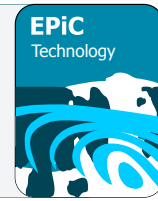




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Research Equipment in CroRIS in Support of Open Research Infrastructure in Croatia

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Abstract

Croatian Research Information System (CroRIS) contains comprehensive and reliable data on the science and higher education system in the Republic of Croatia. It integrates standardized information on Croatian research activities – including institutions, projects, researchers, publications, equipment, services, and patents – within a single platform, thereby enhancing the visibility and transparency of research in Croatia. One of the CroRIS modules supporting open science is Equipment and Services. This paper focuses on the equipment component of the module and describes its development following the migration of data from the legacy Šestar database into CroRIS. The migration process involved metadata mapping, data cleaning, harmonization through controlled vocabularies, and alignment with CERIF principles to ensure structural and semantic interoperability. The paper presents the metadata schema used to describe research equipment, data management practices, institutional and regulatory use cases, and mechanisms for linking equipment with authoritative records and other research information. In addition, the paper examines the role of the CroRIS Equipment sub-unit in supporting open research infrastructures through standardized metadata, interoperability, and potential future integration with persistent identifier (PID) frameworks such as PIDINST. The results demonstrate that the current metadata model provides a strong foundation for improving the discoverability, accessibility, interoperability, and reuse of research equipment at both the national and international levels.

1 Introduction

Croatian Research Information System (CroRIS)¹ is a national-level Current Research Information System (CRIS) in Croatia, designed to provide comprehensive, complete, and accurate data on national research activities. The system serves as a central point for collecting, integrating, and managing information on researchers, research organisations, projects, publications, and research infrastructure. By providing structured and interoperable data, CroRIS supports evidence-based decision-making, research evaluation, and strategic planning at the national level, while also enhancing the international visibility of Croatian research (Konjević et al., 2025).

This paper focuses on the equipment data in CroRIS, which form a part of the Equipment and Services module. This module is one of the functional units within the system. It consists of two segments, each implemented as a separate sub-unit within the module. The equipment sub-unit enables the structured recording and monitoring of scientific and research equipment. It contributes to increased transparency of available research infrastructure, supports more efficient use of resources, and facilitates collaboration among research organisations. As part of a national CRIS, the equipment component represents an important element in strengthening research infrastructure management and enhancing the overall accessibility of research capacities. An equipment record can be linked to records in other CroRIS modules: CROSBİ (publications), Persons, Projects, Organizational Units, as well as Services (the other entity within the Equipment and Services module). Most equipment data are publicly available, except for certain information related to the protection of personal data of related parties.

Access to the module is based on centralized user authentication and authorization through single sign-on (SSO) service, facilitated via the AAI infrastructure, which is applied across the entire CroRIS system. All registered CroRIS users are authorized to create new equipment entries. Entered records undergo a data verification process by module editors. The editors' task is to review and verify the accuracy of the data contained in the entries associated with their institutions, thereby ensuring the credibility of the information (Alilović et al., 2024). After verification, data can be altered only by module editors, associated persons with the role *Record editor* and database administrators.

Prior to CroRIS, information and data about research equipment and instruments acquired by the Ministry of Science and Education were available in the *Database of Instruments for Scientific Research – Šestar*. The database was developed in 2006 by the Centre for Scientific Information (former Library) of Ruđer Bošković Institute. Initial development was supported by the then Ministry of Science and Education, and since 2007, the Ruđer Bošković Institute has independently continued to develop and maintain the database using its own resources. The aim of Šestar was to provide transparent information on the existence and availability of scientific research instruments at Croatian public institutions within the science and higher education system, in order to enable better planning for the acquisition of new equipment and the financing of maintenance of existing equipment. Users could log in to Šestar through the AAI infrastructure, create new entries and connect them with institutions. Institutions appointed database administrators who were responsible for editing records associated with their institutions (Mayer & Konjević, 2021).

CroRIS was later developed within a national strategic framework aimed at establishing a comprehensive research information system. It was created as part of the "Scientific and Technological Foresight" strategic project, led by the Ministry of Science and Education and co-funded by the European Union. Development began on December 1, 2017, with the University Computing Centre (SRCE) as the partner responsible for the development and maintenance of the CroRIS system. On October 19, 2021, the Ruđer Bošković Institute joined the project, which enabled access to existing equipment data from the Šestar application so that the data could be mapped, cleaned and imported into the CroRIS central database (Macan & Konjević 2022) .

