilitarian, and practical purposes. The experience of preserving and reproducing unique technologies for making ethnographic textiles in Western Ukrainian and Lithuanian territories became the subject of a bilaterian interdisciplinary R&D project «Unique Technologies of Ethnographic Textile: Experience of Preservation in Western Ukraine and Lithuania» (2022—2023) between scientists of the Folk Art Department of the Ethnology Institute of NAS of Ukraine and the Faculty of Mechanical Engineering and Design of Kaunas University of Technology. The implementation of this project by scientists of both countries was allowed by the principle of open science, which, in accordance with the recommendations of UNESCO, provides for increasing scientific collaborations between different scientists of different fields.

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MATERIALS AND METHODS

The principles of open science, namely the availability of materials and research results, were applied during work on the project. Scientists have created a joint database of items from the museums of both countries, in particular separate groups of interior (bedspreads and towels) and clothing (belts) textiles. Empirical, theoretical, and graphical methods were used for the investigation. In the first stage, the main role was played by empirical methods. The partners photographed museums` exhibits, which helped the digitization of national heritage objects of both countries, and photos and other data were placed in a common database and made available to all project participants. The fabric structure parameters, which were established by the organoleptic method or using a textile lens and SMZ 800 Nicon stereoscopic microscope, were determined for warp and weft raw material, decoration or finishing techniques, and so on. The next stage consisted of the graphic processing of the collected and analysed samples. Plans of fabric weaves were made using specialized software «Audiniai» and «Ornamentika» to analyze and design fabrics and ornament, created at Kaunas University of Technology [1, p. 2]. At the theoretical level, scientists used comparative analysis, which contributes to common and individual ways of the development of décor of both countries' ethnographic textiles. Scholars used structural analysis for study items, as well as modeling and reconstruction methods, which contributed to the restoration of partially or completely lost weaving techniques. Art historical and formal analysis was used to identify the characteristic features of items` decoration and its components; the comparative-historical method made it possible to analyze the similarities and differences between Ukrainian and Lithuanian ethnographic textiles, as well as the features of their use from the end of the 19th to the beginning of the 21st centuries.

RESULTS

The research process of ethnographic textiles during the implementation of the bilateral project Unique Technologies of Ethnographic Textile: Experience of Preservation in Western Ukraine and Lithuania» was opened to the public thanks to popular articles, conferences, and scientific seminars: Features of Making Western Ukrainian and Lithuanian Sashes: Comparison of Technological and Artistic Features», «The results of the Ukrainian and Lithuanian towels` exhibition», «Universal & Unique Techniques of Traditional Clothing Components Weaving of the Western Part of Ukraine and Lithuania» [2, 3]. Scholars have published the results of their work in several publications in open access databases journals, including ERIH PLUS [1, 4 - 6]. However, the most resonant result of the project was the organization and preparation of the exhibition of Ukrainian and Lithuanian towels «Weave, Sister, Towels» at the

Open Air Museum of Lithuania., which runs from June to October 2023.

The study of Western Ukrainian and Lithuanian ethnographic fabrics proved the existence of a significant number of woven items` types and their local variants. Comparative analysis of the decoration of national and Lithuanian items made it possible to identify a number of common and distinctive artistic features, ethnic features of identity, and local originality, which are significant components of the national artistic heritage of Ukraine and Lithuania.

The items developed during the implementation of the joint Ukrainian-Lithuanian project proved the use of common weaving techniques in Ukraine and Lithuania in making bedspreads: plain, rib, different kinds of twill weaves, pick-up, overshot, and overlaid, terry techniques [1, p. 86]. It was used to make towels in both countries plain, rib, twill weaves, pick-up, and overshot techniques, the last of is more common in Lithuanian than in Ukrainian towels. In Western Ukraine and Lithuania, different weaving techniques could be combined into one item. Twill and pick-up combinations were common [4, p. 12]. Horizontal looms of various designs have long been used to weave belts in Ukraine, on which products were made using twill, rep weaves, and warp and weft weaving. In Lithuania, ancient forms of weaving with limited use of looms lingered longer. One of the common techniques was «card» weaving, in which Lithuanian scientists see a combination of twisting and weaving techniques [5, p. 1151]. Often the pick-up technique with pick-up on warp was used for Lithuanian belts.

Both countries were characterized by cross-striped and checkered fabrics, formed by linen and varieties of twill weaving. Longitudinal stripes, which were quite common in Lithuania, were rare in Ukraine. A large variety of cross-striped coverlets was recorded in both countries. Symmetric schemes of grouping strips of unequal width into patterned complexes with the selection of the main ones, symmetry of the arrangement of narrow strips in relation to the central one, and the preference for neutral background planes were typical for Ukrainian bedspreads. Lithuanian cross-striped bedspreads are characterized, as a rule, by a composition of dominant wide stripes with narrow ones, which only complemented the central one, without creating separate groups.

In Ukraine and Lithuania, there are mostly cross-striped compositions of towels with a concentration of smooth, finely patterned, and main planes of the ornament near the narrower ends. In Ukrainian items, the central field is most often monochromatic, sometimes interwoven with individual narrow ribbons in a monotonous or fading rhythm towards the middle of the towel [6, p. 770]. The richness of ornamental compositions and the variety of motifs distinguish pick-up towels from most of the studied ethnographic regions of Ukraine. Lithuanian

analogues are significantly inferior to them in compositional schemes, the number of motifs that are not the same, and a more stingy color in which the red color prevails, in contrast to the prevailing polychromy in Ukrainian items. Overshot Ukrainian towels with two warp are marked by the greatest variety of patterns of arrangement of ornamental motifs. Analogous Lithuanian towels are richer in the forms of motifs and the variability of their arrangement than their Ukrainian (Polissia Region) counterparts.

In Lithuanian belts, dark ornaments on a light background prevailed, while in Western Ukrainian items, we cannot unequivocally distinguish dominant color combinations between the ornament and the background. Ukrainian belts are characterized by measured static compositions, while in Lithuania, due to the use of S-shaped and swastika motifs, dynamic compositions are also found. In Western Ukrainian customs and rites, the belt has not been used as widely as in Lithuanian, but the apotropaic function inherent in the item has remained unchanged in both countries.

CONCLUSION

The productive dialogue of Ukrainian and Lithuanian scientists, and the project results` presentation in the public national and world humanitarian space (collective and individual scientific and popular science articles, conferences, seminars) have prospects for scientifically based, objective interpretation of the national specificity of Ukrainian and Lithuanian ethnographic textiles, finding ways to popularize it, as well as creating modern competitive textile products based on ancient samples. During the implementation of the project, its participants consistently acted in accordance with the principles of open science. Ukrainian scientists drew attention to the program «Lithuanian National Heritage: Traditional Crafts» of the Ministry of Agriculture of Lithuania together with the Lithuanian National Museum, which is designed to support the preservation of Lithuanian intangible national heritage, part of which is ancient weaving techniques. We consider it expedient to implement the mechanisms of its action in Ukraine in order to preserve and develop old Ukrainian weaving skilfulness.

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CHAPTER 21

Effectiveness of Access to Scientific and Informational Resources of Libraries of Ukraine

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Keywords: Aervice, Access to knowledge, Scientific and informational library resources, Types of resources.

INTRODUCTION

One of the primary tasks facing the scientific library today is the improvement of methods and means of user access to information resources. The ability to have access to the results of scientific activity and their dissemination to all levels of interested users is of great value to society.

The scientific library as an information center should contribute to the initiatives of open science, most fully and qualitatively reflecting the content produced in the world information space. The complication of scientific communication and its transition to the online mode presents library institutions with the task of helping researchers at every stage of their activity. Management of information flows created by scientists requires appropriate services from the library for easy and competent search, storage, organization and protection of data.

MATERIALS AND METHODS

These are based on the application of a complex of scientific approaches and procedures. The main principles of socio-communicative, systemic, functional, and informational approaches were applied, which made it possible to investigate

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the issue of library scientific and informational resources in the context of electronic information space. Comparative and systemic analysis was used to identify the problematic situation in the development of access to the electronic information space of the library web environment.

DESCRIPTION

We will consider and evaluate the effectiveness of access to knowledge in the "Scientific Resources of Libraries" database, which is a component of the "Science of Ukraine: Access to Knowledge" information portal, which is implemented by the National Library of Ukraine named after V. I. Vernadskyi.

The service is an annotated Internet navigator of scientific resources of Ukrainian libraries, systematized by types and fields of knowledge. It combines information about heterogeneous scientific information resources of different types of libraries of the country (national, regional universal, academic, branch, specialized, university libraries, *etc*.), ensures the relevance of this information and wide opportunities for a fairly accurate search of scientific resources based on this information, provides support for means of scientific communication and services related to the possibility of promptly informing users about resources relevant to them, *etc*.

The service supports the main types of resources:

Authoritative file (searches for documents in the electronic catalog by all variants of the author's name; different variants of the author's name (in different languages, different spellings in the same language, pseudonyms, surname changes, monastic or maiden name, *etc*.) are merged into one search query, which documents are searched).

Electronic catalog (opens the information repository and provides procedures for entering, searching, placing and issuing information sources).

Repository (accumulates, stores and systematizes academic texts: dissertations, qualifying graduation theses, articles in scientific publications, monographs, scientific publications, reports in the field of scientific activity, textbooks, publications on the Internet on platforms for the exchange of scientific publications).

Bibliographic database (provides comprehensive information about tools and databases containing bibliographic information (a set of information about documents arranged according to certain rules).

Virtual exhibition/presentation (is a tool for the presentation and preservation of

cultural heritage and new relevant publications by libraries and provides a wide range of users with the opportunity to increase the efficiency of information search and expand the range of necessary materials (texts, graphics, audio, video, *etc*.)).

Electronic collection (provides quick access to electronic documents interconnected by certain features that reveal the object of the collection, providing the possibility of automated search of its elements).

Electronic library (implements qualitatively new possibilities for working with large volumes of information; sequential, selective or parallel viewing of many documents; multi-aspect search in the entire volume of information; copying of necessary documents; creation of own documents, *etc*.).

Catalog of archival collections (ensures the ability to search for relevant information on arrays of documents of archive collections of libraries).

Referential database (allows, with today's huge flow of information, to select the necessary professional information in a short time, in which the essence of the issues is explained and the most important conclusions are given).

Information complex/portal (provides access points to library information via the Internet, which helps users find the necessary sources).

Factual database (provides brief information about objects (factual information, factual data, factual records), provided in a precisely defined format).

CONCLUSION

The service “Scientific resources of libraries” helps the user to create a unified view of the possibilities of automated extraction of the information he needs from a certain subject area. Presentation of library resources in the form of linked data expands the functionality of the digital library project, enabling:

- inclusion of additional elements of the description of these information resources;
- complete or partial updating of data from sources;
- inclusion of other types of information in the resource description;
- definition of references.

Formation of the database “Scientific resources of libraries” is carried out

based on the software of SAB “IRBIS64”. The search and access system includes:

- distributed search in catalogs and databases of scientific libraries;
- integrated means of full-text search in open-access resources;
- subject-specific Internet navigator of library scientific and informational resources;
- interconnected authoritative files of scientific groups and authors;
- interaction with scientific information search systems (Google Scholar) to improve the openness of the results of scientific activity and conducting scientometric studies;
- geoinformation map of scientific resources of Ukrainian libraries.

To date, 533 records have been recorded.

The successful functioning of the service allows to meet the information needs of users at a qualitatively new level, in particular, to provide access to information resources and services in network mode, which makes the search for the necessary library information more efficient, fast and convenient.

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CHAPTER 22

Criteria and Indicators For Evaluating the Effectiveness of Pedagogical Research Using Digital Technologies

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Keywords: Criteria and indicators, Digital technologies, Evaluation, Pedagogical research, Result, Scientometrics, Scientific and pedagogical workers.

INTRODUCTION

The use of information and communication technologies (ICT) in the field of education and science contributes to the identification of wide opportunities for its development at the international level, which also applies to Ukraine. In the conditions of the reform of the domestic system of higher education and science, the problem of the quality and effectiveness of pedagogical research and evaluation of the results of scientific and pedagogical activity becomes important. One of the main priorities for the development of domestic pedagogical science is to increase the effectiveness of pedagogical research and use their results to ensure the development of the educational sector of Ukraine. The implementation of digital technologies in all spheres of human activity, including in the field of education and science, provides an opportunity for scientific and pedagogical workers to present their achievements, primarily the results of scientific and pedagogical activities, in open access, in particular on the Internet, with the help of various web resources. Presentation of scientific and pedagogical research in open access will contribute to the development of new approaches, methods and educational technologies for practical use and will affect the improvement of quality indicators in education. The scientometric indicators characterize the work

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of researchers and scientific organizations, help assess their activities, and create ratings.

MATERIALS AND METHODS

To fulfil the tasks, theoretical and empirical methods of scientific research were used: analysis of the state of research of the problem in scientific publications; generalization of domestic and foreign experience of using scientometric indicators; analysis of the main terms and concepts and the relationship between them; a method of comparative analysis of existing practices for selecting criteria and indicators of scientific results; selection of digital technologies for evaluating the results of scientific research in pedagogical sciences; study of the practical experience of using information and digital technologies by scientific and pedagogical workers; generalization and classification of indicators and criteria.

RESULTS

The use of information and digital technologies provides new opportunities for evaluating the effectiveness of the pedagogical activities of individual scientists, laboratories, departments, departments, universities and institutions. This allows you to monitor the relevance of scientific research works, topics, publications, ratings, the number of revisions and downloads of electronic versions of scientific products through the analysis of the values of indicators of scientometric systems. In the study, we rely on the concept of effectiveness and evaluation of the effectiveness of pedagogical research on the use of digital technologies.

We understand the effectiveness of pedagogical (scientific) research as a characteristic of the set of obtained scientific results that have practical and social significance and are confirmed by quantitative and qualitative evaluation indicators.

Evaluating the effectiveness of pedagogical research using digital technologies is the process of tracking, collecting, processing quantitative and qualitative indicators of publicizing, distributing and using the scientific results of pedagogical research using digital technologies in order to evaluate their social value and practical significance in the field of education and science [1].

Usually, pedagogic science is based on the citation indicators of scientific works in the assessment of results. Focusing on the evaluation of results exclusively on citation rates, along with the advantages that led to their widespread distribution, has certain disadvantages. First of all, the scientific community's focus on citation indexes prompts individual commercial organizations to artificially build

strategies to increase the citation index and create analytical tools that manage to artificially hide the real value of a particular scientific work [2].

Existing approaches to the evaluation of the results of scientific and pedagogical research involve the determination of factors of scientific contribution and indicators of the impact of works. Usually, such indicators of influence are the number of citations, the Hirsch index and co-efficients (indices) calculated on the basis of the bibliography of publications.

The conducted analysis of the problem of dishonest use of analytical tools in pedagogical science showed the need to find new methods and criteria for a more objective assessment of the scientific achievements of scientists and the results of collective research for evaluating the scientific activity of structural units, scientific institutions and universities in the field of socio-humanities, in particular in the field of pedagogical sciences. For such studies and activities, citation indexes in various scientometric databases, in particular in commercial Scopus and Web of Science, should be important but only part of the necessary criteria for assessing the effectiveness of the impact [3].

We propose to determine the criteria and indicators for evaluating the effectiveness of pedagogical research using digital technologies in accordance with the "Regulations on the Implementation of Research Results by the National Academy of Educational Sciences of Ukraine" and the "Methodical Recommendations for Monitoring the Implementation of Research Results of the National Academy of Educational Sciences of Ukraine".

The criteria for evaluating the effectiveness of pedagogical research include: publication (pre-supposes the determination of the number of publications from scientometric databases, scientific electronic libraries, academic and publicly available social networks); distribution (involves determining the number of downloads of material in scientific electronic libraries and "reference managers" (for example, Mendeley), tracking posts by users in social networks, for example, on the Facebook page of a scientific topic); influence (assumes consideration of the number of citations of publications on the topic of research in international scientometric databases (Scopus, Web of Science), citations in open bibliometric search databases (Google Scholar)); the number of distributions, comments, reactions and citations in public social networks, such as Facebook, as well as the number of reviews, recommendations and citations of the material in the academic network, for example ResearchGate; expert evaluation (presupposes a qualitative evaluation by an expert of the novelty, theoretical and practical significance of the obtained scientific results, and compliance of the performed research with its Terms of References).

An example of such use of the specified criteria is the number of publications on a scientific topic by professors and scientists of the department or scientific unit, by an individual author, or by the institution as a whole. The number of downloads of scientific works in electronic open journals and digital repositories also plays an important role. A sign of interest in scientific research is the number of citations. The scientific novelty of the research is an indicator of the relevance and integrity of the research, which are subject to expert evaluation.

CONCLUSION

The proposed criteria are the result of an analysis of existing problems in pedagogical science related to the unscrupulous use of scientometric indicators. Pedagogical science is oriented towards practice, therefore, it is important to use such indicators that will contribute to qualitative changes in the educational process. Therefore, the criteria presented in the work can be used to develop a methodology for evaluating the results of research by scientific and pedagogical workers using digital means. At the same time, the combination of formal (scientometric) and informal (expert) indicators is important.

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CHAPTER 23

Mission of the University Library in the Development of Open Science in Ukraine

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Keywords: Library resources, Open science, Open access, Scientometrics, Scientific research, Scientific Library of Yaroslav the Wise National Law University.

INTRODUCTION

Due to the spread of the latest information and communication technologies in Ukraine, the “Free science” and “Open access” movements, whose philosophy is based on a modern approach to conducting scientific research and spreading knowledge transparently and jointly, have significantly intensified. Their goal is to make data and results obtained by scientists and specialists, representatives of various fields of knowledge, as well as achievements and innovations, open and accessible to all citizens to overcome the gap in knowledge. Higher education institutions (HEIs) of Ukraine are one of the centers of dynamic transformation of information means and methods of obtaining and producing knowledge, ensuring the development of creative capabilities, in particular, when conducting scientific research and discoveries, which, in turn, causes the need to change the information image of the university library, transforming it on a modern information and communication complex of a university for system integration of the research process at the university into European scientific community.

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MATERIALS AND METHODS

The issues related to the "Open Science" movement were especially actively studied during remote work and the full-scale invasion of the Russian Federation in Ukraine. In the works of scientists, attention is mainly focused on the expansion of the context of open science because, thanks to the development of ICT, it is detailed [1 - 3]. Open science, together with ICT, is integrated into modern research processes and scientific communication, which ensures the uninterrupted functioning of the repositories of Higher Education Institutions as electronic archives of scientists' works, placement of institutional repositories in cloud storage in order to prevent data loss, increasing the professional adaptability of the scientific library as a producer and "administrator" of open resources of higher educational institutions and monitoring of the publishing activity of scientists.

