ISSN 2707-0476 (Online)
University Library at a New Stage of Social Communications Development. Conference Proceedings, 2024, No. 9
UniLibNSD-2024

UDC 338.28

TSYBENKO I. O.
State Scientific and Technical Library of Ukraine (Kyiv, Ukraine),
e-mail: tsyb2012@ukr.net, ORCID 0000-0002-6408-9011

ZHEREBCHUK S. V.
State Scientific and Technical Library of Ukraine (Kyiv, Ukraine),
e-mail: zerebcuksofia@gmail.com, ORCID 0000-0002-0212-7107

FEDCHUK A. P.
State Scientific and Technical Library of Ukraine (Kyiv, Ukraine),
e-mail: andriyf@gmail.com, ORCID 0000-0003-4719-8133

Driving National R&D: Methodological Insights into Developing a Classifier for the Ukrainian National CRIS System by the State Scientific and Technical Library of Ukraine

Objective. The objective of this study is to develop and characterize a comprehensive classifier for research and development (R&D), which plays a crucial role in the effective implementation of a National Current Research Information System (CRIS). The study aims to address the challenges and methodologies involved in creating a system that categorizes diverse R&D initiatives while ensuring interoperability with existing systems and adaptability to evolving scientific fields. **Methods.** The development of the classifier involved a multi-step process, including consultation with domain experts and reviewing existing classification systems. The study focused on identifying key research areas, ensuring compatibility with international standards, and developing a flexible taxonomy to cover both established and emerging fields. A diagnostic study on CRIS systems in Latin America and insights from similar systems, such as in Croatia and Portugal, were examined to refine the classifier's design for Ukraine. **Results.** The study successfully developed a classifier that addresses the specific needs of the Ukrainian research landscape, particularly within the Ukrainian Information System for Current Research (URIS). The classifier's structure aligns with international standards and supports interoperability with global databases. Furthermore, the dynamic nature of the classifier allows for continuous updates, making it adaptable to new research fields. The classification system was also tailored to accommodate Ukraine’s unique research ecosystem and infrastructure. **Conclusions.** The development of this R&D classifier represents a strategic advancement for Ukraine’s research infrastructure, enhancing data organization, accessibility, and collaboration. By addressing both technical and contextual challenges, the classifier provides a flexible, scalable solution that supports long-term scientific innovation. This study highlights the importance of context-driven approaches in creating effective research management tools, positioning the classifier as a robust framework for future developments in CRIS systems. The State Scientific Technical Library of Ukraine has played a pivotal role in developing this classifier, ensuring it meets the specific needs of the Ukrainian research community.

Keywords: Research and Development (R&D); National Current Research Information System (CRIS); classifier development; data management; interoperability; standardized terminology; scientific taxonomy; usability; Ukraine; State Scientific and Technical Library of Ukraine

Introduction

Creating a comprehensive classifier for research and development (R&D) plays a crucial role in the successful implementation of a National Current Research Information System (CRIS). This classifier serves as the foundation for organizing and categorizing diverse R&D initiatives, providing a structured framework for data management and analysis. However, the development of such a classifier is accompanied by its own methodologies and challenges.

Firstly, the design of an effective R&D classifier requires a clear understanding of the various dimensions and categories that the system must encompass. This includes identifying key areas of research, subfields, and the relationships between different scientific disciplines. The

https://doi.org/10.15802/unilib/2024_315157

classifier must be detailed enough to cover specific research topics while being flexible to accommodate emerging fields and interdisciplinary studies. Developing a taxonomy that strikes this balance involves extensive consultation with domain experts, review of existing classification systems, and iterative refinement.

Secondly, one of the significant challenges in creating a comprehensive R&D classifier is ensuring its interoperability with other existing databases and information systems. This requires the adoption of standardized terminology and coding schemes that are widely recognized in the scientific community. The classifier must be compatible with international standards to facilitate data exchange and collaboration across borders. This aspect is critical for integrating national research data into global databases, enhancing the visibility and impact of the research (European Commission, Directorate-General for Research and Innovation, 2017).

Moreover, the dynamic nature of scientific research presents a challenge in keeping the classifier up to date. Continuous advancements and discoveries necessitate regular updates to the classification system. This requires establishing a robust mechanism for ongoing review and revision, which includes gathering feedback from researchers, monitoring trends in various scientific fields, and incorporating new categories as needed. Maintaining the relevance and accuracy of the classifier is vital for its long-term utility and effectiveness.