¹ <https://www.croris.hr/>

2 Data migration process

The migration of equipment data from the legacy Šestar database into CroRIS represented both a technical and a conceptual transformation of the existing data model. In addition to transferring records into a new system environment, the process included metadata harmonization, implementation of controlled vocabularies, and alignment with CERIF-based interoperability principles. The following sections describe the main phases and challenges of the migration and integration process.

2.1 Conceptual and Technical Framework of Integration

Following the data migration on July 7th, 2022, the legacy database was closed for active use and new data have since been entered exclusively into CroRIS. At the time of migration, Šestar contained 3129 records. Equipment data from the Šestar database were migrated into the CroRIS database and are available through the newly developed Equipment and Services module. The integration was carried out in accordance with CERIF principles, with the aim of achieving structural and semantic interoperability, standardized metadata, and clear connections between different types of research information within a national CRIS. In this context, the CroRIS equipment component plays a key role in supporting the visibility, accessibility, and reuse of research infrastructure resources, thereby contributing to the development of open research infrastructures in the Republic of Croatia.

2.2 Metadata Mapping and Data Harmonization

For the data migration process from the Šestar database to the CroRIS database, a new Java application named Data-import was developed. Its primary purpose was to enable the correct mapping, cleaning, and validation of data originating from various sources, typically JSON or XML files, before storing them in the CroRIS database.

Many fields in the Šestar database were represented as unstructured textual values, which made the matching of controlled vocabularies particularly challenging (e.g. locations, institutions, and persons). During the migration process, controlled vocabularies from the CroRIS database were loaded into the application memory and generally consisted of a name and one or more identifiers. The names of source entities were matched against the corresponding entities loaded from the CroRIS database, while only the CroRIS identifiers were ultimately used for storing relationships between entities.

In certain cases, the source data contained additional attributes besides the entity name, requiring the comparison and validation of multiple fields in order to achieve accurate matching. This approach to data mapping and storage significantly contributed to the establishment of consistent and interconnected relationships between different entities within the CroRIS database. As a result, the system no longer relies on isolated textual fields, but instead on clearly defined entities with unique identifiers and associated metadata. Such a structure enables a more coherent overview of the entire system and facilitates the interpretation and management of research information.

During the development of the database model for the Equipment and Services module, efforts were made to follow the CERIF structure as closely as possible, while introducing new tables and columns only when necessary. The ER diagram (Figure 1) illustrates the relationships between entities in the CroRIS database during the early stages of development. Entities with names containing the *cf* prefix were adopted directly from the CERIF model, while additional entities and attributes with the *hr* prefix were introduced in order to address requirements specific to the Croatian CRIS environment. Although the CERIF model provided a solid foundation for interoperability and standardization, certain extensions were necessary to support the full range of functionalities required by the CroRIS system.