Scientific approaches (socio-communicative, systemic) and methods of scientific knowledge (source studies, content analysis, statistical, analysis and synthesis) were applied in the process of researching the selected issue, which made it possible to identify the problems faced by university libraries in promoting and integrating the results of branch scientific discoveries and innovations into the world scientific space, to analyze the reasons and factors which affect the effectiveness of this process and to outline measures to improve the activities of the relevant services of libraries.

EXPERIMENTAL MATERIALS

The global impulse towards the openness of science on the part of universities, scientific libraries, scientific research institutions, and scientists is invaluable, as it allows a free and open exchange of knowledge and innovations. Such newly created structures as the scientometric and bibliometric service (Scientific Library of NLU named after Yaroslav the Wise) play an important role in the bibliometric analysis of quantitative indicators of the publication activity of scientists, collect and process data on scientific publications of the University scientists, provide consultative and practical assistance in arranging author profiles and university teams (ORCID, Google Scholar, scientometric platforms Scopus, Web of Science), maintain the electronic index "Works of scientists", and use electronic means and digital tools to organize remote work (Google Meet, Google Drive, Google Site, Microsoft Outlook, corporate domain nlu.edu.ua, official websites of university and scientific libraries; scientometric databases Scopus and Web of Science, ALIS, Obsidian file manager, Microsoft 365 shared work files) [2]. Social networks and messengers are also active in disseminating information and knowledge. Since the beginning of 2023, 200 posts have been published on social

networks: “Scientometric Grammar” on Facebook, “Scientometrics for a Scientist” on LinkedIn, “Scientometrics for a Scientist” on Viber, “Scientometrics. NLU” on Instagram, and “Service of Scientometrics (SoS). NLU” on Telegram. Changing its information image, the university library is always at the epicenter of the university's activities, including those held within the framework of the “Open Science” movement. The library at the institutional level is designed to meet high standards in the field of digital support of scientific research with the aim of integrating it into the world scientific research environment.

RESULTS

It was established that important scientific results are presented mainly in dissertations, scientific articles and abstracts of reports at conferences or round tables. They should be available to the general public, as they can become the basis for innovative projects in the future. Open access will have a positive impact on a number of thematic areas of scientific research in the field of law in Ukraine, as it will make it possible to analyze the legal systems of the world, compare the legal systems of the world and Ukraine, comprehensively study their origin, formation, development, current state, prospects for reform in the conditions of European integration processes, *etc*.

The vocation of the library is to provide free access to foreign research and present Ukrainian scientific achievements. The experience of Ukraine is quite important and useful, especially in areas such as war crimes, violations of the laws and customs of war, their documentation, their qualification and investigation, announcement of sentences, prosecution, *etc*., in the protection of human rights and freedoms in conditions of war in compliance with the Geneva Convention on the Treatment of Prisoners of War, in genocide of Ukrainians, its evidence and legal recognition, *etc*. In this complex movement, the university library community is called upon to conduct thorough OSINT intelligence, fact-checking, and timely delivery of important information and resources to the end user - the scientist. To ensure the maximum openness of dissertations, the Scientific Library: 1) adds bibliographic descriptions to the electronic catalog and databases that are available online; 2) fills the institutional repository with electronic versions of scientific works; 3) compiles bibliographic indexes, electronic versions of which are available online; 4) makes short informative messages on pages in social networks, *etc*.

The above confirms that the scientific library is an important information and communication intermediary in supporting scientists and students of higher education, contributing to increasing the “visibility” of achievements of scientists

due to the improvement of tools for providing consultations, organizing the main profiles of authors, which will make it possible to identify University scientists, present their scientific research to the world, establish partnerships, receive research grant support, *etc*.

CONCLUSION

In order to confirm the transformation of libraries into a modern information and communication complex for processing, consolidation, cumulation of scientific information arrays and dissemination of knowledge in the scientific research space, it is necessary to take into account two interrelated components: 1) significant opportunities and various tools for the presentation of scientific research in scientific circles both in Ukraine and abroad (in particular, in the field of law). The experience of Ukraine during the period is particularly valuable war, which affects the reformation of both national and international law and legislation; 2) greater openness of scientific results will contribute to the increase in citations of Ukrainian scientists, the growth of their international authority, which, in turn, will affect the recognition of Ukrainian higher education institutions at the national and global levels.

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CHAPTER 24

Refining How we Talk about ORCID by Listening to our Community

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Keywords: Community of practice, Community, Global participation, ORCID, ORCID communication, Talk about ORCID.

INTRODUCTION

Persistent identifiers (PIDs) are currently considered part of the building blocks of the research infrastructure ecosystem (Meadows *et al*., 2019). They ensure that different entities in the ecosystem —research outputs, organizations, projects, events and contributors, among others (Dappert *et al*., 2017) — are uniquely and permanently identifiable, fostering transparency, reproducibility, and collaboration. Researchers, institutions, funders and publishers rely on these identifiers to streamline research processes, track impact, and facilitate seamless (meta)data sharing and reuse, ultimately advancing the efficiency and credibility of research discovery and enhancing integrity. PIDs on their own also represent an important layer of the so-called FAIR Data Object (Hodson *et al*., 2018), and implementing processes based on PIDs and their related (meta)data sharing and reuse has been proven to save time and resources at an institutional and national level (Brown *et al*., 2022, 2021).

In this context, the ORCID iD serves as a central user-driven PID — and identifiers hub — distinguishing researchers and research-related individuals, enhancing their visibility and facilitating accurate attribution.

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As a community-driven organization with the goal of improving the ORCID experience for researchers and member organizations, we embarked on a comprehensive research project focused on understanding and addressing their needs and aspirations. This member value research project encompassed a multifaceted approach, comprising a wide-reaching survey distributed to all members and in-depth interviews conducted with key stakeholders, including Consortia Leads and influential members from various stakeholder groups. The results of this project have proven instrumental in gaining insights into what our member organizations truly value about ORCID and how we can better align our services and communication with their objectives.

MATERIALS AND METHODS

The Member Value Research project comprised member value interviews and the 2021 member survey.

The member value interviews were conducted between December 14, 2020 and April 1, 2021 by ORCID's Executive Director and various ORCID's senior team members. These were 40 in-depth, hour-long structured interviews via Zoom. These interviews were strategically aimed at Consortium Lead organizations and key members from various stakeholder groups. A high participation rate was achieved, with 75% of Consortia Leads, 18 out of 24, actively engaging in this insightful dialogue.

The member survey was administered from January 29, 2021 till March 4, 2021. To ensure comprehensive coverage, we employed a diverse promotional strategy, utilizing our monthly member newsletter, targeted email campaigns to primary contacts at member organizations, and individualized invitations to select members. We received 260 responses from our active membership base of 1167, resulting in a commendable response rate of 22%. Of these responses, 187 were deemed complete, demonstrating a robust completion rate of 72%.

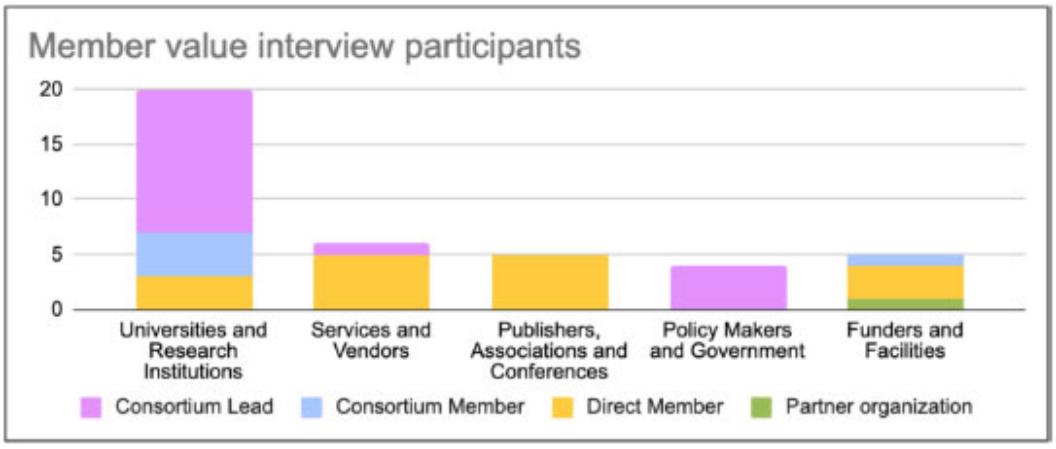

Fig. (1). Classification of the member value interviews participants.

Table 1. Responses to the member survey per stakeholder category.

Answer Choices	Responses	
University or Other Academic/Research Institution	72%	186
Government Agency	7%	18
Association/Society	7%	17
Publisher	5%	14
Funder	4%	11
Other (to be separately specified)	3%	8
Third-Party Service Provider/Vendor	2%	6
Total	**260**	

The analysis of the results obtained in the project led to greater insight and knowledge of how the community views and values ORCID. The following section will discuss the main results and how they influence the newly developed materials and communication strategies.

RESULTS

ORCID is strongly supported by each of our main stakeholder groups, with an overall Net Promoter Score (NPS) score of +41 and a range of +100 to +33. A little over 80% of ORCID's member organizations think that their membership aligns with their strategic objectives. However, under 60% think ORCID is helping them achieve those objectives. It was repeatedly noted that the perception was that the value of obtaining and using an ORCID record was not that obvious for the researchers, especially in cases where it was required in a workflow

without any accompanying information. Also, given the complexity of integrations and the low number of researchers with ORCID iDs, not many members have seen high-value propositions in action.

CONCLUSIONS

Given the research results, we concluded that there was a lot of opportunity to improve the awareness of ORCID's value both to researchers and member organizations by focusing on stakeholder-specific messages. By interviewing and listening to our member community, we were able to pinpoint areas of persistent confusion that contribute to barriers to adoption and develop messaging that can help alleviate that confusion and better articulate the value not only of obtaining an ORCID record but of actively using the record in respective workflows.

This led us to work on specific messages for each stakeholder in the community and a more concrete analysis of what benefits or added value ORCID presents for each of them. As a result of this work, so-called "Value Stories"[2] were developed as additional material. These materials have been appreciated by leading consortium organizations, consortium members and direct members alike. They have been especially useful when communicating ORCID internally to different levels of institutional leadership.

Fig. (2). Example of Value Story focused on Universities and Research Institutions.

Internally, for the ORCID team, the "Value Stories" represent our understanding of how we can meet our stakeholder needs. They are a bridge between our Strategic Plan 2022-2025 (Shillum *et al*., 2021), which is our understanding of what our stakeholders need, and the metrics we use to measure our progress towards meeting those needs.

The "Value Stories" are not designed to be static but to be periodically reviewed and adapted to what we hear from our stakeholders and community through outreach activities, surveys and individual conversations.

FUNDING

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CHAPTER 25

DataverseUA: Peculiarities of Implementation of the Dataverse Open Scientific Data Repository in Ukraine

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Keywords: FAIR data, Open science, Open data repository, Open research infrastructure.

INTRODUCTION

Since 2017, the scientific community and the European Commission have been working on the creation of an Open Science infrastructure regulated by the EU Directive to ensure interaction with research infrastructures in Europe for open, unhindered access and reliable reuse of data and all other digital objects created during the research lifecycle [1]. Open-access repositories are an integral part of the Open Science infrastructure in the EU. They work according to the principles of creating FAIR (Findable, Accessible, Interoperable, Reusable) data, which provide for the searchability of research data, their availability, interoperability (including technological compatibility), and the possibility of multiple uses [2]. The Dataverse e-platform is used as one of the software applications for building data repositories. Dataverse software was developed at the Harvard Institute for Quantitative Social Sciences (IQSS) with many contributors and developers from around the world. Currently, in addition to the United States, Dataverse platforms

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are deployed in the countries of the European Union, Latin America, Africa, South Asia, China, India, and Australia. In total, there are more than 95 installations (https://dataverse.org/). The central Dataverse platform in the European Union is the DataverseNL repository in the Netherlands, which provides data management services for 11 Dutch universities and coordinates the sites of the European Dataverse Repository Network. An important element of the European data infrastructure is the European Open Science Cloud [3].

MATERIALS AND METHODS

Development of the Open Data Repository "DataverseUA" for the NAS of Ukraine carried out within the framework of the scientific and technical project of the NAS of Ukraine "Development and implementation of open science infrastructure in the NAS of Ukraine (OPENS)" for 2023-2024 was approved and started by the orders of the Presidium of the NAS of Ukraine dated 02/07/2023 No. 67 and dated 03/30/2023 No. 170. The establishment of the Open Data Repository for the National Academy of Sciences of Ukraine, using Dataverse software, is based on the experience gained from the project conducted as part of the Target Program for Informatization of the National Academy of Sciences of Ukraine in 2021.

The aim of this project is to establish an Open Data Repository for research conducted by scientific institutions affiliated with the National Academy of Sciences of Ukraine using the DataverseUA web platform. This repository is intended to provide researchers, innovators, technology companies, and the general public with an accessible, reliable, and open-distributed environment where they can publish, discover, and re-use data.

EXPERIMENTAL MATERIALS

The test version of the DataverseUA Repository (based on Dataverse platform v 5.13) is installed on the cloud cluster of the Bogolyubov Institute for Theoretical Physics of the National Academy of Sciences of Ukraine (https://www.data verse.net.ua/). The main services of the platform were set up with the support of specialists from DataverseNL (Netherlands). The repository of open data is primarily designed for researchers of the Centers for Collective Use of Appliances (CCUA) and scientific institutions of the National Academy of Sciences of Ukraine that produce research data. Therefore, the initial page of the Ukrainian version of the platform was created along with the English version, and the Ukrainianization of the platform interface was performed. Registration forms for scientific institutions and users were developed, and an extended authorization system was applied. Special attention was paid to the development of business processes for submitting applications for data placement, the interaction of a data

curator from CCUA or Institution with an author during the preparation of data for publication, and the development of study materials on working with the Open Data Repository. At the moment, profiles have been created for two institutions of the National Academy of Sciences of Ukraine and two CCUAs in their structure (Fig. **1**). Extended personalized metadata files have also been developed, considering the specifics of the work and research topics conducted in these institutions.

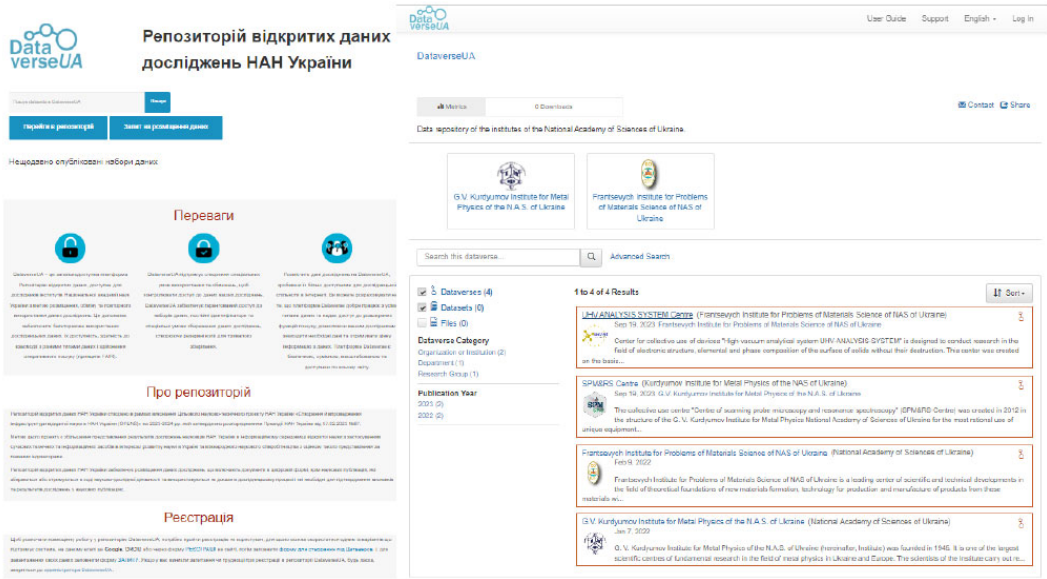

Fig. (1). The screenshots from the DataverseUA website. (https://www.dataverse.net.ua/).

To ensure the operation of the Open Data Repository, draft documents have been developed and prepared. These documents are currently undergoing coordination and enhancement.

As a result of negotiations with the DataCite organization, Kyiv Academic University received the opportunity to obtain a free DOI for open data sets that were to be placed in the DataverseUA Repository until the end of 2023. To obtain a DOI for data published in DataverseUA in 2024, it will be necessary to enter into a paid contract with the respective organization.

RESULTS

The DataverseUA repository is currently in the research exploitation phase and is operating in a testing mode. The introduction of the e-platform into industrial operation is planned for 2024. The DataverseUA Repository is intended to offer

data with interoperable access and is specifically designed to safeguard the intellectual property rights of researchers who have placed their scientific research data in the repository.

CONCLUSION

The architecture and implementation of the Open Data Repository in NAS of Ukraine are presented.

FUNDING

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CHAPTER 26

Using CRIS Systems Located in DRIS to Provide Interoperability of Scientific Data Ensuring FAIR Principles

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Keywords: Current Research Information Systems (CRIS), FAIR principles, Interoperability, Research transparency, Systems science research, Ukrainian National Systems.

INTRODUCTION

Currently, the problem of availability and interoperability of scientific data exists [1 - 3]. Current Research Information Systems (CRIS) have evolved to play pivotal roles across various facets of the academic and scientific landscape. Their applicability ranges from university settings, where they streamline research data management,to research organizations, where they provide critical administrative support [4]. Notably, CRIS systems have shown promise in fostering the development of systems science and technology and furthering the principles of Open Science [5].

In the global arena, efforts to systematize scientific information have yielded robust systems. For instance, the Netherlands boasts of NARCIS, a comprehensive platform that assimilates structured research information from OAI repositories. This encompasses an array of data, including but not limited to publications, scientific outcomes, institutional websites, and news pages [6].