Another important consideration is the usability and accessibility of the classifier for various stakeholders, including researchers, policymakers, and funding agencies. The system should be user-friendly, allowing easy navigation and retrieval of information. Adequate training and support should be provided to ensure that users can effectively utilize the classifier for their specific needs. User feedback should be actively sought and incorporated to improve the system's functionality and user experience.

In summary, the development of a comprehensive R&D classifier is a complex but essential task for the successful implementation of a CRIS (García A., García M., Gallinas, Sánchez, & Gutiérrez, 2022). It requires careful planning, extensive consultation, and continuous refinement to address the methodological and practical challenges involved. By providing a structured and standardized framework for organizing research information, the classifier facilitates better data management, analysis, and collaboration, ultimately contributing to the advancement of scientific research and innovation.

In this study, the following articles and research were utilized to provide a comprehensive understanding of the topic.

The article "Adapting CERIF for a National CRIS: A Case Study" describes the development of a national Current Research Information System (CRIS) in Croatia. During its design, international trends in research data management were considered. The system uses CERIF, a European model that helps organize research information. Although CERIF generally met the system’s requirements, some issues arose during implementation, particularly related to managing time-based data. To address these challenges and meet the needs of key users, the system was adapted with technical adjustments and model extensions (Kremenjaš, Udovičić, & Orel, 2020).

Another article «Development of Plan S monitoring and compliance tool in the context of PTCRIS for Portuguese National Science Foundation» (Moreira et al., 2022) explains how the Portuguese Foundation for Science and Technology (FCT) is developing a tool to monitor and ensure compliance with Plan S and FCT's open access (OA) policy, which has been in place since early 2021. The tool will help track and enforce open science policies by integrating information from various systems. It is being built using the existing infrastructure from the PTCRIS program, which FCT has developed over recent years.

https://doi.org/10.15802/unilib/2024_315157

The system has two main parts: an operational component, which links to FCT's grant management system, and an analytical component, built on a Data Warehouse and Business Intelligence (DW/BI) system. The DW/BI system will organize data into three areas: funding, scientific results, and monitoring compliance. The compliance area will calculate how well scientific outputs adhere to Plan S and FCT's OA policies.

One more research contributed valuable insights for this study is «Supporting research information management: overcoming the inherent culture gap between traditional library ethics and the management of CRIS systems» (Azeroual & Schöpfel, 2023).

The article discusses the challenges and opportunities of involving academic librarians in the management of Current Research Information Systems (CRIS). CRIS systems are used to collect and analyze data on research performance at universities and research institutes, and they are increasingly connected with library systems and repositories. However, many librarians are more experienced with managing institutional repositories and publishing platforms than with research evaluation systems like CRIS.

This presents a challenge, but also an opportunity for librarians to expand their skills and take on new roles. By working with CRIS, they can apply their expertise in metadata, data curation, and ethical standards, while also strengthening their relationship with academic researchers and management. Their knowledge of persistent identifiers and data protocols is essential for the successful development of CRIS as part of the research support infrastructure.

Another valuable study for the purpose of our research is this article, which provides important insights into the current state and implementation of CRIS systems in Latin America (Vázquez Tapia, 2022). The article outlines the initial findings of a survey aimed at evaluating the development of Current Research Information Systems (CRIS) in Latin America. The survey, conducted between July and November 2021, involved higher education and research institutions from 21 countries. Out of 133 participating institutions from 16 countries, 23% (31 institutions) indicated that they had implemented a CRIS system. The next stage of the study will involve documenting national CRIS projects across seven countries in the region.

Methods

In developing the classifier, three main methods were utilized:

1. **Stakeholder Engagement** involved interacting and collaborating with various key stakeholders to ensure their participation and consideration of their perspectives in the development process of the R&D classifier for the CRIS system. Interaction with researchers was crucial to understand the diversity of scientific fields and address the actual needs of academic and private research institutions. Collaboration with institutions such as universities, research centers, and laboratories helped account for the specific working conditions of different organizations and their views on R&D classification.