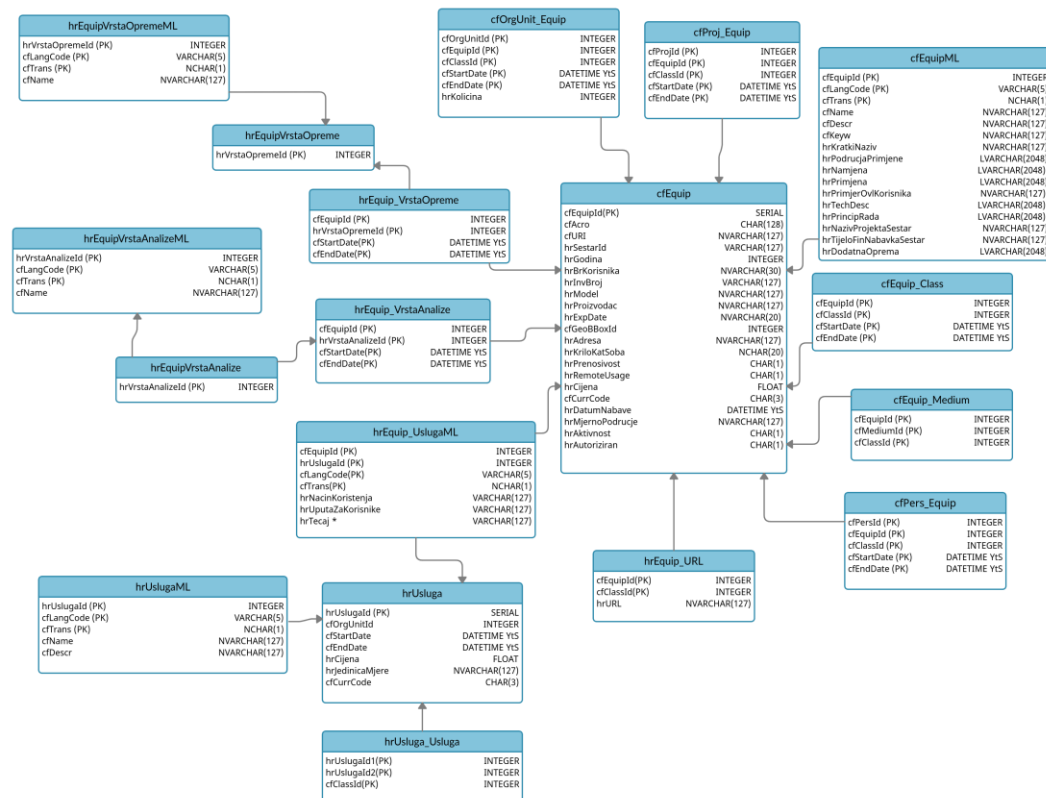


Figure 1: Early-stage database model structure

The integration process began with the specification of metadata elements in the legacy databases, followed by detailed data mapping to identify differences between the source systems and the CroRIS data model (Konjević & Alilović, 2026). Another key challenge was data import, which required extensive data cleansing and the integration of data from multiple sources into CroRIS (Balenoović et al., 2022). A comprehensive analysis of existing data was conducted to ensure the consistency, completeness, and accuracy of records in CroRIS, thus enabling reliable use of the system. Due both to CERIF requirements, which prescribe standardized data structures, controlled vocabularies, and clearly defined relationships between entities, and to new functionalities introduced by CroRIS, such as data exchange and the ability to connect entities across different system modules, targeted data interventions were required. These included completing missing values and correcting or removing invalid or inconsistent records. In the new system, metadata elements, their repeatability, and the contexts in which they are used were clearly defined. Data cleaning was approached as a curatorial process aimed at improving the reliability and interpretability of records. This process focused on enhancing metadata quality, reducing ambiguity, and ensuring the consistent use of standardized values across records. Rather than treating data cleaning as a purely technical task, it was understood as an essential step in supporting long-term data reuse, interoperability, and meaningful integration of equipment records within the broader CroRIS ecosystem.

Particular attention was given to the cleaning and disambiguation of personal name data associated with equipment records. Fields such as *Authorized Users*, *Instrument Manager*, *Contact Persons*, *Institution*, *Project Name* under which the instrument was acquired, and *Price* were systematically reviewed. A unified list of persons linked to equipment records was extracted and analyzed together

with the identifiers of the corresponding instrument records. Incorrect entries were removed, spelling errors were corrected, and incomplete name data were supplemented. Only after the completion of this process was it possible for the cleaned personal data to be reliably linked to person records in the CroRIS database, enabling consistent identification and reuse of information on persons across different system modules.

2.3 Institutional Alignment and Project Linking

Since it was decided that the association of equipment records with institutions in CroRIS would be limited exclusively to institutions listed in the official institutional registry, further data harmonization was necessary. During the data cleaning phase, instrument records linked to sub-entities were reassigned to their parent institutions. However, information about sub-entities related to the equipment was preserved through the CroRIS location section, which allows a more detailed description of the exact location of the instrument within an institution.

In the legacy Šestar database, the project name during which an instrument was acquired was stored as a free-text field, resulting in inconsistent naming practices and incomplete references. For migration into the CroRIS database, these data were cleaned by aligning them with authoritative project records from the POIROT database, which had also been cleaned and imported into the central CroRIS database. This enabled explicit linking between equipment and project entities within CroRIS, in line with CERIF recommendations for describing relationships between research infrastructure, projects, and funding activities.