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Comparatively, Slovenia has instituted SICRIS, a centralized repository that catalogs data on researchers, research groups, and affiliated projects and organizations [7]. Likewise, Finland's Research.fi stands as a testament to the nation's commitment to research transparency, offering insights into research publications, projects, datasets, and the broader research ecosystem [8]. Therefore, there are a lot of systems that currently exist. The FAIR principles ensure the interoperability of scientific data. Skvortsov (2018) emphasizes the need for formal specifications and semantic interoperability to enable meaningful data exchange and reuse among scientific communities [9]. Inau (2021) focuses on initiatives and implementation practices of FAIR data principles in the health domain, aiming to support evidence-based clinical practice and research transparency [10]. Wilkinson (2017) explores web technologies and design patterns that facilitate data discovery, accessibility, transformation, and integration, aligning with the FAIR Data Principles [11]. It seems relevant to ensure the use of unique interferers following FAIR principles. The aim of this research is to provide a basic analysis of the CRIS systems that exist to consider this data during the providing of the architecture of Ukrainian National Systems that is being developed [12].

MATERIALS AND METHODS

We analyzed the data that is declared in the Directory of Research Information Systems (DRIS). The data was separated by attributes of national scale as we defined a vast number of local systems, and we decided that the first step of integration should be with national systems. This will have a more significant effect. We transferred noted data into Google Sheets, and to provide analysis and aggregation, we used Google Data Studio. We provided aggregation by geolocation to define the regions where CRIS systems are used and aggregated data by the region where those systems exist. To provide the last one, we manually defined each county and its belonging to the region.

EXPERIMENTAL MATERIALS

Most of the CRIS systems are created in the Europe region. This is proved by both Fig. a and Fig. b. Thus, 18 systems are developed in Europe, and only 3, 2, and 1 are developed by Countries located in South America, Asia, and Australia.

The specificity of the data is that a few systems of CRIS data management were developed by the same country. It seems relevant to additionally investigate the idea of the development of two different systems in such countries. This situation is relevant to Georgia and Brazil. Thus, Georgia created the Georgian Research Information System and Digital Repository of Georgian Scientific Works, whereas Brazil created BrCris: Brazilian Current Research Information System

and Sucupira Platform. The Ukrainian system is also represented in the DRIS, and it seems to be an important system that already has more than 400 users per month, according to DRIS statistics. It is worth noting that not all of the CRIS systems are represented in DRIS. For example, Brazil has the Lattes Platform that is not represented in DRIS [13].

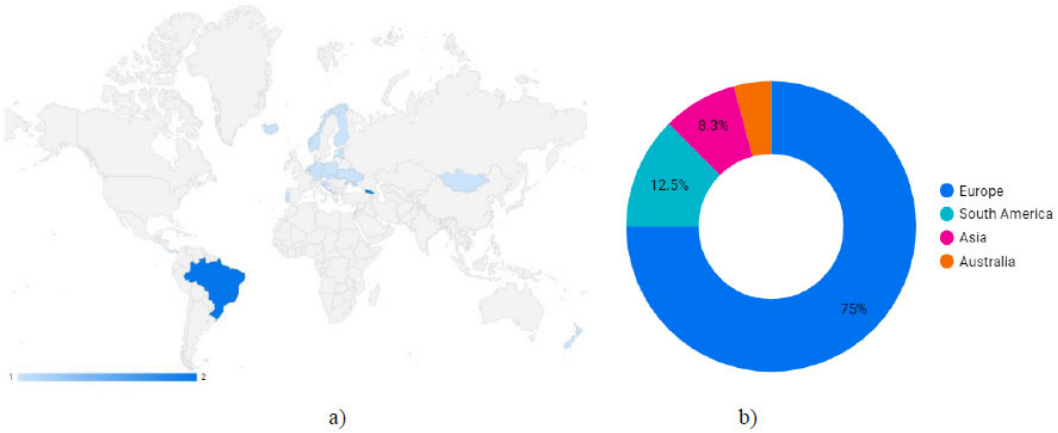

Fig. (1). Geographical location of CRIS systems declared in DRIS in the form of geochart (**a**) and in the form of pie chart by region.

CONCLUSION

CRIS systems, like NARCIS and SICRIS, are crucial in academic and scientific research. They align with FAIR principles for seamless data integration. There is a gap in understanding CRIS in systems science research. Europe, including Ukraine, has many CRIS systems, with Ukraine having over 400 monthly users (DRIS). More research is needed to optimize their use with FAIR principles.

FUNDING

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CHAPTER 27

Innovative Cooperation in Managing the Development of Ukraine

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Keywords: Business, Development, Innovative cooperation, Model, Management, State, Science, Society.

INTRODUCTION

In the conditions of adaptation to modern challenges, the formation and development of innovative cooperation is one of the guarantees of success in the future and the driver of the renewal of the country's infrastructure. It is innovation that creates opportunities for improving business processes at the micro and macro levels, which is a condition for building a high-tech, knowledge-intensive environment, as well as a strategic vision and delineation of the development vector. In recent years, there has been an intensification of crisis phenomena, which requires the development of effective management mechanisms for adaptation. Ensuring the sustainable development of any country, in particular Ukraine, should be based on the systematic implementation of innovative and energy-saving technologies along with digitalization processes, which will eventually lead to an effective competitive economy.

Scientific problems related to the meaning, development and tasks of innovative cooperation were studied by domestic and foreign scientists, in particular P. Drucker, R. Fichman, M. Porter, J. Schumpeter, and B. Twiss [2 - 6]. However, despite significant scientific achievements, the problems of scientific substantiation of development and implementation of innovations as a basis for the development of countries, taking into account their socio-economic aspects,

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remain insufficiently studied and require further elaboration. Therefore, the purpose of the study is to outline a systemic vision of the issue of innovative cooperation in the management of the development of Ukraine.

MATERIALS AND METHODS

When conducting research on innovative cooperation, a set of general scientific and special methods of cognition were used, namely analysis and comparison, synthesis and theoretical generalization, and scientific abstraction, when determining the theoretical and methodological approaches to the essence of innovative cooperation, and abstract-logical, systemic approach, when identifying participants of innovative cooperation, economic-mathematical modeling, to describe the formation of the effect of innovative cooperation.

The information base of the study consists of the innovative development programs of the leading countries of the world, in particular, the EU, statistical and analytical information of the State Statistics Service of Ukraine, research by Ukrainian and foreign scientists, informational and analytical materials, and scientific information from the worldwide Internet.

RESULTS

American scientist William Edwards Deming wrote that “you cannot change; survival is not an obligation...” [1]. However, if the country is trying to be competitive in the modern world, then it is necessary to conduct a constant search for tools, methods, means, *etc*., in terms of building an innovative ecosystem, the use of which will support the development of the country. The development of the ecosystem of innovative enterprises through innovative cooperation and open innovation platforms, which will allow to achieve harmony in processes, expand partnership opportunities and commercialize scientific developments, is a priority for the development of the national economy. The analysis of the innovative development of the country as a whole and enterprises, in particular, allows us to draw the following conclusions. As for the energy efficiency of Ukraine's economy (low level of energy security, energy capacity), it is the lowest in the world; twice as much energy is spent in Ukraine to produce $1,000 of GDP. As for industrial enterprises, more than 20% are innovatively active, which is the lowest indicator compared to European countries. In Ukraine, the number of industrial enterprises that introduced innovations is, on average, 15% of the total number of industrial enterprises. The dynamics of the value of the generalized indicator Global Innovation Index (Global Innovation Index), whose components are creativity, knowledge and results of scientific research, business experience, market indicators, infrastructure, human capital and research, and institutions,

shows that in 2022, the country worsened its rating, losing positions in individual components.

Along with this, the strength of Ukraine remains the topic scientific research; however, due to a number of factors, in particular, a decrease in funding, there is a loss of the obtained advantages. Also, in Ukraine, against the background of crisis phenomena, there is an asymmetry in the development of territories in terms of economic and social indicators, the reason for which is also a decrease in the level of innovative activity. This proves the practicality of using the "innovation deficit" model. This determines the expediency of the implementation of the innovation imperative, which involves increasing economic productivity and reducing the accountability of universities since it is science that can become the driving force and additional economic resource of the country's development through the repurposing of scientific research into a national economic asset. This involves significant changes at the expense of institutional reforms at all levels of the socio-economic system of Ukraine, with the main priority being sectoral cooperation, economic usefulness of knowledge and top-down management. This will ensure the economic viability and financial independence of universities and increase the competitiveness of the national economy.

In order to intensify innovative activity in Ukraine, it is proposed to develop innovative cooperation through the four-subject interaction "state - business - science (university) - society" (integration and consolidation of efforts). The model of the formation of the effect from the development of innovative cooperation can be presented in the following form:

$$e_{InCoop} = \left[\varphi_{InCoop}: IR_{st} \times M_b \times IR_{un} \times M_s \rightarrow P_{InCoop}\right],$$

where, IR_{st} – a set of institutional reforms in the field of education and science management;

M_b – a set of mechanisms for the interaction of universities and business structures in the field of innovation (direct funding of scientific research, use of public-private partnership, introduction of innovative products, *etc*.);

IR_{un} – a set of institutional reforms in the management of universities (shifting emphasis on the practical value of scientific research for the growth of the national economy, increasing its competitiveness and innovativeness and ensuring the national security of the country, *etc*.);

M_s – a set of mechanisms of interaction between universities and society in the innovation sphere (wide implementation of digital platforms in the field of

education and science, use of an open model of interaction between universities and society);

φ_{InCoop} – the relation of emergence, which is realized in sets IR_{st}, IR_{un} considering sets of mechanisms M_b, M_s within the framework of the formed innovative cooperation;

P_{InCoop} – a set of parameters that determine the intensity and effectiveness of innovative cooperation in Ukraine.

Thus, in order to intensify innovative activity in Ukraine, it is proposed to develop innovative cooperation through the four-subject interaction "state - business - science (university) - society" (integration and consolidation of efforts) by improving the technology of public-private partnership. At the same time, the conditions for the development of innovative cooperation with the aim of introducing innovative and energy technologies should be financial aspects, an institutional component, the unity of integration processes, and the demand for innovative products.

CONCLUSION

The introduction of innovative and energy-saving technologies should be oriented towards the production of an innovative product, increasing the use of intellectual capital, which will eventually allow for the sustainable development of the national economy and the support of its competitive positions. The proposed model of the formation of the effect from the development of innovative cooperation can be used to evaluate the effectiveness of the interaction of the state, business, science (universities) and society.

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CHAPTER 28

Electronic Library in Providing Open Access to the Results of Scientific Research

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Keywords: Electronic library, Electronic information resources, Full-text databases, Intelligent information system, Open access, Open science, State Scientific and Technical Library of Ukraine.

INTRODUCTION

Modern electronic libraries occupy a prominent place in the processes of organization and exchange of information in the course of scientific research and provide open access to the results of scientific research [3, 4]. The creation of a new class of electronic libraries that have a higher level of intellectualization, namely semantic electronic libraries, provides an opportunity to ensure a higher quality of open access to full-text databases of scientific and technical information resources. In this context, innovative transformations of the information space of the State Scientific and Technical Library of Ukraine are aimed at building such a model of a semantic electronic library, which is able to provide users with opportunities to obtain knowledge in open access based on a system of multidimensional vision of knowledge, using modern technological innovations and the Internet.

In the context of the implementation of the state policy on open science and open access to scientific and information resources, the key issue remains the solution of the problem of integrating electronic scientific and technical information resources of the State Scientific and Technical Library of Ukraine into domestic and foreign information and communication systems and ensuring remote access

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to them, which will provide domestic institutions of higher education and scientific institutions with open access to the use of international electronic databases of scientific information.

METHODS

In the course of research and development of the methodological foundations of the creation of an electronic library using the concept of the semantic web, methods and models of knowledge presentation based on processing natural language texts, further implementation of intelligent technologies for processing, searching, and presenting information based on modern software tools and platforms were applied. The methods of the theory of logical networks were used to develop information-linguistic models and knowledge identification methods based on natural language texts, as well as a system of general scientific and special research methods: analysis, synthesis, analytical-synthetic processing of information, systemic, informational, structural-functional and comparative approaches.

RESULTS

An analysis of existing modern library automation systems and their application was carried out. The concept of a full-system electronic library of the State Scientific and Technical Library of Ukraine was developed. The structure and content of the electronic catalog database of the State Scientific and Technical Library of Ukraine were developed and formed in accordance with international standards.

Methodological principles for processing natural language texts are developed. The use of information technologies in the processing of documents in library systems is summarized, which contributes to the increase in the efficiency of work with various lexical data in various subject areas. The main directions and tasks in library activities related to the presentation of knowledge and the processing of textual information are established. Knowledge presentation formats with different degrees of information fragmentation are characterized by the specificity of the structure of metadata elements. Subject areas use metadata formats, taking into account the purpose of development. Bibliographic editions are currently acquiring a new quality that provides access to a certain number of documents. The identification of information objects in the library using annotation and abstracting algorithms is represented. Application in practice will determine the identification of the thematic feature of the document using a multi-aspect search in the database. The processing of keywords as an informative basis will allow us to present them in a standard lexicographical form [1, 2]. The advantages are finding the correct word form and taking into account repetitions of complex

language constructions in the text. The meaningful filling of heterogeneous l-systems is substantiated. It is proposed to use an intermediary language. The theoretical foundations of this approach ensure accurate transmission of the content of the input text. When forming such systems, it is appropriate to use etymological analysis and an intermediary language with deep syntactic structures.

Modern informational and linguistic models of knowledge presentation are outlined and summarized. The application of the logical-semantic model of the subject area is substantiated. An information-logical model for use in the knowledge identification method is presented. A universal invariant knowledge representation model for use in library systems has been developed. The application of the text mining method for solving the problems of indexing full-text documents is represented. The application of mathematical tools for the identification of knowledge is generalized. The identification of information objects in modern electronic libraries is presented. The results of research on morphological and syntactic processing of text documents using annotation and abstracting algorithms are presented. Morphological modules implement algorithms for the analysis, lemmatization and synthesis of text units, which involve the use of an electronic grammar dictionary (EGD) of the language in which the analyzed text is written. There are other approaches to the construction of morphological modules, for example, the probabilistic approach (stemming), as well as the approach based on the construction of empirical formulas. However, for inflectional languages, it is most appropriate to use algorithms of analysis, synthesis, and lemmatization, which are based on the use of electronic grammar dictionaries. Therefore, the formal and technological principles of the creation of grammatical dictionaries are provided in our research algorithms of morphological analysis and synthesis, which are based on certain grammatical constructions.

The identification of information objects using annotation, referencing, and quasi-referencing algorithms is represented: knowledge recognition at the professional level of natural language text representation, knowledge recognition at the linguistic level of natural language text representation, knowledge recognition in conditions of ambiguity and uncertainty, application of heterogeneous l-systems.

CONCLUSION

The formation of a semantic electronic library is able to provide users with open access opportunities to obtain knowledge based on the system of multidimensional vision of knowledge by using modern technological innovations and the Internet, which is the priority of the modern stage of reconstruction and

formation of a new quality of development of the unique information space of the State Scientific and Technical Library of Ukraine. Effective functioning of such a full-system model of an electronic library requires a sufficiently high level of services and technological developments, which allows cultivating this environment along the vector of approximation to natural intelligence. A characteristic integral feature of the conceptual model of a “smart” electronic library is mobile access to informational, scientific, technical and scientific resources of the State Scientific and Technical Library of Ukraine. This provides open access to the entire range of digital services of the institution anywhere in the world. It is assumed that such services should be individual and aimed at each user.

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CHAPTER 29

Basic Regulations and Principles of Citizen Science in Ukraine

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Keywords: Citizen science, Ecological, Higher education, Open science, Research, Scientific work.

INTRODUCTION

Open science as a new paradigm for organizing and conducting scientific research, as well as disseminating information about their results, allows to improve the use of resources, increase the transparency of the research results, accelerate innovative development and promote the involvement of citizens in the research. Open science is one of the pillars of the European research area, full integration into which is extremely important for Ukraine. The implementation of an open science policy is one of the priorities of European universities, and higher education institutions themselves are leading subjects for open science. At the same time, citizen science in ecological and environmental sciences is of particular interest as a component of the open science concept and a prerequisite for ensuring sustainable development. The purpose of the work is to carry out an analysis of the foundations of the concept of citizen science in Ukraine.

MATERIALS AND METHODS

External secondary research and electronic resources of the Internet were used for the analysis of legislative and regulatory acts of Ukraine and the EU.

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RESULTS

As defined by the Oxford English Dictionary, citizen science is a scientific work carried out by members of the general public, often in collaboration with/under the guidance of academics and academic institutions [1]. According to Irwin's concept, the emphasis is on the role of citizens as stakeholders in the results of the research (for example, in environmental factors of health) [2, 3]. According to Bonnie, citizen science focuses on volunteers and their contribution to data collection and field observations of the environment [4]. Despite the fact that citizen science is a flexible concept that can be adapted and applied to diverse research topics, there are some common principles.

The Law of Ukraine 'On Scientific and Scientific and Technical Activity' defines the need to create conditions for realizing the intellectual potential of citizens in the field of scientific and scientific-technical activity, as well as ensuring the use of achievements of domestic and world science and technology to meet social, economic, cultural and other needs, which correlates with the concepts of citizen science. The National Plan for Open Science in Ukraine for the period up to 2030 sets a number of tasks, including ensuring open access to scientific results and scientific and technical information, popularizing science, expanding scientific knowledge, and involving citizens in scientific and scientific-technical activities. It is envisaged to develop and implement measures taking into account international experience, in particular, the principles of the European Citizen Science Association (ESCA), which could be summarized as the following [5]. Citizen science projects actively involve citizens in the generation of new knowledge and interpretation. The role of citizens in the project could be diverse and meaningful. Public science projects respond to real scientific tasks. Citizen science projects provide scientific, professional, personal, social and other benefits for both professional and citizen scientists. The next important aspect is that citizen scientists receive feedback from the project. Citizen science provides the opportunity for greater public engagement and democratization of science. It is crucial to aim for the transparency and openness of project data. Legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and environmental impact of any activity while performing citizen science projects should be taken into account.

As modern domestic cases of implementation of the elements of citizen science in the ecological sphere in Ukraine, the functioning of the groups, Mushrooms of Ukraine, Birds of Ukraine, Flora of Ukraine, Ukrainian Botanical Group, Birdwatching Ukraine and others, is defined [6]. Nevertheless, it is essential to set/analyze the listed projects on the subject of compliance with the main formal features and principles of citizen science. The ESCA`s characteristics of citizen

science consider 5 sections of citizen science [7]. They are core concepts (scientific research, monitoring, database creation, roles and responsibilities, ethics *etc*.); disciplinary aspects (areas of natural sciences and engineering); leadership and participation (individual projects, community-led projects and researcher-led projects, organization, science engagement and science education); financial aspects (financial support for scientific research, payment to take part in a project) and data and knowledge (data generation, ownership, collection and so on). Crowdsourcing methods, data processing technologies, visualization, *etc*. open wide opportunities for the development of citizen science.