Additionally, relevant ministries were involved. Engaging regulators is essential for adhering to standards and regulations in the field of scientific research. This ensures that the development of the classifier meets both national and international requirements.

Civil society organizations, such as groups studying ethical aspects or advocating for the rights of information consumers, add a social dimension and consider the interests of the general public.

It is crucial to ensure effective communication and interaction with all participants, taking into account their views, opinions, and feedback. This can be achieved through various forms of engagement such as consultations, discussions, webinars, and more.

https://doi.org/10.15802/unilib/2024_315157

2. **Literature Review.** Developing a classifier for research infrastructures is a process that requires in-depth analysis and study of existing methodologies and best practices in this field. We began with a literature review, where we examined existing publications and scientific works in this area.

During the literature review, it was important not only to understand the theoretical foundation of research infrastructure classification but also to identify practical insights and recommendations that could be applied to our project. We thoroughly studied which aspects of classification are already in use and how they impact the effectiveness of research infrastructures.

After gathering sufficient information from the literature review, we moved on to identifying international standards and frameworks. At this stage, we examined the recommendations and norms existing globally related to the classification of research infrastructures. Understanding these standards helps ensure compatibility and interoperability of our classifier with global research databases.

Throughout the development process, our team aimed to consider both theoretical aspects and practical experience, making necessary improvements to create a classifier that is effective and meets modern standards of research infrastructures.

3. **Data Modeling.** Data modeling was also employed in the development of the research infrastructure classifier. This involved creating a comprehensive model that accounts for various aspects of scientific research. Data modeling helps in structuring and organizing information in a way that ensures accuracy and facilitates easy access and analysis. By incorporating different dimensions of research activities, such as fields of study, types of research outputs, and funding sources, the model aims to reflect the complexity and breadth of the research landscape accurately.

The development of the R&D classifier for the CRIS system involved a multi-faceted approach that included stakeholder engagement, a thorough literature review, and sophisticated data modeling. Each method contributed to creating a robust and adaptable classification system that can effectively organize and manage research information, ultimately supporting the advancement of scientific research and innovation (Czerniak, 2020).

In the initial phase, requirements were meticulously gathered from users and stakeholders. This critical step involved defining various research domains, project types, and funding sources that the classifier needed to incorporate. Engaging with stakeholders from different sectors ensured that the classifier would be comprehensive and relevant to a wide range of users.

The next stage was the development of a comprehensive data model. This model was structured to capture the multidimensional nature of research activities. It included the interrelations between research fields, funding sources, and project types, establishing the primary connections between different elements within the research ecosystem. This structure ensures that the classifier can handle the complexity and diversity of research data effectively.

To enhance the interoperability of the classifier, ontologies and semantic technologies were utilized. The development of an ontological model facilitated the clear definition of concepts and their interrelationships. Semantic technologies played a crucial role in understanding the content of the information and automating the processing of data. These technologies help to ensure that the classifier is not only robust but also capable of integrating with other systems and databases seamlessly.

The data model was rigorously tested to evaluate its efficiency and adherence to the requirements. Based on the testing results, the model was optimized, incorporating necessary changes and enhancements. This iterative process of testing and optimization helped refine the classifier, making it more accurate and user-friendly (Leiva-Mederos, Senso, Hidalgo-Delgado, & Hipola, 2017).

https://doi.org/10.15802/unilib/2024_315157

The classifier is designed to be dynamic and continuously evolving. It is regularly updated to reflect changes in the research landscape, including new research fields, emerging funding models, and evolving project types. By staying current with these developments, the classifier remains a valuable tool for researchers, policymakers, and funding bodies.

This approach ensures that the classifier is not only effective in its current form but also remains relevant and adaptable over the long term. By continuously integrating updates and improvements, we can maintain its utility and relevance, ensuring that it meets the evolving needs of the scientific community and other stakeholders involved in research and development (Fecher, Kahn, Sokolovska, Völker, & Nebe, 2021).

In this context, it is essential to highlight the use of artificial intelligence (AI) in building the R&D classifier model. Through automated information processing, AI quickly and efficiently analyzed large volumes of data related to various aspects of research infrastructures (analyzing scientific publications, texts, and other sources to extract key information). Using machine learning methods, AI developed classification models that learn to recognize the characteristics of research infrastructures and group them by common attributes.