3 Functional and Regulatory Implications

Upon the launch of CroRIS, higher education institutions and research institutes across Croatia were systematically informed about the new system through official communication channels. Dissemination activities included targeted emails sent to institutions, as well as workshops, presentations, and training sessions organized in collaboration with University of Zagreb University Computing Centre (SRCE). These activities aimed not only to introduce the functionalities and objectives of CroRIS, but also to support institutions in the transition towards centralized and standardized research information management. Continuous communication with institutions, user support, and educational activities played an important role in encouraging data entry, improving data quality, and fostering broader engagement with the system.

The Equipment and services module is primarily intended for recording equipment of a higher value, more specific and rare in the Croatian scientific and research community, equipment which the institution offers for use to users from other institutions, or equipment which is included in different types of official reports for different CroRIS stakeholders (ministries, state agencies, universities etc.) by the criterion of equipment value. Although there is no clearly defined monetary threshold for inclusion, the module is not designed for logging consumables, office supplies, or standard work equipment such as personal computers and small laboratory items. The inclusion criteria are therefore primarily guided by the scientific relevance, infrastructural importance, and a potential for shared use of the equipment, rather than by the acquisition cost alone. This approach allows institutions from different scientific fields to record equipment that represents significant research infrastructure within their specific disciplinary context.

Centralized records of such equipment also contribute to greater visibility of the national research infrastructure and support more efficient planning, management, and reuse of research resources. For institutions within the science and higher education system of the Republic of Croatia, it is important to register equipment records in CroRIS because an increasing number of project funders (e.g. Croatian Science Foundation) require equipment to be entered into CroRIS when applying for financing.

Additionally, when applying to public calls issued by the Ministry of Science, Education and Youth, where funding is requested for repairs, maintenance, or upgrades of research equipment, the equipment must be registered in CroRIS (Macan & Konjević, 2022). Data about scientific equipment, along with other data from CroRIS, are used in the reaccreditation process of higher education institutions and research institutes carried out by the Agency for Science and Higher Education (AZVO). Data are used for generating certain reports for the reaccreditation process, which are available in CroRIS through the module Reports. For example, internal document of Ruđer Bošković Institute *Regulations on Scientific Equipment*² mandates that all of the Institute's scientific equipment with a value greater than 50,000 EUR must be registered in CroRIS, and specifies that a person in charge for the equipment is obliged to do it. Regular entry of equipment data into CroRIS also enables systematic record-keeping and improved transparency for the institution's internal needs.

The basic set of equipment data in CroRIS must be entered in Croatian, although entry in other languages is also supported. Descriptive metadata include general and technical descriptions, operating principles, measurement and operational ranges, usage rules, manufacturer, and model. Equipment records are further classified by acquisition cost category, level of integration, equipment type, analytical capabilities, and application domain, all selected from controlled vocabularies. Lifecycle information, such as acquisition date, acquisition cost, estimated value, usability period, and operational status, is also recorded.

Equipment records are explicitly linked to person entities through clearly defined roles (e.g. *Contact person*, *Authorized user*), with contact information drawn from authoritative person profiles. Funding information is mandatory and can be recorded either by linking the equipment to a project through which it was acquired, upgraded, or serviced, or by linking it to a funding organization, following the same procedures used for project records. Equipment records may additionally be linked to services, digital objects (e.g. images and documents), and locations, supporting rich contextualization and reuse of equipment data across CroRIS. Additionally, an application programming interface (API) is available for the module, enabling data exchange and interoperability with external information systems.

4 Metadata Schema in CroRIS

The metadata schema of the CroRIS Equipment sub-unit was developed to support the standardized description and classification of research equipment within a national CRIS environment. It combines structured metadata and controlled vocabularies to ensure interoperability, consistent data management, and the representation of diverse types of research infrastructure across scientific disciplines. Originally designed for experimental, analytical, and technical equipment used in laboratory environments, the schema is sufficiently flexible to accommodate different scientific disciplines and institutional contexts. It includes descriptive, technical, organizational, financial, and relational metadata elements.