CONCLUSION

The successful implementation of citizen science in Ukraine is impossible both without systemic state policy on the one hand, and active support of this concept by professional scientists on the other. The use and popularization of citizen science by universities is one of the aspects of active integration into the European Research Area, promoting sustainable development and green transition. The Rome Ministerial Communiqué for the period 2020-2030 lays down the provision of assistance by educational institutions in achieving the goals of sustainable development, in particular, on environmental issues (such as clean water and proper sanitary conditions, affordable and clean energy, sustainable development of cities and communities, responsible consumption and production, mitigating the consequences of climate change, preserving marine resources, protecting and restoring land ecosystems), which is one of the aspects of ensuring the quality of higher education [8].

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CHAPTER 30

The Peculiarities of Creating the Open Access Policy for Research Infrastructure in Ukraine

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Keywords: National plan, Open access, Open access policy, Open science, Research infrastructure, Ukraine.

INTRODUCTION

Open access to research infrastructure facilitates collaboration among researchers, institutions, and even countries. Researchers can access and utilize shared resources and tools, leading to more comprehensive and innovative research projects. Open access reduces the duplication of research infrastructure, as multiple researchers or institutions can use the same resources. This can result in cost savings for both researchers and funding agencies.

In Ukraine, the Open Access (OA) to the research infrastructure (RI) is only under discussion. We have two sides of this issue. First, the Ukrainian government has recognized the importance of OA to RI [1, 2]. Ukraine collaborates with international partners and organizations to enhance access to research infrastructure [3]. This includes participation in European research infrastructure projects and networks [4]. On the other hand, there is no legislation on principals and guidelines for creating a policy for OA to RIs.

MATERIALS AND METHODS

The methodology involves an analysis of legal and policy documents relevant to the implementation of open-access policies in Ukraine. This encompasses an examination of legislation and other regulatory materials within the field of open access in Ukraine.

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RESULTS

On October 8, 2022, the Government approved a resolution on the “Approval of the National Plan regarding Open Science”. This document facilitates the implementation of Ukraine's participation in the Framework Programme for Research and Innovation “Horizon Europe” and the European Atomic Energy Community's Research and Training Programme (2021-2025), which complements the “Horizon Europe” program. The realization of the National Open Science Plan will ensure the implementation of Article 6 of the Agreement, underscoring the necessity of supporting open science practices in accordance with the rules of the “Horizon Europe” and “Euratom” programs [5]. The National Open Science Plan predicts: establish the legal framework for shaping a state open science policy; provide interested parties with open access to scientific instruments, tools, and other means of obtaining research results; ensure the processing of scientific data in accordance with FAIR principles (Findable, Accessible, Interoperable, and Reusable); accelerate the circulation of scientific information, providing access to up-to-date scientific data without discrimination; create conditions for more efficient use of research and development results funded by public resources; make the scientific and educational space more transparent [6].

For creating adaptabilty in open access to research infrastructures, we need to commence by conducting a comprehensive assessment aimed at identifying the specific research infrastructure requirements within the country or region. This assessment should entail extensive consultation with researchers, academic institutions, and relevant stakeholders to gain a profound understanding of their needs and priorities. Through this process, we pinpoint the essential research infrastructures that need to be made accessible. The second step should include a well-defined policy framework that delineates the objectives, scope, and fundamental principles of open access to research infrastructures and transparent access procedures, carefully outlining the application processes, eligibility criteria, and expected timelines. This framework should serve as the guiding document for the entire policy and clearly define the roles and responsibilities of various stakeholders. This includes government agencies, academic institutions, and operators responsible for managing research infrastructure. Also, access to research infrastructures is determined solely based on scientific merit and is accessible to both domestic and international researchers. Unnecessary barriers to access should be removed.

At the same time, the implementation of open access to research infrastructure in Ukraine, like in many other countries, presents several challenges. These challe-

nges can be complex and multifaceted, but they are essential to address for the successful adoption of open-access principles.

Developing and implementing appropriate regulations and policies that support open access while respecting intellectual property rights, privacy, and ethical considerations is essential but can be a complex task. Building and maintaining modern research infrastructures that meet international standards can be resource-intensive. It may require significant investments in both physical infrastructure and cutting-edge technologies. Ukraine may face budgetary limitations that hinder the allocation of sufficient funds for the development, maintenance, and operation of research infrastructures. Securing sustainable funding sources for open-access initiatives can be challenging.

CONCLUSION

The approval of the National Plan for Open Science signifies a significant milestone in Ukraine's commitment to open and collaborative research practices. However, at the same time. It is only one regulatory document in the sphere of OA in RIs.

Ukraine's aspiration to integrate into the European research landscape requires alignment with European open-access standards and practices. The policy should reflect Ukraine's commitment to international collaboration and harmonization.

Considering Ukraine's multilingual environment, the policy should address language preferences and cultural factors when promoting open access and research collaboration.

The policy should outline a strategic plan for developing research infrastructures that meet both national and international research needs. It should consider the unique research priorities and opportunities within Ukraine.

Limited financial resources may require innovative funding models and cost-effective solutions for infrastructure development and maintenance.

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CHAPTER 31

On the Distributed Open Research Infrastructure of the National Academy of Sciences of Ukraine

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Keywords: Archive of pre-prints, Digital libraries, Distributed systems, Open science, Open data repository, Open publication harvester, Open research infrastructure.

INTRODUCTION

The National Academy of Sciences (NAS) of Ukraine has built an open science policy inspired by the European principles defined in documents such as the European Commission (EC) Open Science Strategy, the EC Recommendation (EU) 2018/790 of 04/25/2018 on Access to Scientific Information and its Preservation, the Directive (EU) 2019/1024 of the European Parliament and of the Council dated 06/20/2019 on Open Data and Reuse of Public Sector Information, Regulation (EU) 2021/695 and the Model Grant Agreement of the Horizon Europe Framework Program [1]. The Presidium of the NAS of Ukraine issued the resolution dated 11/02/2022 No. 327 “On the participation of the NAS of Ukraine in the implementation of the European principles of open science”. It specifies the tasks for the implementation of the National Plan for Open Science approved by the Cabinet of Ministers of Ukraine (the order dated 10/08/2022 No. 892-r) and forms a Working Group on Open Science (WGOS). The WGOS initiated a target scientific and technical project of the NAS of Ukraine, “Development and imple-

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mentation of open science infrastructure in the NAS of Ukraine (OPENS)" for 2023-2024, approved and started by the orders of the Presidium of the NAS of Ukraine dated 02/07/2023 No. 67 and dated 03/30/2023 No. 170.

The open science implementation in the NAS of Ukraine aims at a better presentation of the research results obtained by scholars of the NAS of Ukraine in the international environment of open research using modern technical and informational means. Its goals include support of science development in Ukraine, re-enforcement of international research cooperation with the assessment of certain indicators, and stimulating and simplifying the integration of the NAS of Ukraine in the European Research Area (ERA).

MATERIALS AND METHODS

The NAS of Ukraine unites about 200 research institutes, educational centers, R&D enterprises, parks and nature reserves, archeology sites, museums and libraries, 2 publishing houses, and 277 scientific journals. The NAS movement toward open science started more than 20 years ago, but its progress was uneven, irregular, and concentrated in separate "islands". As a result, the level of institutional repositories is in its infancy, and only about a third of the journals are open-access ones [2]. At the beginning of 2023, the most developed parts of the open science infrastructure of the NAS of Ukraine were:

- centers of collective use of research equipment, including the NAS computing infrastructure of cloud centers and high-performance computing clusters joined in the National grid over a broadband network,
- e-libraries and repositories of open publications, open access journals.

The open data repository and the harvester as a centralized access point to open publications were underdeveloped. Archive of preprints, another common component, did not exist. The computing infrastructure was the only component completely adjusted to European requirements and integrated into the European infrastructure of EGI (egi.eu).

The OPENS project provides a systematic approach to open science implementation by combining organizational, normative, and technical measurements. The developed and created infrastructure components assigned to different institutions must interact on the standardized rules and protocols to provide the common access point, the unified publication and access policy, the seamless information transfer, and data sharing among the components, as well as the ability to add more and different components in the future. The architecture of the solution is presented in Fig. (**1**).

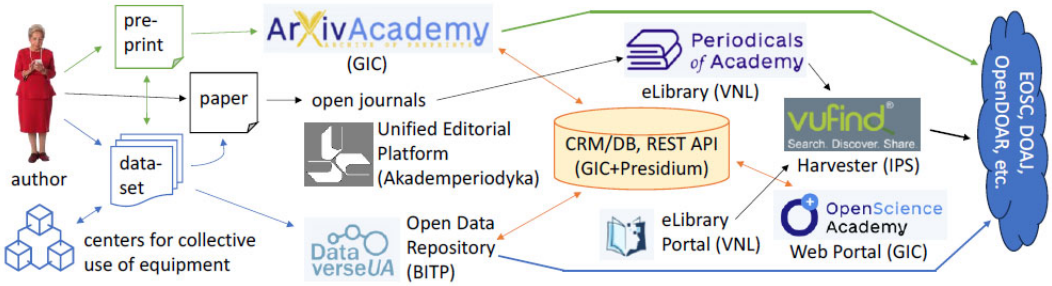

Fig. (1). The distributed Open Research Infrastructure of the NAS of Ukraine: GIC, BITP, IPS are NAS institutes, VNL is Vernadsky National Library.

EXPERIMENTAL MATERIALS

The infrastructure components are built on the basis of selected open-source products with user interfaces translated into Ukrainian and partially replaced by our own modules to provide the required protocols of author login, open preprint or open data approval, external co-author assignment, etc. The products are:

- Open Journal Systems (pkp.sfu.ca/ojs/) for the Unified Editorial Platform,
- Open Preprint Systems (pkp.sfu.ca/ops/) for the Archive of Preprints,
- Dataverse repository (dataverse.org) for the Open Data Repository,
- VuFind Harvest Tools (vufind.org) for the Academic Harvester,
- Views OAI-PMH (drupal.org/project/views_oai_pmh) and Biblio (drupal.org/project/biblio) for the institutional implementation of e-Libraries on the Drupal web content management system.

All the infrastructure components use dual-language metadata (Ukrainian and English) as well as the OAI-PMH protocol for the metadata transfer to Ukrainian, European and international open research repositories of higher levels (such as DOAJ, OpenDOAR, CORE, BASE, OpenAIRE). Access to the published open research results, including the full texts of papers and pre-prints, will be free under Creative Commons licenses and will not require registration of readers. The open data collections are published according to the FAIR principles (findability, accessibility, interoperability, and re-usability). Most of the components propose dual-language user interfaces.

RESULTS

The project continues according to plans, and the first version of the system is expected to operate before the end of 2023 (openscience.nas.gov.ua). Normative acts necessary for its legal use are developed in parallelas well as user manuals and training materials [3]. New installed and updated infrastructure components

will be prepared for full-scale operation with the DOI assignment to preprints and datasets during 2024.

CONCLUSION

The architecture and implementation of the NAS of Ukraine Open Research Infrastructure are presented.

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CHAPTER 32

Statistics of R&D and Innovation in Provision of Management Processes: Problems and Challenges in Modern Ukraine

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Keywords: Challenges, Data, Innovation, R&D sphere, Research and development effectiveness, Standards, Statistical information, War.

INTRODUCTION

The main objective of science in modern society is to create new knowledge, which can then be used in the processes of socio-economic development. Since knowledge is a complex phenomenon, it cannot be described by any single indicator. Moreover, it is impossible to determine "new knowledge" directly through existing statistical indicators, so sets of so-called proxy indicators are used, which more or less fully and adequately reflect the state of science at the country level. The main problem is the selection of a set of such indicators and the development of procedures for their collection, processing and interpretation. Ukraine faces numerous challenges in the way of creation of a relevant system of statistical support of the decision-making system in the R&D sphere, greatly aggravated by the war.

MATERIALS AND METHODS

Analysis of scientific publications, official documents of Ukraine and other countries on S&T policy, and methods of statistical generalizations are used in this paper.

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RESULTS

Since the mid-2010s, the State Statistics Service of Ukraine (Derzhstat) has actually switched to generating statistics on R&D and innovation according to the EU standards. But at the same time, it stopped collecting and publishing some data that were collected earlier, for example, information on publication activity (according to internal standards), other results of research performance, the emigration of scientists and so on. Now, Derzhstat collects certain mandatory data required by the Eurostat. This formal switch to the European methodology ignores the challenges and needs of public authorities in information for making relevant decisions at the state level. New challenges are emerging, in particular, the issue of highlighting the changes caused by the war in the field of science and innovation, while some old problems remain unresolved. Thus, during martial law, Derzhstat suspended the publication of statistical data and did not publish those that were collected for 2021, which makes it difficult to justify political decisions in the field of science and innovation in the most difficult conditions of martial law. Thus, according to the new war-related regulations, respondents who do not belong to the government sector have the right not to submit statistical information during the period of martial law. It is noted that the response rate of respondents is expected to be at least 95%. It would be desirable to lower this level somewhat in order to provide the authorities with statistical information and not 'abandon' it altogether. 'Old' problems include the way of data disclosure and frequent changes in approaches to sampling and/or to the methodology of statistical observations in the field of science and innovation, which make it impossible to build reliable time series. For example, information on the innovation activities of enterprises does not make it possible to calculate the number of enterprises that introduced exclusively organizational and marketing innovations or those that introduced exclusively product innovations. However, even in the statistical collection for 2017, there was such an opportunity. Separately, we should note the problem of monitoring the activities of enterprises with foreign capital in Ukraine because these data are necessary to increase foreign investments and to improve innovation, investment and economic policies. However, having the technical ability to do this, the Derzhstat does not produce data on the innovation activity of enterprises controlled by foreigners. Such information can be obtained by identifying enterprises with foreign investments on the basis of a statistical survey questionnaire №INN (EU-type survey) and obtaining the necessary statistical data from some other 'standard' questionnaires. Another problem is related to the data reliability. Thus, according to the specialized EU-type survey, innovation activity in Ukraine fell 3.3 times from 28.1 to 8.5%. In the industrial sector, innovation activity in 2018-2020 decreased from 29.5% to 12.9%, but, according to data collected in the standard

statistical questionnaire 'No. 1-innovation', the innovation activity of such enterprises was 15.8%– 16.8% in the same period.

CONCLUSION

There is an urgent need to make changes to the practice of data collection and processing, combining the capabilities of the national and sectoral statistics collected by different ministries and agencies. An important task is to ensure the organization of specialized surveys of R&D and innovation for the purpose of full participation of Ukraine in the calculations of relevant European indices and making well-grounded decisions in these areas, in particular, on migration processes, development of research and development infrastructure, *etc*.

FUNDING

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CHAPTER 33

The Digitalization of Methods for Responsible Evaluation of Scientific Institutions

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Keywords: AHP, ANP, Decision support, Experts, Evaluation, Information technologies, Portal, Scientific activity.

INTRODUCTION

In the context of Ukraine's integration into the international research space and the intensification of mutually beneficial scientific, technical, and innovation cooperation, ensuring state support for Ukrainian entities engaged in scientific, scientific-technical, and innovative activities has become of paramount importance [1]. The list of such scientific institutions (SI) is compiled in the State Register of Scientific Institutions receiving state support (hereinafter referred to as the Register). To ensure rational state support for SI, it is necessary to periodically review and improve the normative and legal framework for assessing the performance of institutional scientific activities [2]. According to the vision of the European organization CoARA (Coalition for Advancing Research Assessment), the evaluation of researchers and research organizations should recognize results that maximize the quality and impact of research. This requires an evaluation primarily based on qualitative judgment, where expert assessment plays a central role, complemented by the responsible use of quantitative indicators. The challenges in this domain are largely associated with the multi-criteria task and the issue of selection. Therefore, making informed decisions by government authorities requires comprehensive analytical support. This can only be achieved through the digitization of evaluation processes, which involves providing experts

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with scientifically grounded and formalized computer tools and the necessary information support.

MATERIALS AND METHODS

The question of assessing the performance of scientific institutions has remained relevant worldwide for a long time. Many researchers, including those in Ukraine, draw attention to the unsatisfactory implementation of prioritizing directions and criteria for evaluating subjects of scientific activity for the purpose of their support. Conclusions have also been drawn about the necessity of using expert evaluation methods supplemented with quantitative indicators. To overcome these discrepancies, researchers and experts propose a range of approaches to decision support in a multi-criteria environment, including relying on heuristic, interactive, and expert methods. Developments of new methods for evaluating the performance of subjects of scientific activity, models, and information technologies that can be used for the practical organization of scientific performance evaluation are also suggested.

In modern times, ensuring access to open digital systems to support the evaluation processes of scientific institutions is advisable to implement based on a specialized information and telecommunications system and a national internet portal, which are currently being developed in the country. Such a system aims to create conditions for gathering information from various sources and to simplify and automate procedures for registering SI, including the completion of applications, questionnaires, reports, and other documents. However, to address multi-criteria evaluation tasks of scientific institutions, it is advisable to utilize approaches based on models, algorithmic tools, and methodological frameworks implemented as a Decision Support System (DSS). The authors propose an integrative methodology for constructing such a DSS, which is based on the use of several well-known methods, including approval voting (AVM), Analytic Hierarchy Process (AHP), Analytic Networks Process (ANP), combined with ontological data models, and the application of graphs for visualizing the alternative selection processes [3].

The combination of the aforementioned information and telecommunication system, the internet portal, and the corresponding DSS can facilitate the creation of a modern digital environment for effective government management of scientific activity evaluation processes (Fig. **1**). The cognitive process of decision-making when solving unstructured multi-criteria evaluation problems using DSS supported by integrative methodology is shown in Fig. (**2**).