Moreover, to identify complex interrelationships between different infrastructure parameters, a neural network helped recognize intricate connections, contributing to the development of a more accurate and flexible classifier. Additionally, artificial intelligence can systematically study new data, continuously searching for and classifying new research infrastructures, and providing updates to the classification models.

Results and Discussion

During the research process, a significant challenge emerged related to the diversity of research infrastructures. This diversity stems from a wide range of different research activities across various fields, making it difficult to create a classification system that can adequately account for all this variety. Addressing this issue required a careful approach and the development of a flexible classification system that considers the different domains and unique characteristics of research infrastructures.

Research trends are constantly evolving, and the rapid changes and emergence of new fields demand a high degree of flexibility from the classification system. New aspects and directions in research continually arise, which the system must incorporate. Therefore, the classification system must be adaptable and ready to implement changes. This involves having mechanisms that allow for the easy introduction of new categories and the adaptation to changes in existing ones. Such an approach enables the system to respond effectively to the challenges posed by the dynamic development of research and the emergence of new areas of study (Martin, Remy, Theodoridou, Jeffery, & Zhao, 2019).

Ensuring high quality and consistency of data input from various participants is an ongoing challenge for the classification system. Diverse reporting practices can lead to variations that potentially impact the accuracy of the classifier. It is essential to develop mechanisms for verification and standardization of the input data to ensure their reliability and consistency. This involves creating guidelines and protocols for data entry, as well as implementing validation tools to check for discrepancies and standardize the information.

Achieving seamless integration with international databases and ensuring compatibility with other national CRIS systems requires continuous effort. Different data structures and formats can create challenges when attempting to harmonize information across various platforms. Active work on standardization and the implementation of technologies that facilitate integration is necessary. This might include adopting common data standards, utilizing interoperable

https://doi.org/10.15802/unilib/2024_315157

technologies, and engaging in international collaborations to align practices and protocols (Fabre, Egret, Schöpfel, & Azeroual, 2021).

Encouraging researchers and institutions to adopt and systematically use the classifier is a complex task. This requires the creation of an intuitive and user-friendly system that meets the needs of its users. Additionally, ongoing work with user feedback is crucial for improving and adapting the classifier to their needs and expectations. This involves regular consultations, training sessions, and support services to ensure that users can effectively utilize the system. Gathering and incorporating feedback helps to refine the system, making it more responsive to user requirements and enhancing its overall utility.

During the research process, a significant challenge emerged related to the diversity of research infrastructures. This diversity arises from the wide range of different research activities across various fields, making it difficult to create a classification system that can adequately account for all this variety. Addressing this issue required a careful approach and the development of a flexible classification system that considers the different domains and unique characteristics of research infrastructures.

The development of a comprehensive and flexible R&D classifier for the CRIS system is a multifaceted endeavor that addresses the diversity of research infrastructures, ensures data quality, facilitates integration with international databases, and promotes widespread adoption and systematic use. By employing a flexible and adaptive approach, developing verification mechanisms, striving for seamless integration, and focusing on user engagement and feedback, the classifier can effectively support the dynamic and evolving landscape of scientific research. This holistic approach ensures that the classifier remains relevant, accurate, and valuable for researchers, policymakers, and other stakeholders involved in research and development.

One of the main challenges in creating the classifier was the need to make it truly functional. As is well-known, the EU, both in practice and in its conceptual framework, considers research infrastructure to be a combination of facilities, resources, and related services used by the scientific community to conduct research at the highest level. This encompasses key scientific equipment and instrumentation, knowledge-based resources (collections, archives, repositories, or scientific information databases), communication-based infrastructure (grids, computers, software, and networking), and other unique structures. Therefore, in this context, individual components of the infrastructure had to be excluded during the classifier's development (D'Ippolito & Rüling, 2019).

However, even considering the EU's experience, the primary task was to develop a model suitable for achieving the goals of the National Electronic Scientific Information System "URIS." One of the tasks within the "URIS" system's improvement is the development of an online module for ordering and publishing services of Collective Use Centers for Scientific Equipment (CUCSE), creating a list of available services, and developing an interface for ordering services that considers researchers' needs. For this purpose, the R&D classifier needs to be more detailed.