The first section of the metadata schema contains descriptive metadata fields used for the general description of equipment. These fields include *Name* (mandatory), *Short name*, *Description* (mandatory), *Technical description*, *Accompanying and optional equipment*, *Work principle*, *Work and measurement area*, and *Usage rules*. Descriptive metadata must be entered in Croatian, but parallel language versions of textual fields may also be added, enabling multilingual descriptions of equipment and improving the international visibility and accessibility of equipment records.

The second section of the metadata schema contains technical, organizational, classification, and lifecycle-related metadata fields. In addition to mandatory fields such as *Model*, *Manufacturer*, and *Institution to which the equipment belongs*, it includes metadata describing equipment characteristics, acquisition, valuation, condition, and application. The schema supports both acquisition-based and

² Institut Ruđer Bošković. (2026). *Pravilnik o znanstvenoj opremi*.

valuation-based recording of financial information, while institutional affiliation is linked to authoritative records within CroRIS. Several metadata elements, including *Integration*, *Type of equipment*, *Type of analysis*, and *Type of acquisition*, are implemented through controlled vocabularies to ensure consistency and standardization of records.

The categorization of equipment by financial value supports harmonized reporting and strategic monitoring of research infrastructure capacities at the national level. Equipment records are additionally categorized according to the financial value of equipment into capital (large equipment), medium-scale, and small-scale equipment categories. The categories for capital (large-scale) equipment (above EUR 400,000), medium-scale equipment (EUR 55,000–400,000) and small-scale equipment (below EUR 55,000) are aligned with the classification defined in the *Research Infrastructure Development Roadmap of the Republic of Croatia 2023–2027*³. The third section of the metadata schema contains metadata related to contact persons and user roles associated with equipment records. At least one responsible person must be assigned to each equipment record. Contact persons are linked through authoritative person records from the CroRIS Persons module, meaning that only the users with existing CroRIS profiles can be associated with equipment entries.

For each associated person, additional metadata such as *Title before name*, *Email address*, *Phone number*, and *Fax number* can be displayed through linked person profiles. Each associated person can be assigned one or more roles selected from a controlled vocabulary, ensuring a standardized representation of responsibilities and user functions related to research equipment management and use.

The fourth section of the metadata schema contains metadata related to projects associated with equipment records. Projects are linked through authoritative project records from the CroRIS Projects module, meaning that a project must first exist within the Projects module before it can be associated with an equipment record. This approach enables standardized representation of the financial and operational relationships between research equipment and research projects within the CroRIS ecosystem.

The fifth section of the metadata schema contains metadata related to funding organizations associated with equipment records. If no related project is provided, at least one funder must be associated with the equipment record. Funding organizations are linked through authoritative institutional records from the CroRIS Organisational Units module and selected from controlled vocabularies, with support for multiple funding sources within a single equipment record.

The metadata schema also supports the inclusion of external links, supplementary documents, and images related to equipment records. Descriptive metadata and attachments can be provided for uploaded files, while document types are standardized through controlled vocabularies.

The final section of the metadata schema contains location-related metadata describing the physical placement of equipment within an institution. These metadata fields include *Institution*, *Location*, *Address*, and *Wing/Floor/Room*. The schema supports hierarchical descriptions of institutional locations through organizational sub-entities and more precise spatial information within buildings or laboratories, thereby improving the discoverability and accessibility of research infrastructure resources.

Overall, the metadata schema of the CroRIS Equipment sub-unit was designed to balance standardized data management with the flexibility required for describing heterogeneous types of research infrastructure. Through the use of controlled vocabularies, authoritative records, multilingual metadata, and explicit relationships between entities, the schema supports interoperability, discoverability, and long-term reuse of research equipment data within the national CRIS ecosystem.

³ Ministry of Science and Education of the Republic of Croatia. (2023). *Research infrastructure development roadmap of the Republic of Croatia 2023–2027*.

5 Positioning CroRIS within Emerging PID Infrastructures

Although the CroRIS Equipment and Services module was primarily developed in alignment with the CERIF data model (as was the entire system), ongoing developments in the international research information landscape are being closely monitored, particularly those related to persistent identifiers (PIDs) for research infrastructures and scientific instruments (De Castro, 2025). In recent years, the work of the Research Data Alliance Persistent Identification of Instruments Working Group (PIDINST)⁴ and the growing role of PID providers such as DataCite have highlighted the importance of globally resolvable identifiers for improving the discoverability, interoperability, and reuse of equipment metadata within the broader research ecosystem.