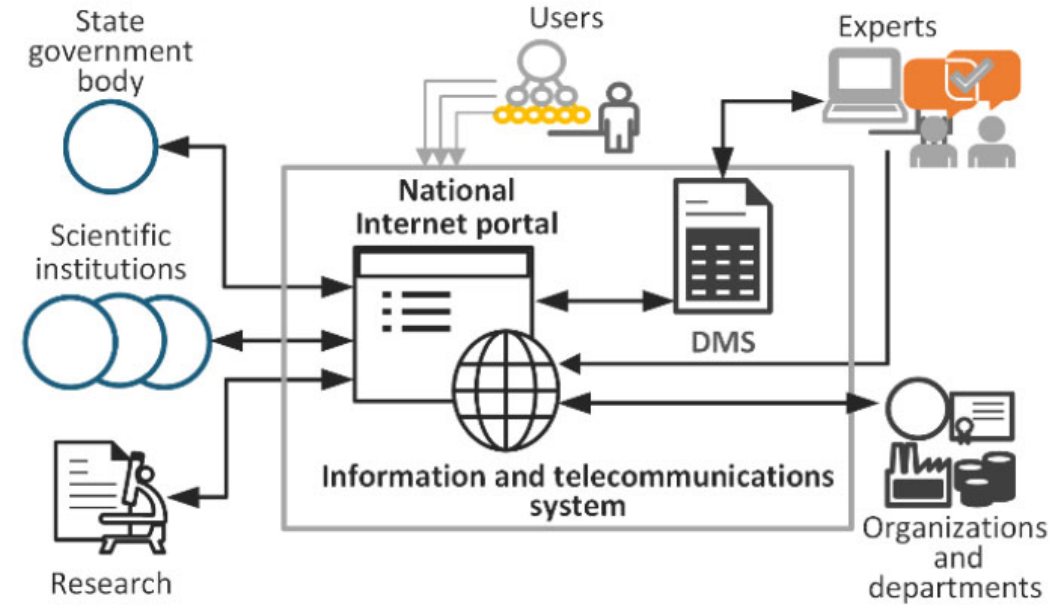

Fig. (1). Digital environment for evaluating scientific activity.

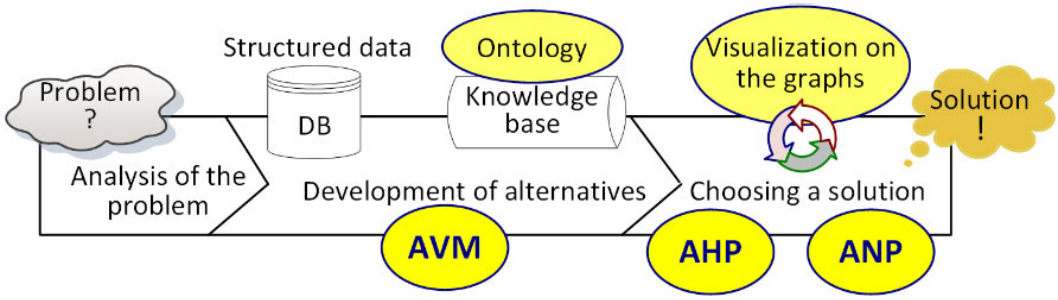

Fig. (2). A cognitive decision-making process for evaluation supported by an integrative methodology.

The above decision support methods can be applied both separately (for simple tasks) and in combination for tasks with complex relationships between alternatives and criteria. This procedure, with the use of appropriate software tools, can be performed by a group of experts from specialists of scientific organizations of various profiles, which will contribute to increasing objectivity and efficiency in decision making.

RESULTS

The experimental sample of the DSS was tested on tasks in the field of defense and civil protection, which confirmed the effectiveness of decision-making support. A technology for choosing alternatives has been developed, which can be

options for the composition of criteria and their point contribution to the overall assessment of the scientific institution activity.

CONCLUSION

The analysis of the state of evaluation of scientific institutions, which receive government support, indicates a lack of comprehensive information and analytical decision support for experts. These problems can be overcome through the use of modern mathematical methods and digital information communication tools.

FUNDING

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CHAPTER 34

Challenges of Implementing Open Science Initiatives

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Keywords: CRIS, Open science, Open access initiatives.

INTRODUCTION

The State Scientific and Technical Library of Ukraine has been actively implementing open-access initiatives since 2019. On November 12, 2019, the Open Ukrainian Citation Index (OUCI) was introduced. Subsequently, the National Electronic Scientific Information System (URIS) was successfully tested and launched. URIS aimed to aggregate, collect, and manage scientific data in Ukraine to support managerial decisions and serve as a tool for conducting competitions for scientific and technical projects and developments under the Ministry of Education and Science of Ukraine.

Another successful project was the establishment of the National Consortium ORCID Ukraine, which now comprises over 30 members. The consortium was created to integrate open repositories and platforms hosting scientific journals with ORCID, ensuring the use of persistent identifiers and proper metadata formatting.

MATERIALS AND METHODS

However, during the implementation of these open science projects, the State Scientific and Technical Library of Ukraine encountered several challenges. In this context, the primary focus should be on the legislative framework for implem

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enting open science principles. Although the Cabinet of Ministers of Ukraine approved a national plan for open science on October 8, 2022, under Resolution No. 892-r, there is a lack of adequate monitoring and evaluation of reforms in the field of open science. This monitoring and evaluation are crucial for identifying successes and shortcomings and making adjustments to the development strategy.

RESULTS

The first step is to define key indicators that will measure progress in implementing open science. These indicators may include the number of open-access publications, the funding volume for scientific research, the number of researchers participating in open initiatives, and more. To evaluate the reforms, relevant data needs to be collected. This may involve creating databases, conducting surveys, analyzing scientific publications, monitoring financial expenditures, and more. The collected data should be analyzed to determine the extent to which goals and objectives have been achieved. Evaluation can be both quantitative and qualitative.

It is essential to identify both successes and shortcomings in the development of open science. The results of monitoring and evaluation should be made accessible to the public, the scientific community, and the government. This promotes open dialogue and can lead to discussions about changes in the development strategy.

Another critical aspect of implementing open science principles is the development of research infrastructure, including research laboratories, data processing centers, and network connections for collaboration, which are essential components of open science. Since the beginning of 2023, the State Scientific and Technical Library of Ukraine has been working on the development of a research infrastructure classifier with the aim of integrating it into the URIS system. This classifier is intended to serve as a tool for researchers, helping them find and access the infrastructure necessary for their research. This will facilitate collaboration among different research institutions and researchers, as they can easily locate and share resources. The overall goal of this process is to create a more favorable environment for scientific research and support open science in Ukraine by developing scientific infrastructure and ensuring access to it for researchers.

Another challenge for open access in Ukraine is gaining access to data and publications. Since 2016, the Ministry of Education and Science of Ukraine has initiated a project through the State Scientific and Technical Library of Ukraine to provide domestic scientific institutions and higher education institutions with access to electronic databases of scientific information. However, the possibility of national subscription (*i.e.*, access for all scientific institutions without

exception) only became available in 2019, and it was only with the onset of full-scale aggression by Russia that all leading providers of scientific information opened their full texts to Ukrainian scientists. Nevertheless, the accessibility of high-quality scientific information needs to be increased, and an important aspect in this context is the support from the state for domestic open-access scientific journal publishers.

Additionally, when discussing the implementation of open science principles and the development of such initiatives, it is crucial to address the change in the culture of researchers. Changing the culture of researchers is a key aspect of implementing open science principles and contributes to the creation of an open and innovative scientific environment. This process requires changes in the approaches, beliefs, and practices of researchers in several directions. It may include publishing in open access, providing access to data for other researchers, and engaging in collaborative research. Open science supports the concept of "open methodology," where researchers share research methods and procedures so that others have the opportunity to replicate and verify results. Furthermore, the assessment of scientific achievements should consider not only the quantity of publications but also their quality and contribution to the advancement of science. It is essential to incentivize and recognize open contributions to the scientific community. Universities and research institutions should also review their institutional practices to support an open culture. This may include open access policies, fostering collaboration among researchers, and providing training in open practices, among other initiatives.

CONCLUSION

The launch of the Open Ukrainian Citation Index (OUCI) and the National Electronic Scientific Information System (URIS) has enabled access to scientific data and contributes to informed decision making.

The establishment of the National Consortium ORCID Ukraine and its integration with open repositories and platforms for scientific journals ensure the use of persistent identifiers and improve metadata quality.

These initiatives promote the development of open science in Ukraine, enhance the accessibility of scientific information, and support collaboration among researchers.

For further success in implementing open science, it is essential to continue developing infrastructure, support the cultural shift among researchers, and ensure access to the results of scientific research for the wider public.

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CHAPTER 35

The ORCID National Consortium: Ukrainian Use Case

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Keywords: Open science, ORCID national consortium.

INTRODUCTION

On 16.09.2022, the license agreement between ORCID and the State Scientific and Technical Library of Ukraine was signed [1]. The ORCID National Consortium in Ukraine was created with the aim of promoting and facilitating the adoption of ORCID identifiers among researchers and organizations in Ukraine to integrate ORCID identifiers into the research ecosystem of Ukraine and implement the principle of open science in Ukraine. The consortium serves as a platform for community building among researchers, universities, libraries, funding agencies, and other stakeholders interested in advancing the adoption of ORCID in Ukraine. It also advocates for the use of ORCID identifiers in research-related activities. Nevertheless, the consortium's functioning faced several challenges.

MATERIALS AND METHODS

During this study, the author used data analysis methods and data collection procedures. The author is the responsible person in the ORCID National Consortium leader (State Scientific and Technical Library of Ukraine) for ORCID communication and implementation policy.

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RESULTS

The creation of the ORCID National Consortium in Ukraine is undoubtedly a significant step toward promoting open science and improving research management in the country. However, like any ambitious initiative, it may face several challenges during its functioning. One of the primary challenges is raising awareness about ORCID identifiers among researchers and organizations in Ukraine. Many researchers are not familiar with ORCID or the benefits it offers, so efforts to promote adoption require extensive outreach and education. At the same time, researchers and institutions resist change, particularly if they are accustomed to traditional research practices. So, the SSTL of Ukraine is putting all efforts into convincing them of the advantages of using ORCID identifiers and integrating them into their workflows.

At the same time, integrating ORCID identifiers into various research systems and platforms is technically complex. It requires collaboration with IT teams and R and D departments to ensure seamless integration, which can be time-consuming and resource-intensive.

Ensuring that researchers from various disciplines and institutions across Ukraine participate in the consortium is also a serious challenge. In Ukraine, we also have scientists, publishers and journals who do not fully support ORCID integration.

Speaking about challenges, it should be mentioned that developing and implementing policies and governance structures for the consortium is complex. Clear guidelines are needed for data management, membership, decision-making, and dispute resolution. While the consortium focuses on Ukraine, it should also seek opportunities for international collaboration. This can be challenging due to differences in research practices, regulations, and standards across countries [2].

CONCLUSION

Assessing the impact of ORCID adoption in Ukraine may require time and effort. Demonstrating how ORCID identifiers benefit researchers, institutions, and the research ecosystem as a whole is crucial for sustaining interest and support.

The ORCID National Consortium in Ukraine, while facing hurdles, made significant strides in advancing the adoption of ORCID identifiers and promoting open science principles within the Ukrainian research landscape. Its ongoing commitment to addressing challenges and its dedication to the cause of open science remain essential for the continued growth and success of research in Ukraine.

FUNDING

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CHAPTER 36

Experience of Relocation of the Educational Process in Order to Ensure the Quality of Medical Education

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Keywords: Experience, Higher education, Medical university, Relocation, Students, War of Ukraine.

INTRODUCTION

A gap in education due to emergencies will cost future generations the benefits of health, income, equality, and psychological well-being that education provides. This fuels the cycle of poverty [1]. Thousands of schools, pre-schools and other education facilities in Ukraine have been damaged or destroyed due to the use of explosive weapons in the war, including in populated areas [2].

At the same time, many parents and caregivers are reluctant to send children to school, fearing for their safety. Education, the backbone of any nation's development, demands the presence of not only infrastructure and facilities but also a peaceful environment [3].

Kyiv Medical University is a remarkable institution that continues to train medical professionals despite the ongoing war in Ukraine. It is a potent provider and performer of all tasks assigned to higher education institutions in the field of medicine. Kyiv Medical University has been able to combine high-quality

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medical education with safety for both teachers and students, thanks to the university management's innovative and effective methods. The university is the only Ukrainian higher education institution to have established a branch office in the European Union - the Polish Campus of KMU.

MATERIALS AND METHODS

Our survey of 67 senior students of the international faculty indicates that 71.6% of the respondents (48 students) noted a greater focus on studying than on their safety since moving from Ukraine. All the interviewed students agreed to the survey and statistical processing of their answers with the publication of depersonalized research results.

RESULTS

The establishment of the educational space outside of Ukraine not only satisfies the basic need for life safety for teachers and students but also provides comprehensive assistance in solving everyday problems. The relocated students have access to qualified medical care in the country of study and receive assistance in legalizing their alien status. The teachers are happy to provide psychological support to students, sharing their professional and life experiences while mentoring and coaching them. A positive aspect of adaptation for students of medical, dental, and international faculties is the immersion in the cultural and sports life of the European Union while maintaining the main national characteristics of students from different countries.

For 89.6% of students, the most worrisome issue was the desire to pass the exam. The qualitative performance of students has improved by 0.4 points compared to the performance of the same students in previous years. Additionally, 22.4% of the respondents expressed interest in participating in international professional conferences, almost half of whom wanted to prepare and present their reports.

CONCLUSIONS

Kyiv Medical University has created a safe learning environment and has involved a highly competent team of specialists to maintain a certain level of teaching and improve the quality of medical education. Despite the ongoing full-scale war in Ukraine, the university has been able to provide uninterrupted education and has established a reputation for excellence. The university has demonstrated its commitment to providing a safe, supportive, and inspiring learning environment for its students.

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CHAPTER 37

Barriers and Opportunities for Implementing Innovative Activities by Enterprises in Ukraine

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Keywords: Accelerators, Business, Innovative potential, Innovative activity, State support, Universities.

INTRODUCTION

The participation of the modern state in global innovation projects and initiatives is a critically important component and is a driver for its sustainable economic development. The development of innovation and investment in innovative projects is a key factor of development and prosperity in the era of digitalization. Domestic enterprises have sufficient potential to participate in initiatives and innovative projects. However, there are a number of barriers that prevent enterprises from fully realizing their potential in this area.

MATERIALS AND METHODS

A complex method consisting of two stages was used to obtain scientific results. The first stage was the search and analysis of relevant statistical data that would reflect a reliable picture of the state of innovative activity of enterprises in Ukraine and the problems and challenges they face. Therefore, a survey was conducted by the Ministry of Education and Science of Ukraine together with the Ministry of Economic Development, Trade and Agriculture of Ukraine and the Ministry of Digital Economy. Total 108 companies took part in the survey, the largest share among which was represented by micro-enterprises - 36%, and the smallest - 19% - by medium-sized enterprises. The vast majority of respondents are representatives of companies without foreign investments - 89.8%. The second stage was a detailed analytical work of existing scientific works on the

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topic of innovation, innovative activity, critical analysis, comparison, and synthesis of the obtained information. Thanks to this approach, it was possible to systematize statistical studies and expert opinions and to identify barriers and opportunities in the field of innovative activity.

RESULTS

For a better understanding of the material, it is worth starting with a description of the current state of innovative activity in Ukraine in a global dimension. According to the "Global Innovation Index 2022" developed by the World Intellectual Property Organization (WIPO), Ukraine is in 57th place. In light of the full-scale invasion of Russia, Ukraine fell from 49th place (according to WIPO data from 2021) and lost 8 positions. Despite this, the report notes that Ukraine's innovative productivity is above expectations for the level of development. Among the indicators identified in the study as strengths are: Education, Government funding, Pupil-teacher ratio, Tertiary enrollment, Females employed with advanced degrees, Utility models, Software spending, ICT services exports, Trademarks, Industrial designs, and Mobile app creation [1]. In this way, we can determine the first barrier to innovative activity by enterprises - this is Russia's armed aggression. However, it should be noted that this creates certain opportunities. Besides the background of the struggle against the occupying forces, both the state and enterprises are constantly developing innovative activities in the field of the military-industrial complex, namely: the creation of high-tech weapons, the creation of training programs, the development of infrastructure for production facilities, *etc*.

Innovative activity is inextricably linked with intellectual work. Therefore, the protection of intellectual rights is one of the key factors in the development of innovative activity. Unfortunately, at this stage of the state's development, the institutions that should regulate and protect intellectual rights cannot fully guarantee the realization of these rights, and prevent violations and abuses. This causes a significant outflow of intellectual capital from the country, which has a negative impact.

Analyzing the survey of business representatives in detail, the following barriers can be identified:

- difficulties in obtaining state financial support for innovative activities.

- lack of information about state institutions that support innovative activities.

- lack of information about types of state support for innovative activities.

- absence / insufficient level of training of personnel in the required specialty.

In particular, among other things, respondents noted that there are such barriers as communication with registrars; insufficient level of innovation culture of the public in general; insufficient level of development of companies in Ukraine; financial constraints; lack of incentives at the state level for conducting innovative activities; the need to increase informational, moral and financial support for innovative business in Ukraine. In addition, according to respondents, the state currently does not significantly influence the development of innovation processes, and the state and business are separate and completely unfamiliar worlds [2]. All these negative factors create opportunities for the state to develop and improve the sphere of innovative activity. A great example is the national project "Diia" from the Ministry of Digital Information. This project has a separate branch that deals with business and provides business advice, has support centers, and offers various programs and training. But despite this, it is worth saying that this is not enough. An expedient solution is the involvement of universities in innovative activities. Universities have significant innovation potential. The business has a significant demand for innovative research. In order to develop the entrepreneurial skills of students and teachers, and to intensify technology transfer and commercialization of knowledge, it is proposed to create accelerators in universities. This will create a "business - university - state" connection, which will undoubtedly lead to an increase in the number of successful startups and the creation of business entities based on them, the activation of technology transfer, and the commercialization of knowledge [3].

CONCLUSION

Summarizing the conclusions, it can be said that the state is facing a number of challenges in the field of innovation, being in a difficult period of Russia's armed aggression, in addition, the imperfection in the legislation on intellectual rights and the lack of effective state support are a barrier. State national projects of the "Diia" type are definitely a step toward meeting, but not enough. The full involvement of universities in the innovation process, primarily through the creation of accelerators, can significantly change the situation for the better. But at the same time, it is these barriers that create challenges and thus opportunities.

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CHAPTER 38

Performing the Candidate Gene Association Study of Cancer in Ukraine Using International Open Science Genomics Projects

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Keywords: *BGLAP*, Open science genomic project, Prostate adenocarcinoma, Single nucleotide polymorphism.

INTRODUCTION

In 2019, the World Health Organization postulates that cancer is the first or second leading cause of death before the age of 70 years outpacing even coronary heart disease and stroke in mortality rates. About 19.3 million new cases and 10 million cancer deaths were recorded worldwide in 2020 and these indicators continue to increase despite the success of current medicine. According to the Global Cancer Observatory (GLOBOCAN 2020), prostate adenocarcinoma (PA) is the second most common oncological process and the fifth leading cause of cancer death in men [1, 2]. Thus new approaches to prevention and early diagnosis of PA must be developed considering its adverse medical, social, and economic impact.