At the same time, excessive detail in the classifier can create problems for users in populating it. There is a likelihood of not providing an option for equipment that does not yet exist but is required due to rapid developments in a particular field. Also, in this context, it is important to remember that the responsibility for directly populating the classifier will lie with the scientific and organizational units of universities and research institutions, whose staff are not specialists across a broad spectrum. Therefore, the classifier must be user-oriented and have a methodology for categorizing research infrastructures that is as clear as possible.

In the process of developing the classifier based on European practices and existing research, various classification criteria were used, such as scientific fields, size, functions, level of accessibility, interdisciplinarity, and the means of providing resources. The appropriateness of

https://doi.org/10.15802/unilib/2024_315157

interdisciplinary classification was determined by its ability to support and promote collaboration among researchers from different fields and address complex problems. However, from the very beginning of developing a functional classifier, the need for a flexible and adaptive classification system that accounts for the diversity of research infrastructures and their rapid changes was evident (Hallonsten, 2020).

Thus, several approaches to classifying research infrastructures were proposed: classification by scientific fields, size or scale (e.g., national, regional, institutional, or individual, which helps in understanding the scale and accessibility of the infrastructure), functional classification, level of accessibility for different user groups, interdisciplinary classification (recognizing the importance of interdisciplinary collaboration and promoting the development of infrastructure that supports cooperation among various scientific fields), and classification by the type of resources provided by the infrastructure.

In further work on developing the classifier, all these approaches were considered and combined. The proposed approach to classifying scientific and technical equipment and instrumentation is based on criteria such as functionality, purpose, technical characteristics, and area of application. The methodology for classifying research equipment by functionality and field specialization involves using a hierarchical system of categories and subcategories. The main approach is to distribute equipment by fields and research directions to ensure more precise and specific classification.

Below there is an example of classification system that provides a comprehensive breakdown of scientific equipment, categorized by functionality and specialization. This classification system highlights the diverse range of scientific equipment essential for advancing research in different fields, from fundamental physics to applied engineering and biomedicine. Each category addresses specific research needs and contributes to the broader scientific endeavor by providing researchers with the tools they need to explore, discover, and innovate.

By Functionality and Sector Specialization:

1. **Research Equipment and Experimental Installations:**

1.1. **Scientific Equipment for Research in Physics, Electronics, Optics, and Other Physical Sciences:**

1.1.1. **Scientific Equipment for Astrophysics and Aerospace: Satellites, Radars, Space Research Equipment:**

- **Telescopes:** Optical, Radio Telescopes, Infrared Telescopes.
- **Detectors and Cameras:** Particle Detectors (for photographing and analyzing cosmic objects), Photometers.
- **Spectrographs, Spectroscopic Equipment (for analyzing light spectra from cosmic objects):** UV Reflection, IR Spectroscopy, Fluorescence Spectroscopy, Mass Spectrometers, X-Ray Diffractometry.

1.1.2. **Electronic and Optical Systems:** Optical Instruments, Microscopes, Spectrophotometers.

1.1.3. **Laser Technology:** For the creation and application of lasers in various scientific research.

1.1.4. **Electron Microscopy:** Scanning and Transmission Electron Microscopes (for studying materials at the atomic level).

1.1.5. **Magnetic and Superconducting Devices:** Superconducting Magnets, Magnetic Resonators, High-Energy Accelerators.

1.1.6. **Experimental Nuclear Reactors.**

https://doi.org/10.15802/unilib/2024_315157

1.1.2. **Scientific Equipment for Chemical Research and Substance Analysis:**

- **Analytical Equipment:** Chromatographic systems (for analyzing the composition of chemical substances): gas chromatography, liquid chromatography, mass spectrometers (for analyzing the mass and mass spectra of molecules and chemical compounds).
- **Nuclear Magnetic Resonance (NMR) Spectroscopy:** NMR spectrometers for analyzing the structure of chemical compounds, X-ray diffractometry.
- **Spectrophotometers:** For measuring absorption and emission of light in various chemical compounds.
- **Chemical Synthesis Apparatus:** Reaction apparatus, spectroscopes.
- **Equipment for Chemical Research:** Reactors, analyzers.