At present, equipment records in CroRIS rely on internal identifiers and publicly accessible record pages. However, different approaches to integration with global PID infrastructures are being considered. One possible model would involve the registration of equipment records through an established PID provider such as DataCite, with CroRIS acting as a metadata source and management layer. In this context, the role of CroRIS would not be to function as an identifier authority itself, but rather to provide structured, curated, and interoperable metadata suitable for PID registration workflows. Such integration, however, would require additional technical and organizational considerations. The other possibility would be assigning DOIs to equipment records directly within the CroRIS infrastructure. Each approach raises specific technical and governance questions, including metadata requirements, registration workflows, and long-term sustainability. Future development will therefore focus on evaluating these options in order to support unambiguous referencing of equipment in research outputs and to strengthen the integration of equipment within the broader research graph.

A more centralized approach implemented through the CroRIS infrastructure could additionally support greater consistency in metadata curation, authority control, and long-term management of equipment records at the national level. Such an approach could contribute to more transparent, interoperable, and reusable descriptions of research equipment, in line with broader open science objectives.

5.1 Alignment of CroRIS Equipment Metadata with PIDINST Schema

The comparison with emerging PID practices⁵ demonstrates that the current CroRIS metadata structure already provides a strong conceptual basis for future interoperability. CroRIS contains rich descriptive metadata, structured relationships between entities, and controlled vocabularies that support consistent data management and integration across modules. From the perspective of supporting open research infrastructures in Croatia, this positioning is particularly important because persistent identification mechanisms could further increase the visibility, traceability, and reuse of nationally available research equipment within both national and international research environments.

Most mandatory and recommended PIDINST elements already have corresponding equivalents within CroRIS. The equipment record has an internal identifier within the CroRIS database, while the old record ID's from Šestar database were retained in a separate attribute. Further elements contain descriptive metadata such as equipment name, manufacturer, model, owner institution, technical description, instrument type, and lifecycle-related information. Elements corresponding to the PIDINST Measured Variable property are represented in CroRIS through fields describing the operating principle, work and measurement area, and analytical capabilities. CroRIS additionally supports extensive linking between equipment records and related entities, including persons, projects, organizational units, services, and digital objects. Publicly accessible CroRIS record pages provide functionality similar to PID landing pages, although they are not currently integrated into a formal PID resolution framework.

⁴ Research Data Alliance. (2022). *Metadata Schema for the Persistent Identification of Instruments*.

⁵ See footnote 4.

Furthermore, CroRIS records may contain institutional inventory numbers, which partially correspond to the PIDINST Alternate Identifier property, although these identifiers are primarily intended for local asset management rather than global interoperability.

In several aspects, the CroRIS model provides a more structured representation of metadata through the use of controlled vocabularies and entity-based relationships. For example, while PIDINST frequently relies on externally referenced identifiers represented as free-text metadata values, CroRIS establishes direct links between entities recorded within the system itself. Relationships between equipment, projects, institutions, and researchers are therefore represented as structured internal connections rather than solely through globally unique identifiers. This approach supports consistency, authority control, and richer contextualization of research infrastructure metadata within the national CRIS environment.

Nevertheless, certain differences between the two approaches remain. Some PIDINST-specific properties, such as explicit schema versioning or the use of globally unique identifiers for related entities (e.g. manufacturers), are not currently implemented within CroRIS. Similarly, PIDINST distinguishes between different lifecycle events, such as commissioning and decommissioning dates, whereas CroRIS currently records primarily the acquisition date of equipment. These differences should not necessarily be interpreted as deficiencies of the CroRIS model, but rather as reflections of different design priorities and system roles. While PIDINST is primarily focused on interoperability within global PID ecosystems, CroRIS functions as a national research information system centered on structured metadata management and integration across institutional and research entities.