Oncological processes belong to the diseases with hereditary predisposition, so both genetic and environmental factors determine the risk of their emergence [3]. Recent studies postulated that *BGLAP* is one of the important candidate genes for PA tumor progression and bone metastasis. An increased *BGLAP* expression levels was observed in androgen-dependent prostate cancer cell lines [4]. Moreover, osteocalcin was used as an indicator for PA bone metastasis and a predictor for the efficacy of hormone therapy [5]. At the same time, there is no

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information concerning the association between *BGALP* variants and PA development for Ukrainians.

It should be noted that the allele and genotype frequencies of the same polymorphic variant differ across populations and therefore may be misclassified as benign or pathogenic. It is important to use ancestry-matched case-control studies in order to obtain reliable results during population genetic analysis. However, populations of developing countries are often underrepresented in genome-wide association studies (GWAS) due to their limited research performance [6]. Thus the aim of this study was to estimate allele and genotype frequencies of *BGLAP* rs1800247 single nucleotide polymorphism (SNP) in Ukrainian patients with PA depending on the smoking habit using available information from the international open science genomic projects.

MATERIALS AND METHODS

SNP Selection

In this study, rs1800247 SNP was selected from the open science genomic project "HapMap Project" [7] using the following criteria: SNP is located in the *BGLAP* gene; minor allele frequency (MAF) for European populations > 5%; known functional role of SNP.

Study Population

The research enrolled 183 Ukrainian males (mean age ± SD 72.9±7.5 years) with diagnosed PA. The patient group was subdivided by smoking habit: 79 subjects did not smoke and 104 participants were smokers.

Genotyping

Whole venous blood from PA patients was used for DNA extraction by the "NeoPrep100 DNA_Blood" kit (Neogene, Ukraine). Nucleotide sequences of the *BGLAP* genomic region and its transcript were obtained from the open science database "dbSNP" [8]. Polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) analysis was performed for patients' genotyping using Thermocycler GeneAmp PCR System 2700 (Thermo Fisher Scientific, USA). Primer sequences, amplification conditions, and reaction mixtures are described in detail in our previous work [9]. Horizontal electrophoresis in 2.5% agarose gel and ultraviolet visualization were used for genotype estimation.

Statistical Analysis

Chi-squared test was applied for the comparison of *BGLAP* rs1800247-polymorphism allele and genotype frequencies. All statistical calculations were

performed using Statistical Package for the Social Sciences software (SPSS, version 25.0, Chicago, IL, USA). The value $P < 0.05$ was accepted as significant.

RESULTS

The following *BGLAP* rs1800247 allele and genotype distributions were found in the compared groups: TT – 55.7%, TC – 44.3%, CC – 0%, MAF – 22.2% in patients who did not smoke, and TT – 60.6%, TC – 36.5%, CC – 2.9%, MAF – 21.2% among smokers. There were no statistically significant differences both in allele ($p = 0.818$) and genotype ($p = 0.208$) distributions.

CONCLUSION

Using the international open science genomic project “HapMap Project” and database “dbSNP”, the population genetic study was conducted that showed no significant differences in *BGLAP* rs1800247 SNP allele and genotype frequencies among Ukrainian PA patients depending on the smoking habit.

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CHAPTER 39

Subsystem for Maintaining the Register of Objects of Intellectual Property Rights in the National Academy of Sciences

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Keywords: Automated workplace, Competition, Distributed information technology, Network, Research, Role.

INTRODUCTION

The Department of Intelligent Information Technologies of the V.M.Glushkov Institute of Cybernetics of the National Academy of Sciences of Ukraine (NASU), in cooperation with the Centre for Intellectual Property Studies and Technology Transfer (CIPSTS) of the NASU, developed the automated workplace (AWP) for an employee of the division on technology transfer, innovation activity and intellectual property (EDTTIAIP) of the NASU research institution.

MATERIALS AND METHODS

The Decree of the Presidium of the NASU «On the first stage of implementation in the National Academy of Sciences of Ukraine of the Subsystem for maintaining [SSfM] the register of objects of intellectual property rights [ROIPR] of the Distributed Information Technology [DIT] to support the research and organizational activities [ROA] of the NASU» of April 23, 2019, No. 272, put into operation the corresponding Subsystem − part of the DIT to support the ROA of the NASU, which has been operated by tens of thousands of users since 2015 in a real-time mode.

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The SSfM ROIPR of the NASU is intended for informational support of one of the NASU tasks – the creation and use of inventions, computer programs, and other IPRs, know-how, patent protection of scientific and technical results with an increase in their level of commercialization, ensuring the conduct of relevant scientific research (SR) at the NASU [1]. Inventions and other results of the SR implementation in the ROIPR of DIT of NASU are considered officially registered OIPRs. The ROIPR stores certain data about OIPRs and is an important information resource of the NASU. The SSfM ROIPR automates the work with ROIPR, significantly simplifying the accumulation of information about ROIPR, as well as the search, analysis, and use of ROIPR data. The SSfM ROIPR ensures the execution of technological procedures on electronic documents (ED) with data on OIPRs (ED OIPRs).

Those procedures are executed by the following groups of users (subjects of SSfM ROIPR):

EDTTIAIP of the NASU research institutions;

Scientific secretaries of the NASU research institutions and specialists of their services, authorized to support the conduct of ROIPR;

Employees of the NASU Presidium authorized to support the conduct of ROIPR;

Employees of the CIPSTS of the NASU.

The subject of the SSfM ROIPR must also be a subject of the DIT ROA NASU. Each of these subjects is given a certain role (roles) in accordance with the job duties in the SSfM ROIPR DIT ROA NASU. The SSfM ROIPR provides support for the users' work with NASU OIPR cards, which contain (input or primary) information from documents according to current legislative, administrative and regulatory acts, in particular:

Notices of submission of applications for the creation of OIPRs;

Applications for OIPR registration;

Information about a protection document (patent, certificate), copyright, *etc*.;

Information on the accounting of intangible assets;

Information on contractual relations with creators (inventors, authors) of OIPRs;

Other information (statements and decisions regarding the issuance of protection documents, creation and use of OIPRs).

The SSfM ROIPR supports the receipt of reporting documents for CIPSTS of the NASU. Reporting forms with OIPRs are the outputs of ED SSfM OIPRs, which are automatically generated by means of the Subsystem [2].

The precondition for operations of the AWP SSfM EDTTIAIP of the NASU research institutions is their integration into the DIT ROA NASU, which works in the environment of the NASU corporate computer network using the capabilities of the state enterprise «Scientific and Telecommunication Center Ukrainian Academic and Research NETwork» (UARNET, Uarnet; launched in 1992), subordinate to the Institute of Physics of Condensed Systems of the NASU (established in 1990) [3].

EXPERIMENTAL MATERIALS

When preparing the reported data, attention is paid to the clarifications on filling out the forms, published in the Announcements section on the website of the NASU (http://www.nanu-patent.nas.gov.ua/).

RESULTS

To date, the ROIPR DIT NASU provides reporting data for each NASU research institution on the creation, protection, and use of OIPRs, and on contracts for the use of OIPRs according to the forms VII-1−VII-7.

CONCLUSION

A problematic issue for Ukraine regarding the protection and commercialization of OIPRs is an organization of serial production (commercialization) of high-tech products, using both modern possibilities of international cooperation and modern results of international competition on the world markets. Obviously, Ukraine's OIPRs will need the foreign complementary OIPRs, in particular industrial designs, utility models, and infrastructure for the development and operation of high-tech products.

FUNDING

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CHAPTER 40

Open Science Implementation: A Cross-Country Comparison of Ukraine and Spain

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Keywords: Implementations, Open science, Open science practices, Open science indicators, Research data, Spain, Ukraine.

INTRODUCTION

Today, science plays an increasingly vital role in addressing pressing global challenges and driving progress. Effective scientific communication is crucial for the creation, functioning, and development of science, especially in the context of cultural and historical changes. Ukraine seeks innovative educational practices to preserve its achievements and traditions. Open science can be a key tool for Ukraine's revitalization and growth, enabling access to new research, technologies, and knowledge that can fuel innovation and economic development. In October 2022, Ukraine's government approved a national open science plan, marking a step towards integration into the European Research Area. In this regard, studying the experiences of other countries, notably Spain, in implementing open science principles is pertinent. Spain, as a leading European nation in this domain, possesses valuable expertise that can benefit Ukraine.

MATERIALS AND METHODS

In the analysis and comparison of various indicators of open science implementation in Ukraine and Spain, the following scientific methods were employed: quantitative analysis for measuring and comparing specific numerical indicators, such as the number of scientific publications in open access, the

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amount of data available for public use, and other quantitative parameters; comparative analysis to examine scientific policies and legislation regarding open science in both countries and their regions to identify similar or distinct approaches.

RESULTS

Several organizations and projects are engaged in monitoring and evaluating the implementation of open science practices in Europe. One of them is OpenAIRE, a project dedicated to promoting open science in Europe. As part of this project, a range of tools and services have been developed to monitor and assess the adoption of open science practices in Europe. One such tool is the Open Science Observatory, which provides information on open access to scientific publications and data in Europe, citizen engagement in scientific research, and other indicators related to the development of open science. The Open Science Observatory (https://osobservatory.openaire.eu) is a platform where metrics and reports on scientific activities are collected, helping to better understand the performance of open science in Europe, both among countries and within them. The primary focus of OSO is on data collection and analysis, as well as the development of tools to support the advancement of open science. The Open Science Observatory aids in tracking open science practices and their timely implementation. The latest measurements were conducted at the end of July 2023 and demonstrated the following indicators of open practices in Spain and Ukraine (Table **1**):

Table 1. Indicators of Open Science Implementation in Ukraine and Spain.

Country	Repositories	Open access journals	Open access Publications	Open access Datasets	Open source software
Ukraine	104	487	67 918	36	0
Spain	219	1081	883 007	25 704	294

[*] The source was created by the author based on data from the OSO website (https://osobservatory.openaire.eu/home).

Scientific repositories are the cornerstone of modern open science, and their accessibility is crucial for the implementation of OS practices. Scientific registries such as openDOAR and re3data provide visibility and representation in various research communities, disciplines, and programs by offering identifiers and maintaining profiles with summary metadata. Spain is developing a national infrastructure for the digital preservation of scientific information, which will contribute to the preservation and dissemination of scientific publications and data in an open manner. Comparing indicators for Spain and Ukraine, it can be observed that there are twice as many open repositories in Spain as compared to

Ukraine. *Open-access journals* are journals whose articles are available and reusable worldwide, free of charge and without restrictions, immediately upon publication. According to data from the Open Science Observatory, Spain ranks second in Europe in terms of the availability of open-access scientific journals. According to Ulrich's data (http://www.ulrichsweb.serialssolutions.com/), 34% of active scientific journals published in Spain are open-access. However, Dulcinea (https://www.accesoabierto.net/dulcinea/), the most comprehensive, up-to-date, and accurate source for Spanish journals, indicates an even higher percentage. Current research shows that 76% of journals are freely accessible on the internet, access to 10.2% is restricted, and only 1.5% are hybrid. The remaining 12.3% of journals are available to subscribers only [1]. In contrast, Ukraine ranks ninth among European countries on the list of open-access journals. The distribution of journals where works by Ukrainian scientists are published according to open-access business models shows that 48% are open-access journals, 22% operate under a hybrid model, and 30% provide open access without additional guarantees [2]. The growth in the number of open-access scientific journals can enhance the prestige of Ukrainian scientists and researchers. Publications include peer-reviewed publications, published articles, preprints, conference presentations, technical reports, *etc*. Currently, in Spain, there is a law that requires researchers receiving funding from public budgets to publish the results of their research in open-access journals. This means that anyone can read these articles online for free. As we can see, the number of publications by Spanish researchers in open access is almost 14 times higher than the number of such publications in Ukraine. *Open research databases* are research databases that are freely available to everyone. Open data must be licensed, and the license should allow people to use the data in any way, including transforming, combining, and sharing it with others, even for commercial purposes. In Spain, many scientific organizations and government agencies provide open access to their data. For example, Spain's data portal (datos.gob.es) provides access to various data that can be useful for researchers, businesses, and the public. In terms of the number of open databases, Spain ranks first in Europe. The fact that the country has a national open data policy and a national data strategy project contributes significantly to its success. Additionally, Spain hosts more than 10 open data events each year. In Ukraine, several open research databases have been created, including the National Repository of Academic Open Information, the National Information Support System for Scientific Research, the open data portal (data.gov.ua), and others. However, their number does not exceed 40. Open access to scientific research and databases can enhance the quality and efficiency of scientific research, promote their broader use in various fields of life, and contribute to improvements in education and learning in Ukraine. *Open-source software* is software with open-source code. International experience in the use of modern information

technologies underscores the necessity of utilizing and implementing such software. Spain has numerous projects for the development of open-source software that can be utilized in scientific research, such as the OSIMIS (Open Simulation System for Healthcare) project for developing open-source software for medical procedure simulation. In Ukraine, commercial software tools are predominantly used, while the Spanish government supports the use of free software. Most initiatives related to the use and implementation of open-source software in Spain are focused on the education and municipal services sectors. The use of open-source software is a sign of a society that values freedom of choice and an open society. The development of open-source software in Ukraine can further contribute to the growth of the IT industry, which is one of the fastest-growing sectors in the country. It will also enhance collaboration between the government, the scientific community, and the business sector. The scientific environments in Spain and Ukraine have their own peculiarities that influence their approaches to open science.

CONCLUSION

Spain is one of the countries actively implementing open science practices. Therefore, it is important for Ukraine to study its experience. Specifically, reducing open science to merely publishing results in open-access journals, assessing researchers' performance based on formal metrics, and imposing requirements for mandatory publications in publications indexed in international databases are considered distortions and vulgarizations of open science principles. However, as the role of science and the practical significance of scientific and experimental research increases in the context of armed conflicts and post-war economic reconstruction, it is important not only to study but also to implement positive foreign experiences. This includes new ways of organizing and financing scientific research and the interaction between government, business, and civic initiatives to ensure fast and efficient scientific-practical solutions for the modernization and development of specific industries.

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CHAPTER 41

Current Issues of Innovative Technologies Application in Forensic Examinations of Literary Works

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Keywords: Artificial intelligence, Forensic expert, Forensic examination in the field of intellectual property, Forensic examination of literary works, Forensic expert activity, Innovative technologies.

INTRODUCTION

Article 54 of the Constitution of Ukraine provides: "Citizens shall be guaranteed the freedom of literary, artistic, scientific, and technical creative activities, protection of intellectual property, their copyright, moral and material interests arising in connection with various types of intellectual activity. Every citizen shall have the right to the product of his/her intellectual, creative activity; no one shall use or distribute them without his/her consent, except for the cases established by law" [1]. The state has developed a reliable mechanism to protect intellectual rights. The use of objects of intellectual rights without the consent of the right holder or other authorized person is considered illegal, except in cases specifically established by law. Systematic improvement of such a mechanism supports and develops the intellectual and innovative potential of society. The protection of intellectual property of domestic right holders from unlawful infringement of their rights has become an essential component of the economic security of the state. One of the tools of the intellectual rights protection mechanism is forensic examination, the conduct of which is aimed at ensuring an objective and

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comprehensive investigation of crimes and the resolution of legal disputes. The forensic expert's conclusion is one of the most important pieces of evidence aimed at establishing the circumstances necessary for the consideration and decision-making in cases related to the protection of intellectual property.

MATERIALS AND METHODS

The research paper contains a variety of general scientific and specialized methods of scientific knowledge. In particular, the generally philosophical (universal) method of cognition was applied at all stages of the research. Through the method of analysis, the author reveals the distinctive features and addresses specific issues related to the use of innovative technologies in conducting forensic examinations of literary works. The general scientific dialectical method, aimed at finding existing connections and clarifying contradictions between individual legal phenomena, made it possible to comprehensively investigate the possibilities of using artificial intelligence in forensic expert activities. Using methods of generalization and legal forecasting, proposals were formulated concerning the necessity for legal regulation of artificial intelligence in forensic expert activity.

RESULTS

During the existence of the direction of forensic examination in the field of intellectual property in relation to research related to literary, and artistic works and others, a certain experience of conducting such research has been accumulated. This has led to the development of scientific and methodological support for the forensic examination of intellectual property objects. As of today, the Register of Forensic Examination Methodologies includes the following methods developed by state-specialized expert institutions of the Ministry of Justice of Ukraine: Methodology of forensic examinations of literary works (2010); Methodology of conducting forensic examinations related to drawings - objects of copyright (2011); Methodology for conducting expert research of literary works of a scientific nature (2019); Methodology for studying signs of use and reproduction of characters in animated works and works of fine art (2019); Methodology of conducting forensic examinations of photographic works as objects of copyright (2019) [2].

In subsection 5.5 of Section 5 of the Scientific and Methodological Recommendations on the Training and Appointment of Forensic Examinations and Expert Studies, there is a tentative list of issues addressed during examinations related to literary and artistic works:

"Is the object of the research (the title) (or a part of it that can be used independently) the result of creative work according to the information provided

in the case file?

Does the object matter of the research (or a part of it that can be used independently) contain features of the copyrighted work according to the information specified in the case file?

Is the work (title 1) a reworking of the work (title 2)? If so, is it a creative work?

Is the work (title 1) a translation of the work (title 2)? If so, is this translation creative?

Was the work (title 1) (or a part of it that can be used independently) reproduced when creating the work (title 2)?

Is the title (quotation, character) of the work (title 1) reproduced in a trademark (title 2)?

Is the title (quotation, character) of the work (title 1) reproduced in the commercial (brand) name (title 2)?" [3].

Forensic examination of literary works is carried out according to four stages of expert research: preparatory; analytical research, comparative research; synthesis of research results, and formulation of conclusions.

Innovative technologies penetrate and significantly and qualitatively change the entire system of forensic expert activity, which has expanded the possibilities of forensic examinations and increased the reliability and evidentiary value of experts' conclusions. Currently on the agenda are the issues of integration and use of colossal capabilities of artificial intelligence, previously not scientifically and practically in demand, in forensic expert activity. On the one hand, the introduction of artificial intelligence will contribute to the solution of current issues in forensic expert activity, and on the other hand, it brings with it a significant amount of uncertainty, discussions, and ambiguous issues that need to be resolved today.

Nowadays, there is no unified approach to understanding the nature of artificial intelligence in the technical realm, which has led to uncertainty in the legal, social, moral, and ethical spheres. So far, legal scholars have not formulated an understanding of artificial intelligence in the form of a law problem that requires urgent resolution. However, the explosive development of cyber technologies leaves no choice but to immediately plunge into the legal analysis of artificial intelligence and the creation of legal frameworks for its application in the practical activities of a forensic expert. If society and the judiciary are convinced that a robot can perform the same function as a human forensic expert, and that it

can handle a research task better than a human, then there will be no alternative to robots. Currently, no human can track all system connections in the way that artificial intelligence can. Researchers have noted that: “Every day there are possible new criminal justice Artificial Intelligence applications to pave the way for future opportunities to support the system of criminal justice and eventually improve public safety” [4].