1.1.3. **Scientific Equipment for Biological, Genetic Research, and Biotechnology:**

- **Microscopes:** Light, electron, and confocal microscopes for studying cellular structure and morphology.
- **Molecular Biology and Genomic Research Equipment:** Genetic analyzers, PCR machines, genome sequencers, reaction apparatus, electrophoresis.
- **Biochemical Equipment:** Spectrophotometers, chromatographs, mass spectrometers.
- **Cell Research Instruments:** Bioreactors, cytometers, fluorescent microscopes.
- **Neurobiology Equipment:** Electroencephalographs, intracerebral microelectrodes.

1.1.4. **Medical Equipment (Devices and Apparatus for Diagnosis, Treatment, and Research in Medicine and Biology):**

- **Diagnostic Equipment:** Magnetic resonance imaging (MRI) machines, X-ray machines, ultrasound machines, cardiographs.
- **Surgical Equipment:** Laser systems, surgical robots, medical implants.
- **Other Laboratory Equipment for Medicine:** Blood analyzers, DNA extractors, microscopes.

1.1.5. **Research Equipment for Ecology:**

- **Environmental Monitoring Systems:** Air, water, and soil analyzers, pollution sensors.
- **Biometric Devices:** For measuring ecosystem and species parameters.

1.1.6. **Scientific Equipment for Oceanographic and Marine Research:**

- **Marine Research Stations.**
- **Hydroacoustic Equipment.**

1.1.7. **Scientific Equipment for Research and Development of New Technologies and Engineering Solutions:**

- **Energy Research Equipment:** Thermal and solar energy systems, equipment for energy production and storage.
- **Mechanics and Automation:** Dynamometers, robots for various tasks, automated control systems.

1.1.8. **Scientific Equipment for Geology:** Geological instruments, drilling equipment.

1.2. **Measuring and Control Equipment (Measuring Instruments, Control Systems):**

- **Measuring Instruments:** Sensors, measuring devices for various parameters, tensiometers, voltmeters.
- **Meteorological Equipment:** For measuring weather and climate parameters.
- **Pollution Monitoring Systems:** For monitoring air, water, and soil quality.
- **Metrology and Quality Control Equipment:** Metrology laboratories, calibration equipment such as calibration weights, measuring instruments.

1.3. **Production Equipment for Materials Science Research and Material Processing:**

https://doi.org/10.15802/unilib/2024_315157

- **Research Equipment for Analyzing the Structure and Properties of Substances:** Diffractometers, scanning electron microscopes.
- **Chemical Synthesizers:** For creating new chemical compounds.
- **Crystallization Equipment:** For growing material crystals.
- **Metalworking Equipment:** CNC machines, lathes, milling machines.
- **Plastic Processing Equipment:** Plastic molding machines.
- **3D Printers:** Various types and sizes.
- **Laser Technologies:** Lasers of various types and applications.
- **Food Industry Equipment:** Ovens, extruders.

1.4. **Information and Computing Equipment (Technologies and Infrastructure for Collecting, Processing, Storing, and Disseminating Data and Information Related to Scientific Research):**

- **Computers:** Personal computers, workstations, supercomputers.
- **Servers and Computing Clusters:** Systems for processing large volumes of data and digitally modeling complex processes.
- **Network Infrastructure, Grid Systems:** For distributed computing and shared use of computing resources.
- **Data Storage Systems:** Disk arrays, accounting systems, digital archives, cloud environments for accessing, storing, and sharing scientific data via the Internet.
- **Geographic Information Systems (GIS):** For analyzing and visualizing geographic data.
- **Data Processing Software:** CAD, scientific software.

This approach allows for the creation of a clear and logical structure for classifying various types of research equipment across scientific domains, with the classifier itself serving as the foundation for organizing and categorizing a wide range of initiatives in the field of research and development. It provides a structured basis for data management and analysis.

One of the outcomes of this study is the development of a classifier specifically for research equipment rather than research infrastructures. This distinction arose due to differences in the interpretation of the term "research infrastructures" between the European Union and Ukraine, as well as in response to the specific tasks faced by the URIS system. The adaptation of the classifier to the specific realities of the Ukrainian scientific environment was crucial in this process.

Conclusion

The direction of classifier development was significantly shaped by the distinct challenges faced by the Ukrainian Information System for Current Research (URIS). These challenges, ranging from data organization to accessibility issues, necessitated a tailored approach to classifier design. Understanding these unique hurdles allowed for the refinement of functionalities to cater specifically to the Ukrainian research landscape.