PIDINST Property	CroRIS Equivalent	Alignment
Identifier	Internal ID	Full
SchemaVersion	N/A	N/A
LandingPage	Record URL	Partial
Name	Name	Full
Owner	Institution	Full
Manufacturer	Manufacturer	Partial
Model	Model	Full
Description	Description	Full
InstrumentType	Controlled vocabularies	Partial
MesuredVariable	Work principle/Work and measurement area	Partial
Date	Date of purchase	Partial
RelatedIdentifier	Linked entities	Different approach
AlternateIdentifier	Inventory number	Partial

Table 1: Alignment of CroRIS Equipment Metadata with PIDINST Schema⁶

⁶ PIDINST Property column from this table was adapted from: Research Data Alliance. (2022). *Metadata Schema for the Persistent Identification of Instruments*.

6 Conclusion

The integration of the Šestar database into CroRIS demonstrates how a domain-specific legacy system can be transformed into an interoperable, CERIF-aligned CRIS module that actively supports open research infrastructures. Through the use of standardized metadata, controlled vocabularies, authoritative person and organization records, and clearly defined relationships between entities, the CroRIS Equipment sub-unit improves the findability, accessibility, interoperability, and reusability (FAIR) of information on research equipment at the national level. These features enhance the transparency, discoverability, and reuse of equipment data for the research community, while supporting institutional reporting, funding application processes, and strategic planning of equipment purchasing. The results presented in this paper indicate that CroRIS already contains many of the structural and semantic elements required for future integration with PID-based infrastructures. Establishing sustainable workflows for persistent identification and metadata interoperability could further enhance the role of CroRIS in supporting open research infrastructures and the integration of Croatian research equipment into the broader international research graph. As such, the CroRIS Equipment sub-unit represents a key component of the national CRIS ecosystem in Croatia, contributing to data governance, interoperability, and the development of an open and sustainable research infrastructure landscape in line with CERIF and open science principles.

References

- Alilović, Z., Šarić, H., Hoić, M., Mayer, M., & Konjević, S. (2024). *Challenges and Practices of the User Support Service in the Croatian Research Information System – CroRIS*. CRIS2024 – Vienna. <https://dspacecris.eurocris.org/handle/11366/2566>
- Balenović, N., Kremenjaš, D., & Orel, O. (2022). *CroRIS Development Update*. Strategic Membership Meeting 2022 – Autumn (Nijmegen). <https://dspacecris.eurocris.org/handle/11366/2252>
- De Castro, P. (2025). Expanding the research graph underpinning the implementation of Open Science: Research instruments and facilities. *Scottish Journal of Open Research*, 1. <https://doi.org/10.36399/dme15z31>
- Institut Ruđer Bošković. (2026). *Pravilnik o znanstvenoj opremi*.
- Konjević, S., & Alilović, Z. (2026). Opis podataka u informacijskom sustavu znanosti RH - CroRIS. *Arhivi, knjižnice, muzeji: mogućnosti suradnje u okruženju globalne informacijske infrastrukture*, 27, 51–77.
- Konjević, S., Alilović, Z., & Šarić, H. (2025). *From Data to Decisions: How CroRIS Enhances Research Management in Croatia*. <https://repository.ifla.org/items/6085b5b2-7567-4efe-88ff-7e2a1299d639>
- Macan, Bojan & Konjević, Sofija. (2022). Implementacija CroRIS-a, migracija podataka i edukacija korisnika. *Srce novosti*, 92, 16–18.

Mayer, M., & Konjević, S. (2021). U trendu i sa sedamdeset: Nove (stare) usluge Centra za znanstvene informacije. *Vjesnik bibliotekara Hrvatske*, 64(1), 227–250. <https://doi.org/10.30754/vbh.64.1.838>

Ministry of Science and Education of the Republic of Croatia. (2023). *Research infrastructure development roadmap of the Republic of Croatia 2023–2027*. Retrieved April 23, 2026, from <https://mzom.gov.hr/UserDocsImages/dokumenti/Znanost/ZnanstvenaInfrastruktura/ZnanstvenaOprema/znan-oprema-29-12-2023/Research-Infrastructure-Development-Roadmap-of-the-Republic-of-Croatia-2023-2027.pdf>

Research Data Alliance. (2022). *Metadata Schema for the Persistent Identification of Instruments*. Retrieved April 16, 2026 from https://www.rd-alliance.org/wp-content/uploads/2022/01/pidinst-schema-1.0_Final.pdf