One of the main disadvantages of artificial intelligence is the probabilistic outcome of answering a question, so you should not exclude an expert from the research process, and most importantly, from formulating a conclusion. By modeling the work of the brain, artificial intelligence, like humans, is prone to making mistakes. Therefore, when it is used in forensic activities, it is necessary to determine the issue of a forensic expert’s responsibility in a situation where the system makes such a mistake. No matter how perfect artificial intelligence may be, the principle of personal responsibility of a forensic expert for the results of the study should not be canceled. Artificial intelligence can be presented as an auxiliary means of solving the tasks facing a forensic expert in a particular situation.

CONCLUSION

To implement the concept of artificial intelligence in forensic science, it is necessary to develop substantive and procedural legislation. This legislation should provide standardized decision-making algorithms to determine the obviousness and non-obviousness of events and evidence, as well as criteria for assessing the reliability of expert knowledge in addressing investigative and trial tasks in criminal, civil, commercial, and administrative cases. Not everything in forensic expert activity can be algorithmized, but most processes can be implemented in the form of artificial intelligence algorithms, given the typical expert tasks in a significant number of court cases. The current conditions for the functioning of expert support of justice can be significantly modified by legally enshrining the principle of reliability in judicial practice and public administration.

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CHAPTER 42

Info-epidemiological Research Tools During the COVID-19 Pandemic

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Keywords: *COVID-19*, *Google trends*, *Health informatics*, *Infodemiology*.

INTRODUCTION

For clinicians and public health professionals, the Internet is a critically important source of information about the state of the global health care system [1]. In contrast to the background of the appearance of a large number of hybrid web applications, in particular, Health-Map, MediSys, Argus, EpiSPIDER, and BioCaster, the science of distribution and identification of information posted on the Internet for informing public health – infodemiology – has rapidly developed [2]. Info-epidemiological data can be collected and analyzed in real-time. As a convenient tool of infodemiology, the Google Trends resource [3, 4] has been actively used for a long time, in particular for the study of allergic [5, 6] and infectious diseases [7, 8].

MATERIALS AND METHODS

In the course of the study, the Google Trends resource (https://trends.google.ru/trends/explore) was used to search for Google queries "ковід + ковид + COVID-19" (CCS) in Ukrainian and Russian languages. By default, the search options "All Categories" and "Web Search" were selected. The combination of keywords in Ukrainian and Russian was chosen to include more search results in the study. Normalized relative to the country of study and time interval, the data obtained from Google Trends were downloaded in *.csv format.

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The time interval of the study from 15.03.2020 to 23.02.2022 was determined by available official information on the state of the incidence of COVID-19 in Ukraine. Correlation between quantitative indicators was assessed using the Spearman rank correlation coefficient. Differences were considered statistically significant at $p<0.05$.

EXPERIMENTAL MATERIALS

Correlational dependencies between Google Trends queries and indicators of the state of morbidity in Ukraine with COVID-19 are presented in Table 1.

RESULTS

Correlational dependences were observed between the number of "KKS" queries in Google Trends and the cumulative number of infected people in Ukraine ($R=0.2807$; $p=0.0039$), the cumulative number of deaths ($R=0.2807$; $p=0.0039$), number of new cases per day ($R=0.6625$; $p<0.0001$), number of deaths per day ($R=0.582$; $p <0.0001$). A reliable close correlation between the "CCS" request rate and the number of new cases of the disease in the period 01.03.-31.03.2020 was revealed, which reflects the info-epidemiological picture of the spread of the virus among European countries in the period 22.02.-17.03.2020 [8] and consistent with data from the Worldometers resource on the state of the disease in the world. As of March 25, 2020, the number of cases of COVID-19 exceeded 471.000 (https://www.worldometers.info/coronavirus/).

CONCLUSION

GT is a tool for the rapid collection of information on the state of the disease on the scale of the country. For effective forecasting of COVID-19, it is necessary to define search keywords taking into account national characteristics. For Ukraine, with high reliability, the most effective terms are "CCS". The revealed regularities can be used in international epidemiological studies, allowing to take into account national characteristics, the geographical location of the country, the impact of preventive restrictions, *etc*.

FUNDING

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CHAPTER 43

Leveraging Graph Databases for Enhanced Information Retrieval

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Keywords: Graph database, Information retrieval, Large language model, Low-code, Retrieval-augmented generation, Vector database.

INTRODUCTION

Developments in generative AI have shifted the paradigm behind information retrieval from search engines to large language models (LLMs). These models are trained on a significant volume of data; however, gaps in knowledge are not uncommon. Retrieval-augmented generation [1] (RAG) is a technique that allows LLMs to benefit from an external database, filling in the missing information with valuable domain knowledge. RAG traditionally uses word embeddings [2] to facilitate the calculation of similarity between text segments.

However, embeddings can often be suboptimal in the context of RAG. The results returned by vector databases lack explainability, as the only similarity indicator is a number from -1 to 1, which is hard to interpret and reason about. Additionally, they consider the relationship between the text segments to be strong only if those segments are used in similar contexts; at the same time, some inferences require connecting novel ideas that were only mentioned on a minimal number of occasions. Moreover, vectors do not incorporate the inherent links between concepts, leading to problems while reasoning about challenging cases.

A potential solution is to utilize a knowledge graph [3]. When the relationships between ideas are clearly stated, graphs allow us to uncover surprising facts in intricate structures of concepts. Such capabilities are due to special consideration

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given to links rather than the entities alone, leading to a process resembling human reasoning. This architecture is also highly flexible, facilitating easy expansion and adjustment when scaling is needed. Furthermore, the results are easily explainable, as one only needs to follow the path of relationships from the input to the output to confirm the validity of the model's claims.

MATERIALS AND METHODS

We have chosen the following technologies for our models: a graph database *Neo4j*, a vector database *Pinecone*, and a generator model *gpt-3.5-turbo*. The RAG process with a vector database consists of converting user query into an embedding, retrieving the most similar documents from a database, and summarizing the results using an LLM. A graph database requires a different approach. We first prompt the LLM to separate the user prompt into the main ideas. Then, we execute a command in Cypher – a declarative graph query language – to find the paths between those ideas.

Using an example, let us demonstrate the advantages of a graph database for RAG. Potential adopters of RAG include low-code developers utilizing specialized tools like Microsoft's Power Automate, which features many actions to perform common programming tasks. However, some popular operations, such as compressing an image file, are not available at the time of writing. The lack of possibility of such file alterations may prompt a low-code developer to ask: "How to compress an image in Power Automate?" We use Microsoft's documentation, forum threads, and articles to populate the databases. This information is split into small pieces, each containing a complete idea. In the case of a vector database, we transform each part of the information into word embeddings before storing them. By contrast, the graph database accumulates the entities unchanged, and the links between those entities are manually added according to best judgment about the relevant relationships.

RESULTS

The output of the graph model is presented in Fig. (**1**).

The LLM correctly identifies two main ideas – "Power Automate" and "Compress Image." A graph query finds a path between these nodes: "Power Automate" – [CREATES] → "Flow" – [SENDS] → "Multipart/form-data" – [TRIGGERS] → "Azure Function" – [PERFORMS] → "Compress Image." Nodes and edges contain parts of documentation about the systems and their connections. The retrieved information is then passed into an LLM as a context to a user query, and the final answer is given.

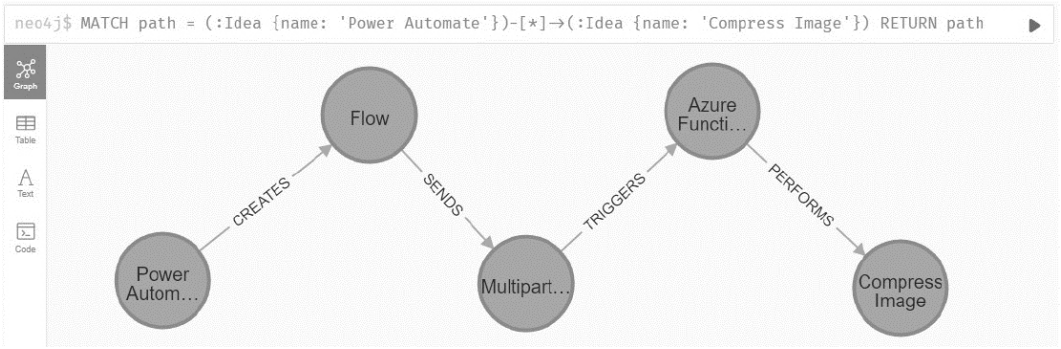

Fig. (1). Illustration of the graph path found by the model.

Conversely, the vector model did not produce satisfactory results. The source and destination were the only relevant nodes found by a cosine similarity query. Such behavior can be explained by examining the similarity scores between the question and the vectors stored in the database. While “Power Automate” and “Compress Image” get high scores (0.85 and 0.84, respectively) to warrant their place in the best matches, other steps are less relevant in the view of the vector algorithm, which causes significant errors in the model’s response.

CONCLUSION

In summary, the graph database produced the expected results, linking the user’s ideas into a single path that can be followed to achieve the goal. In contrast, the vector database failed to capture the necessary information to help the user, instead opting for an answer lacking specificity. These results demonstrate the advantages of graphs for complex reasoning, surpassing the vector representation model. However, substantial manual resources must be allocated to create the relationships between the graph nodes, while the vector model can operate without human intervention. Further research efforts will be focused on automating the creation of links in a graph representation.

Potential use cases for graph RAG include conducting scientific research and exploring existing accomplishments in the academic field. Such endeavors will be streamlined as graphs facilitate discovering unexpected connections between different concepts. Graph models can summarize papers from separate disciplines, letting researchers in cross-domain fields draw original conclusions. These models also produce a visual representation of their findings, which may deepen the understanding of scientific ideas and the relationship between them. Such visualizations may be particularly helpful in studying biology, bioinformatics, and neuroscience.

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CHAPTER 44

Diagnosis of Skin Diseases Based on Medical Images Using Neural Networks

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Keywords: Artificial intelligence, Combined model, Medical images, Neural networks, Skin diseases, Training.

INTRODUCTION

Artificial intelligence (AI) is nowadays widely used in all spheres of life, and medicine is no exception. AI is particularly useful in image recognition, preparation for surgical interventions, prostheses, and fundamental and applied studies. Dermatological research using AI based on image recognition is currently at the peak of its development [1]. Deep learning algorithms and algorithms of convolutional and recurrent neural networks (RNN) can improve the efficiency of image classification, detection of certain abnormal areas or objects, segmentation, and other tasks [2]. The use of NNs in the analysis of skin lesions images in dermatological diseases allows doctors to conduct diagnostic screening and comparative assessment of the result after the treatment. The aim of our study was to improve the accuracy of diagnosing skin lesion elements based on medical images using convolutional and recurrent NNs.

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MATERIALS AND METHODS

Deep learning is most often used to analyse skin images, process them, and find differences between certain types of skin lesions. Currently, the most representative models are recurrent neural networks (RNN) and convolutional neural networks (CNN) [3]. AI systems based on the use of recurrent neural networks (RNN) and convolutional neural networks (CNN) use data sets of skin malformation images for training to make accurate diagnoses. These images can be either images from dermatoscopy or clinical case photos (according to certain characteristics). Quite a lot of studies have been conducted using various neural networks in the analysis and processing of skin images [1; 4 - 9], with classification accuracy, which was more than 80%, which is significantly higher than the classification accuracy of clinicians.

"The HAM10000 data set" was used as the image database [4, 10]. The database contains a total of 10015 images of the 7 most common diseases: melanocytic nevi (6705 images); melanoma (1155 images); benign lesions similar to keratosis (1057 images); basal cell carcinoma (514 images); actinic keratosis (327 images); vascular lesions (142 images); dermatofibroma (115 images).

RESULTS

The following steps were performed in the process of model implementation: importing the necessary libraries, setting up the visualisation of results, loading image paths and defining classes, pre-processing and examining data, creating training and validation sets, training the combined model, evaluating the model's efficiency (automatic), and manual testing of the model. After training, the model generates two graphs (Fig. **1**). The first one shows the dynamics of the model's loss and accuracy values during training for each epoch. The second graph shows the dynamics of losses and accuracy on the validation dataset for each epoch. These graphs help to confirm whether the model is learning correctly and allow us to detect whether the model has overfitted (overfitting) when the accuracy on the training set continues to increase and the accuracy on the validation set decreases.

From the above graph, we can conclude that there was no overtraining of the model, as the accuracy of the validation set is increasing.

Evaluations of metrics such as precision, recall, F-1 score, and support helped to assess the model's effectiveness in recognising and classifying skin diseases. Both indicators for each class and general ones were obtained (Fig. **2**).

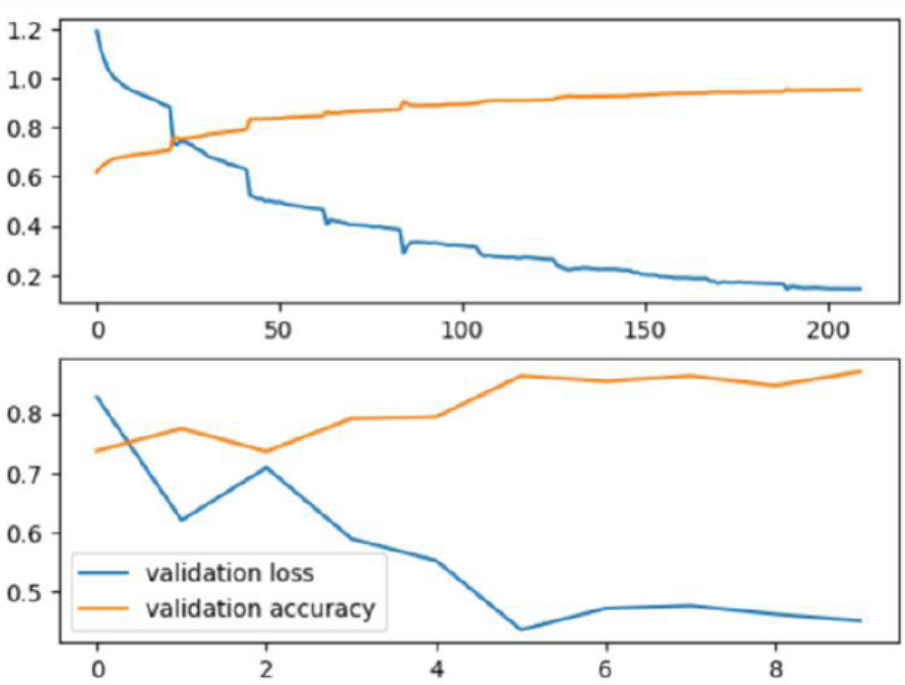
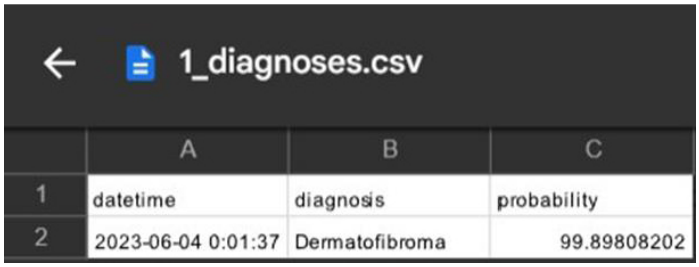


Fig. (1). Dynamics of loss and accuracy values on the training and validation data set.

	precision	recall	f1-score	support
akiec	0.52	0.70	0.59	30
bcc	0.74	0.83	0.78	35
bkl	0.80	0.73	0.76	88
df	0.70	0.70	0.70	8
nv	0.99	0.94	0.96	883
vasc	0.38	0.79	0.52	46
mel	1.00	0.77	0.87	13
accuracy			0.91	1103
macro avg	0.73	0.78	0.74	1103
weighted avg	0.94	0.91	0.92	1103

Fig. (2). Metrics for evaluating of the model's effectiveness.

To test the model, a separate function test_model (model, image_path, transform, user_id) was created. It accepts a set of parameters: the model to be tested, the path to the image to be analysed, the transformation to be applied to the image to prepare it for the model input data, and the user ID used to connect with the stored data. The image is opened, transformed, and converted into a tensor for feeding into the model. The image is then passed to the model, which produces output data that reflects the predicted probability of each diagnosis category. As a result, an index of the highest value that corresponds to the predicted diagnosis is obtained (Fig. **4**).



1_diagnoses.csv

	A	B	C
1	datetime	diagnosis	probability
2	2023-06-04 0:01:37	Dermatofibroma	99.89808202

Fig. (3). - Saved patient data.

Finally, the diagnostic results and health status are displayed on the screen. In addition, the user is given instructions on how to upload a photo for analysis (Fig. **3**).

```
[ ]  # Надаємо інструкції користувачу
     print("Завантажте фото ділянки шкіри, зроблене на відстані від 5 до 20 см.")
```

```
Завантажте фото ділянки шкіри, зроблене на відстані від 5 до 20 см.
```

Fig. (4). The user instruction.

This instruction is important because the distance between the camera and the area of skin being photographed can significantly affect the quality of the image and therefore the accuracy of the diagnosis the model outputs.

CONCLUSION

The following steps were performed in the process of model implementation: importing the necessary libraries, setting up the visualisation of results, loading image paths and defining classifications, pre-processing and researching data, creating training and validation sets, training the combined model, evaluating the model's performance (automatic), and manual testing of the model.

The created model achieved an accuracy of 91% and also showed good results in manual testing with photos from other sources. The model takes into account various scenarios that can occur during image analysis and is also able to track changes in skin lesions over time.

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CHAPTER 45

Research Assessment Values and Principles: The Case of Ukrainian HEIs

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Abstract: The European experience of research assessment, which is reflected in the fundamental documents of the EU, is presented. The results of a national survey on the assessment of HEI research activities conducted by the Institute of Higher Education of NAES of Ukraine are analyzed. The dichotomy in the context of assessment as a process and as a result is characterized. The value principles of assessing the research activities of universities in the context of open science are substantiated.

Keywords: Assessment, Ethics, Open science, Open access, Research integrity, Values.