Moreover, the development of the research equipment classifier underscores a pivotal adaptation to meet the contextual demands of Ukraine. By aligning with the intricacies of the local research ecosystem, the classifier not only ensures enhanced usability but also fosters a more inclusive and comprehensive representation of research activities within the country.

This adaptability highlights the robustness of the approach, showcasing its capacity to evolve in response to the evolving needs of the scientific community. It underscores the versatility of the classifier, positioning it as a dynamic tool capable of effectively addressing a spectrum of challenges inherent to research management and analysis within Ukraine.

https://doi.org/10.15802/unilib/2024_315157

The development and customization of the classifier not only signify a strategic response to the challenges encountered but also embody a proactive endeavor to optimize research infrastructure in alignment with national objectives and priorities. By tailoring solutions to local contexts, this initiative serves as a testament to the importance of context-driven approaches in fostering innovation and advancement within the scientific domain.

REFERENCES

Azeroual, O., & Schöpfel, J. (2023). Chapter seventeen – Supporting research information management: overcoming the inherent culture gap between traditional library ethics and the management of CRIS systems. In D. Baker, L. Ellis, C. Williams, & C. Wragg (Eds.). *Benchmarking library, information and education services: New strategic choices in challenging times* (pp. 281-294). Elsevier, Chandos Publishing. doi: https://doi.org/10.1016/B978-0-323-95662-8.00017-5 (in English)

Czerniak, A. (2020, March 27). *Implementation of the OpenAIRE-CRIS-CERIF Guidelines in DSpace-CRIS*. OpenAIRE. Retrieved from https://www.openaire.eu/blogs/implementation-of-the-openaire-cris-cerif-guidelines-in-dspace-cris (in English)

D'Ippolito, B., & Rüling, C.-C. (2019). Research collaboration in large scale research infrastructures: Collaboration types and policy implications. *Research Policy, 48*(5), 1282-1296. doi: https://doi.org/10.1016/j.respol.2019.01.011 (in English)

European Commission, Directorate-General for Research and Innovation. (2017). *Peer review of the Ukrainian research and innovation system: Horizon 2020 policy support facility*. Publications Office of the European Union. doi: https://doi.org/10.2777/095726 (in English)

Fabre, R., Egret, D., Schöpfel, J., & Azeroual, O. (2021). Evaluating the scientific impact of research infrastructures: The role of current research information systems. *Quantitative Science Studies, 2*(1), 42-64. doi: https://doi.org/10.1162/qss_a_00111 (in English)

Fecher, B., Kahn, R., Sokolovska, N., Völker, T., & Nebe, P. (2021). Making a research infrastructure: conditions and strategies to transform a service into an infrastructure. *Science and Public Policy, 48*(4), 499-507. doi: https://doi.org/10.1093/scipol/scab026 (in English)

García, A. M. F., García, M. I. M., Gallinas, R. B., Sánchez, M. M., & Gutiérrez, M. E. B. (2022). Integration and open access system based on semantic technologies: A use case applied to university research facet. *International Journal on Semantic Web and Information Systems (IJSWIS), 18*(1), 1-19. doi: http://doi.org/10.4018/IJSWIS.309422 (in English)

Hallonsten, O. (2020). Research infrastructures in Europe: The hype and the field. *European Review, 28*(4), 617-635. doi: https://doi.org/10.1017/S1062798720000095 (in English)

Kremenjaš, D., Udovičić, P., & Orel, O. (2020). Adapting CERIF for a national CRIS: A case study. In *2020 43rd International Convention on Information, Communication and Electronic Technology (MIPRO). Proceedings* (pp. 1633-1638). IEEE. doi: https://doi.org/10.23919/MIPRO48935.2020.9245344 (in English)

Leiva-Mederos, A., Senso, J. A., Hidalgo-Delgado, Y., & Hipola, P. (2017). Working framework of semantic interoperability for CRIS with heterogeneous data sources. *Journal of Documentation, 73*(3), 481-499. doi: https://doi.org/10.1108/JD-07-2016-0091 (in English)

Martin, P., Remy, L., Theodoridou, M., Jeffery, K., & Zhao, Z. (2019). Mapping heterogeneous research infrastructure metadata into a unified catalogue for use in a generic virtual research environment. *Future Generation Computer Systems, 101*, 1-13. doi: https://doi.org/10.1016/j.future.2019.05.076 (in English)

Moreira, J. M., Pardelha, F., Laranjeira, C., Pereira, F., Novais, J., Lopes, P.,.Cardoso, E. (2022). Development of Plan S monitoring and compliance tool in the context of PTCRIS for Portuguese

National Science Foundation. *Procedia Computer Science, 211*, 151-161. doi: https://doi.org/10.1016/j.procs.2022.10.187 (in English)

Vázquez Tapia, R. (2022). Development and characterisation of CRIS systems in Latin America: Preliminary results of diagnostic survey. *Procedia Computer Science, 211*, 267-276. doi: https://doi.org/10.1016/j.procs.2022.10.201 (in English)

TSYBENKO I. O.
Державна науково-технічна бібліотека України (Київ, Україна),
e-mail: tsyb2012@ukr.net, ORCID 0000-0002-6408-9011

ZHEREBCHUK S. V.
Державна науково-технічна бібліотека України (Київ, Україна),
e-mail: zerebcuksofia@gmail.com, ORCID 0000-0002-0212-7107

FEDCHUK A. P.
Державна науково-технічна бібліотека України (Київ, Україна),
e-mail: andriyf@gmail.com, ORCID 0000-0003-4719-8133

Стимулювання національних досліджень і розробок: методологічні ідеї щодо розробки класифікатора для української національної системи CRIS Державною науково-технічною бібліотекою України

Мета. Метою цього дослідження є розробка та характеристика комплексного класифікатора досліджень і розробок (R&D), який відіграє вирішальну роль в ефективному впровадженні Національної інформаційної системи поточних досліджень (CRIS). Дослідження спрямоване на вирішення проблем і розробку методологій, пов'язаних зі створенням системи, яка класифікує різноманітні науково-дослідні ініціативи, забезпечуючи при цьому інтероперабельність із існуючими системами та адаптивність до наукових галузей, що розвиваються. **Методика.** Розробка класифікатора включала в себе багатоетапний процес, в тому числі консультації з експертами галузі та огляд існуючих систем класифікації. Дослідження було зосереджене на визначенні ключових галузей досліджень, забезпеченні сумісності з міжнародними стандартами та розробці гнучкої таксономії, що охоплює як усталені галузі, так і ті, що розвиваються. Для вдосконалення дизайну класифікатора для України було проаналізовано діагностичне дослідження систем CRIS у Латинській Америці, а також досвід подібних систем, зокрема, у Хорватії та Португалії. **Результати.** В результаті дослідження було успішно розроблено класифікатор, який відповідає специфічним потребам українського дослідницького ландшафту, зокрема, в рамках Української інформаційної системи поточних досліджень (УРІС). Структура класифікатора відповідає міжнародним стандартам і підтримує інтероперабельність з глобальними базами даних. Крім того, динамічний характер класифікатора дозволяє постійно оновлювати його, що робить його придатним для адаптації до нових дослідницьких галузей. Система класифікації також була адаптована до унікальної дослідницької екосистеми та інфраструктури України. **Висновки.** Розроблення цього класифікатора досліджень і розробок є стратегічним кроком вперед для дослідницької інфраструктури України, воно покращує організацію даних, їхню доступність та співпрацю. Вирішуючи як технічні, так і контекстуальні проблеми, класифікатор забезпечує гнучке, масштабоване рішення, яке підтримує довгострокові наукові інновації. Це дослідження підкреслює важливість контекстно-орієнтованих підходів у створенні ефективних інструментів управління дослідженнями, позиціонуючи класифікатор як надійну основу для майбутніх розробок систем CRIS. Державна науково-технічна бібліотека України відіграла ключову роль у розробленні цього класифікатора, забезпечивши його відповідність конкретним потребам української дослідницької спільноти.

Ключові слова: Науково-дослідні та дослідно-конструкторські роботи (НДДКР); Національна система поточної наукової інформації (CRIS); розроблення класифікатора; управління даними; інтероперабельність; стандартизована термінологія; наукова таксономія; зручність використання; Україна; Державна науково-технічна бібліотека України

Received: 15.07.2024

Accepted: 13.11.2024

https://doi.org/10.15802/unilib/2024_315157