INTRODUCTION

The accelerated dynamics of the world science development, as evidenced by the annual increase of publications by 5% since 2000 [1], integration into open science, and intensive use of artificial intelligence drive reforms in research assessment, introduction of new approaches, and relevant research-based criteria and indicators. More open research methods and results require a decisive shift in assessment across all dimensions: researcher, research project, research team, and institution [2]. The EU policy reflects this in many documents, the most important of which are "Towards a reform of the research assessment system – Scoping Report" (2021) [3] and "Agreement on Reforming Research Assessment" (2022) [4]. As of September 21, 2023, total 619 organisations signed the agreement, including 10 from Ukraine, notably the Institute of Higher Education of NAES of Ukraine [5]. The Coalition for Advancing Research Assessment (CoARA) was established under the agreement, and appropriate working groups and national

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chapters are being formed, particularly in Ukraine [6]. The key initiatives of the agreement are [7]: to recognise the diversity of research outputs, contributions and careers; to conduct primarily qualitative assessment supplying with quantitative indicators; to refuse using the journal's impact factor, h-index, and research organizations' rankings in research assessment. Value-cantered recognition systems are essential, where qualitative research and positive research cultures are preserved to attract the most talented and innovative researchers and maintain excellence in all research assessment processes and practices [8]. However, the first step towards reforming assessment is to define the values as the fundamental guidelines for improving the system of research performance assessment at the national and institutional levels.

MATERIALS AND METHODS

To achieve the above problem, the authors used the theoretical and comparative analysis methods – analysis, synthesis, systematisation, generalisation, and interpretation of the results obtained (for official materials and analytical reports of international organisations, *etc*.) on research assessment. The mathematical method – ranking method aims to classify the importance of certain research assessment indicators in the descending order. The use of statistical methods provided for quantifying respondents' data and their graphical representation. The methods of expert analysis, extrapolation and forecasting were used to make conclusions on the research assessment at the national and institutional levels.

EXPERIMENTAL MATERIALS

The Institute of Higher Education of NAES of Ukraine researchers conducted an all-Ukrainian survey "Open Science in Higher Education Institutions of Ukraine" from March 21 to April 3, 2023. It involved more than 1.5 thousand respondents (heads of institutions and structural units, research and academic, library, and IT staff) from 105 HEIs (excluding the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk regions) [9]. It has been established that presenting the state of development of the Open Science policy in HEIs, 60.1% of respondents answered the question in the affirmative, another 21.7% of HEI employees noted that the open science policy is only being developed, while 1.8% state the absence of such a policy and 16.4% are not aware of such initiatives at all.

The results of our study to determine the basic approaches to research assessment (quantitative and qualitative and their key criteria) by ranking (Fig. **1**) showed that the quantitative approach prevails in HEIs: first of all, the number of publications, patents, etc. is taken into account (95.4% of respondents). Instead, 73.8% of

respondents noted the assessment of research quality/excellence; 64.7% of respondents pointed out the impact of research on solving social problems. In terms of research assessment, it is essential to conduct peer review activities, in particular, participate in expert committees, groups, editorial boards, professional associations, *etc*. (88.0% of respondents) and perform scientific supervision/consulting of Master, PhD, and DSc students (87.4% of respondents). The assessment of career development is done through obtaining scientific degrees, awarding academic and other titles (84.6% of respondents), and determining research reputation through the prism of integrity, awards, etc. (84.0% of respondents), and research cooperation through joint projects, publications, and events (82.6% of respondents). 75.5% of respondents consider the assessment of research activities relevant based on the principles of open science and open access to research results, and 63.2% – on the amount of external funding.

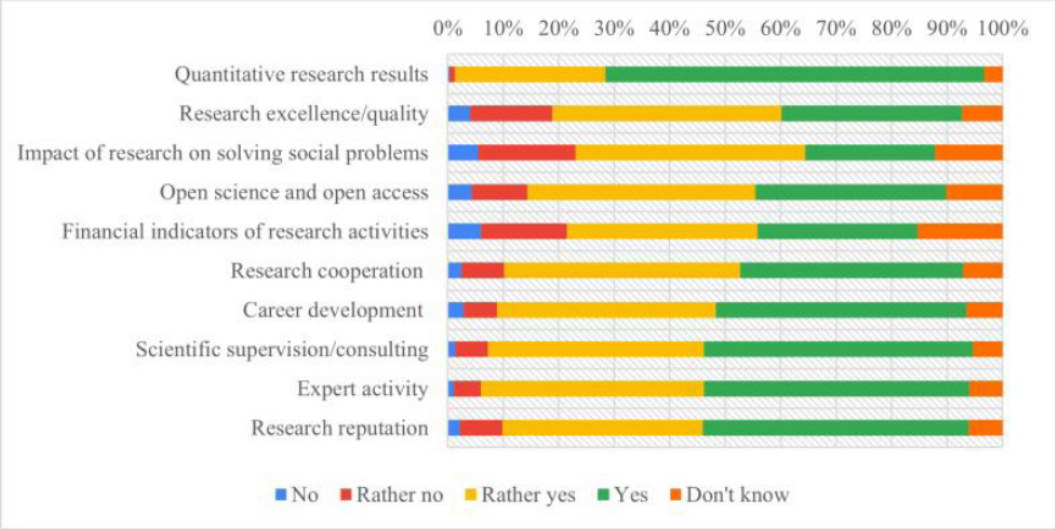

Fig. (1). Research assessment in Ukrainian HEIs.

RESULTS

In the national research and educational area, research assessment is characterized by a dichotomy in the context of assessment as a process and as a result. The definition of assessment as a result is based on two approaches – quantitative (based on internationally recognized scientific and technical indicators – bibliometric indicators [10; 11] and altmetrics [12]) and expert, based on the concept of excellence [13 - 16]. Today, the scientific community is actively discussing the relevance and significance of these approaches. It is concluded that

quantitative indicators: cannot be the main ones but should complement the qualitative assessment and reflect the research goals of institutions, research teams, or researchers; do not take into account field differences and cannot be equally used for all scientific areas. Horizon Europe [17] emphasizes the importance of qualitative assessment of research activities, according to which the assessment should be based on excellence, not on the journal's impact factor and h-index.

Another controversial issue that is widely discussed by researchers is the peculiarities of assessing research in the Social Sciences and Humanities, which, on the one hand, are of great national importance, and on the other hand, the results of such research are required in an international context, where the main criterion is scientometric indicators in highly ranked journals indexed by Scopus and Web of Science. Guidance and support for the concept of "balanced multilingualism" in scientific communication based on implementing the Helsinki Initiative will help resolve the mentioned contradictions [18].

As for the process of research assessment, it is the highly professional objective assessment by experts that determines its result, which affects the adoption of institutional decisions on funding, functioning of relevant structural units of HEIs, staffing and career development of researchers, *etc*., as well as the substantiation of conclusions on the successful development of the university and its mission, and strategic planning of socio-economic development of society at the national level in general. In Ukraine, the process of research assessment involves the following bodies: Ministry of Education and Science of Ukraine – at the stage of reporting and certification of research institutions and HEIs research activities; National Council of Ukraine for Science and Technology Development – in assessing reports on the use of funds for research activities; National Research Foundation of Ukraine – in selecting and funding research projects on a competitive basis; Ministry of Finance of Ukraine – at the stage of approval of funds for the formation of the state budget for the next year; Accounting Chamber of Ukraine and State Financial Inspection of Ukraine – in determining the effectiveness of the use of public funds for research. However, the criteria and indicators for such research assessment are different, which leads to biased conclusions that significantly affect decision-making at the institutional and national levels regarding the research activities of research teams, HEIs, research institutions, *etc*.

A consolidated function in the process of research assessment can be provided by fundamental values [19], which in the context of open science are the subject of systematic discussion by European organizations and are substantiated in the "Council Recommendation (EU) on a Pact for Research and Innovation in

Europe" [20], European Research Area and Innovation Committee Guideline Paper on "Research evaluation in a context of Open Science and gender equality" [21], and DORA recommendations [13; 22].

CONCLUSION

The implementation of open science and open access to research results raises the issue of assessing the research activities of universities. This is due to the fact that assessment is part of the state policy on innovative development of society and competitive quality of higher education. In the European Union, initiatives to reform research assessment have been presented and efforts are being made to review, develop criteria, and tools, and improve assessment processes.

In our opinion, the main value principles for assessing the research activities of universities in the context of open science are:

- *Ethics and integrity*, which are cross-cutting in all types of research activities, from conducting research ("The new European Research Area" [23], "The European Code of Conduct for Research Integrity" [24]) to the use of artificial intelligence in research [25; 26];
- *Identity* that is built on promoting trust in universities' research activities, taking into account their mission;
- *Excellence*, which demonstrates support for research of the highest (world) quality, conducted on the basis of transparent methodologies and providing reproducible research results;
- *Comprehensiveness*, which reflects the representativeness of the assessment and the use of a variety of quantitative methods based on reliable data, complementing a sound qualitative assessment, institutional self-assessment, *etc*.;
- *Diversity*, which is based on the recognition of the versatility of research activities, including, in particular, the implementation of research projects, scientific supervision, international cooperation, impact on society, etc. taking into account the field of research;
- *Responsibility*, which implies the joint responsibility of all participants in the assessment for agreed approaches, high ethical principles, and honesty;
- *Openness*, which is confirmed by a transparent assessment of universities' research activities and the use of open methods, criteria, indicators, *etc*.

Notes

Ukraine currently lacks common criteria and indicators at the national and institutional levels, taking into account international initiatives, in particular

CoARA, for a balanced objective assessment of all types of research activities and their results, recognising diversity, and qualitative assessment as opposed to the quantitative one. The definition of such indicators would allow unifying requirements not only for researchers but also for those organisations that assess the research activities of HEIs; involving experts in the field, from among leading researchers, rather than persons who are not professionally qualified to conduct such an assessment.

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CHAPTER 46

Methodology of Altimetric Assessment of Information and Innovation Resources of Research Works

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Keywords: Adolescents, Children, Healthcare, Information resources, Innovation resources, Qualimetric assessment.

INTRODUCTION

In the modern scientific space, there are trends in creating methodological innovations regarding the objective assessment of the effectiveness of scientific research, scientific and technical activities of research institutions, and science, in general, using statistical data, expert assessments of scientific and technical activities and taking into account qualitative indicators. One of the rational approaches in this process is the qualimetric analysis of research papers (R & D).

MATERIALS AND METHODS

Qualimetric analysis of information resources created based on the results of the research was carried out according to the following criteria: evaluation of publications, in particular, publications of book (criterion "coverage of acquired knowledge"), and electronic publications (criterion "prompt promotion of scientific results in the world space"). Qualimetric analysis of innovative resources created based on the results of the research was carried out according to the criteria for translating research results into scientific and methodological documents and intellectual property objects.

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RESULTS

Quantitative indicators of information and innovation resources created based on the results of 563 research projects conducted in the period 2012-2021 in the thematic areas of child and Adolescent Health Protection are analyzed. Research accounting is selectively analyzed, which provides a bibliographic description of scientific medical documents created based on the results of the research topic.

Quantitative analysis of primary scientific documents that form information and innovative research resources shows that in the structure of Information documents, abstracts occupy the first rank position (52.55%), articles – the second (45.16%), and books – the third position (2.58%).

Based on the analysis of the responses of experts (leading scientists of Ukraine) in the field of child and adolescent health, statistically significant average scores, their gross coefficients were identified and objective estimates of each type of scientific product were weighed according to the 10-point system. The basic assessment of publication materials (information resource) is interpreted as follows: optimal (high) – the sum of points higher than 22.67, sufficient (average) – the sum of points from 13.35 to 22.67, insufficient (low) – the sum of points lower than 13.35 points.

Assessment of innovative resources: optimal (high) – the sum of points is higher than 4.33, sufficient (average) – the sum of points is in the range from 3.00 to 4.33, insufficient (low) – the sum of points is lower than 3.00.

The authors began to pay more attention to scientific articles in electronic form. Electronic presentations of lectures and speeches at scientific forums have appeared on the Internet. The rating based on the criterion of rapid promotion of scientific results in the world space is 5.41 points, which characterizes a sufficient level of presentation of scientific results on the Internet.

The result of the assessment based on the criterion of coverage of acquired knowledge (3.55 points) characterizes a sufficient level of presentation of research results in book publications (textbooks, monographs, reference books). Information technologies were more widely implemented, and the authors began to submit scientific articles in electronic form (online publications and electronic presentations of reports).

All these processes were reflected in the average basic qualimetric assessment of research publications, which increased to the optimal level of publication of research results of 25.7 points, which characterizes the optimal (high) level of publication of research results in the direction of “child and Adolescent Health

Protection”.

In the structure of innovative resources, the first place is occupied by patents for inventions and utility models (7.23%), the second for methodological recommendations (5.17%), and the third place for author's certificates and scientific works, computer programs, and databases (0.62%).

Among the innovative documents, innovations, intellectual property objects, in particular copyright objects, and methodological documents began to be developed more actively. The lowest level was presented by the results of scientific research in the form of proposals to departmental institutions and the government, standards, and protocols for diagnosis, treatment, rehabilitation, and prevention.

The basic assessment of innovative research resources was 5.28 points, which characterizes a sufficient level of creation of innovative resources based on the results of the research.

CONCLUSION

1. The results of qualimetric assessment of the information and innovation components of research work in the field of child and adolescent health protection indicate their rather high level.

2. The proposed tool for operational analysis of publication materials and innovative research resources contributes to increasing the creative work of researchers and creates conditions for the transfer of medical technologies to practical healthcare.

CHAPTER 47

Digital Open Science Tools (DOTS) for Research Life Cycle

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Keywords: Digital science , DOTS , Digital open science tools , Open science , Research life cycle , Scientific communication .

INTRODUCTION

The open science movement has facilitated significant transformations in scholarly communication, ushering in several pivotal changes in the accessibility, dissemination, and re-using of scientific knowledge. The scientific community has become more open, with not only publications but also research data being made available. A culture of open peer review, preprints, data reuse, and preregistration of ideas and hypotheses has emerged [1]. Consequently, a digital ecosystem of tools supporting open science practices has been created, reshaping contemporary scientific communication, policies, and mechanisms for creating, preserving, disseminating, and reusing scientific data. However, a comprehensive analysis of such digital services and applications across all stages of the research lifecycle within this interconnected ecosystem is still lacking.

MATERIALS AND METHODS

Digital services and applications of open science were identified from various sources. The primary database was constructed based on key research conducted on open science tools [2]. It was expanded through web searches and tools developed within key open science communities, such as the Research Data Alliance [3], FOSTER Open Science [4], Open Science MOOC [5], and relevant

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publications from the past two years. The list is not exhaustive, and only a selection of the most commonly used digital applications has been analyzed.

RESULTS

Digital Open Science Tools (DOTS) are open tools, software programs, or open information standards and services designed to assist scholars at all stages of the research lifecycle, from planning to the creation, preservation, dissemination, and reuse of scientific knowledge. Typically, these are web applications, which may or may not have download requirements, and they can be open-source or commercial. Each tool is generally tailored to a specific research task based on the stage of the research lifecycle. Comprehensive solutions that facilitate collaboration among researchers across all stages of the research lifecycle already exist. These solutions expedite the sharing of results within research communities, facilitate bias or error detection, enable the reuse of openly available data, and enhance result reproducibility. The revisions made here mainly involve separating long sentences into smaller, more digestible sentences and clarifying the meaning of certain phrases for better comprehension.

An effective ecosystem of digital open science applications plays two key roles: 1) promoting practices that enhance open and transparent research and 2) ensuring the accessibility of these practices and resources for researchers worldwide [6]. The following services and applications have been analyzed and reviewed.

- Comprehensive Solutions: Open Science Framework (OSF), GitHub, Globus.
- Research Planning and Data Management Planning: DMPTool.
- Search Engine: Google Scholar, Semantic Web, CiteSeerX, BASE, WorldWideScience, Lens.org, PubMed, WorldCat;
- Reference Managers: Zotero, Mendeley, EndNote, JabRef, refbase, Paperpile, Biblioscape, RefWorks, Citavi.
- Data Analysis, Data Analytics, and Text Mining Tools: Python, R, Jupyter, OpenRefine, Looker, Rapid Miner, Chartio, Metabase, Redash, Galaxy, BinDiscover, Microsoft Power BI, MATLAB, SPSS, SAS, GeneMatcher, PhenoDB, Protocols.io, JSTOR Labs Text Analyzer.
- Data Visualization Tools: Gephi, Graphviz, Tableau, Datawrapper, ffmpeg, Flourish, ImageMagic, ParaView, POVRay, VisiData, VisLT.
- Geographic Information Systems (GIS): ArcGIS Pro, QGIS, GRASS GIS, gvSIG, ILWIS.
- Artificial Intelligence (AI) Applications: ChatGPT, Llama 2, Google Bard, Microsoft Bing, Jasper Chat, Elicit, SciSpace, Scite Assistant, ChatPDF, Copy AI, Rytr, QuillBot, Grammarly, DeepL, Prepostseo Paraphrasing Tool, Ginger, Spinbot, WordAI, Research Rabbit, Litmaps.

- Writing and Collaboration Tools: Google Docs, Microsoft Word Online, Authorea, Overleaf, Fidus Writer, Etherpad, WPS Writer, Nisus Writer Pro.
- Open Peer Review: F1000Research, OpenReview, PeerJ, PREreview, PubPeer, Hypothesis, PaperHive.
- Publication and Dissemination: Zenodo, Figshare, Mendeley Data, 4TU.ResearchData, DRYAD, Harvard Dataverse Repository, Qeios, Science Data Bank, Kudos.
- Social Media Platforms: ResearchGate, Academia.edu, LinkedIn, Mendeley, Zotero, ShareResearch.

CONCLUSION

The ecosystem of digital open science applications is dynamic and diverse, varying depending on the subject area of research, geographic distribution, existing academic culture, and digital infrastructure in different countries and fields, among other factors. The rapid development of artificial intelligence applications is already having a significant impact on further changes. For researchers in Ukraine, it is particularly important to understand and utilize such interconnected elements that support various stages of the research lifecycle and promote open science practices, open access, and open data in line with global trends and the National Open Science Plan [7].

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This conference proceedings volume compiles presentations from the second event held online on October 26-27, 2023. It includes presentations and discussions of new ideas for integrating modern technological achievements into scientific practices, including the development of scientific information systems and databases. The volume concludes with insights into Ukraine's strides towards global scientific integration and the crucial role of open science principles in fostering collaboration and innovation.

Highlights:

- In-depth analysis of Ukraine's transition towards open science and its alignment with European standards.
- Practical solutions and best practices for data management, open access publishing, and adherence to FAIR principles.
- Insights from leading experts in academia, industry, and government sectors.
- Emphasis on collaboration, transparency, and accessibility as catalysts for scientific progress and innovation.
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