

Enriching the Institutional Research Graph on DSpace-CRIS: Equipment and Facilities

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Abstract

In January 2026 the Vietsch Foundation awarded a project to euroCRIS, 4Science and the Hamburg University of Technology (TUHH) to expand the DSpace-CRIS data model so that it becomes possible to add instruments and facilities to the snapshot for the institutional research activity. The INST-DSpace project plan includes the modelling of this new CERIF research entity by euroCRIS on the basis of the work done by the RDA PIDINST WG, its implementation in the upgraded DSpace-CRIS-based euroCRIS repository and its real-life testing by the TUHH via their DSpace-CRIS-based institutional CRIS TORE.

This contribution summarises the INST-DSpace project achievements and the lessons learned at the time the project was presented at the CRIS2026 Conference in May 2026. The paper highlights the value of this new DSpace-CRIS functionality and examines the progress on its application at the TORE institutional CRIS. The objective is that other institutions using this software solution may become familiar with the metadata set used to describe these objects and the links that can be established to other CERIF entities already in the system such as researchers, organisations, projects and research outputs.

Keywords

research instruments and facilities, DSpace-CRIS, research information management, open-source software solutions, research graph, open science, CERIF

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1 Introduction

The Vietsch Foundation-funded INST-DSpace project ([euroCRIS, 2026](#)) is aimed at expanding the coverage of the institutional research graph at universities and research centres using DSpace-CRIS as the basis for their Research Information Management System by adding research instruments and facilities into it. There are two main drivers for the project:

- The growing relevance and inclusion of research instruments and facilities in Current Research Information Systems (CRIS)
- The recently announced merger between DSpace and DSpace-CRIS ([4Science, 2025](#)) that will allow any institution running a DSpace-based repository to expand its underpinning research graph to cover additional research entities.

1.1 The growing relevance of research equipment

The collection of data on research instruments and facilities in institutional and national/regional CRIS systems is an area of increasing importance. This became apparent during the round table on the topic held at the Autumn 2024 euroCRIS Strategic Membership Meeting (SMM2024) at the INRAE in Paris ([De Castro, P., 2025](#)). This panel discussion featured representatives of national and regional CRIS from Finland, Croatia, Flanders/Belgium, Norway and the United Kingdom. Aspects discussed included the workflow for capturing this research information at an institutional level and providing it to the national- or regional-level aggregation as well as the cross-linking of this 'new' research entity with other information already in the system to provide an enhanced research graph where instruments and facilities constitute an integral part of the snapshot for institutions and beyond.

The recently held CRIS2026 Conference in Ponta Delgada featured numerous contributions on this area of practice, showing an increasing relevance and widespread implementation. These CRIS2026 contributions – which ranged from institutional case studies based on different CRIS systems to national-level initiatives in countries like Poland and Croatia through specific reflections on the value of CRIS systems for holding and showcasing this information – were allocated a specific session on the programme and a keynote on Day II of the event.

There is ongoing work at various levels in the domain. Institutions are figuring out ways to optimally collect this information from the research facility managers. National and regional initiatives are exploring how to best ensure a smooth and comprehensive information exchange workflow that allows the aggregation to progress regardless of the specific software solutions used by institutions ([Jisc Equipment Data Service, 2026](#)). This includes the use of persistent identifiers for selected equipment and facilities ([DataCite Commons, 2026](#)). European University Alliances are often pooling their combined equipment and facilities as part of their collaborative research workflows ([SEA-EU, 2025](#)). National funders are gathering information on research infrastructure they oversee ([DFG, 2026](#)). All these stakeholders are moreover defining the use cases for this set of research information and exploring the ways to collect live data on the usage of these equipment and facilities and the results arising from it.

At the same time, the number of CRIS software solutions that allow information on equipment and facilities to be stored and cross-linked to other research entities keeps expanding. During the CRIS2026 Conference case studies have been presented for the use of Pure and Converis for this purpose ([Schanne et al., 2026](#)). National-level initiatives are working on vendor APIs to allow institutions using different solutions to seamlessly export their data to the aggregation, occasionally including open-source solutions ([Loughborough, 2026](#)). However, no specific attempt has so far been made to include the major *international* open-source CRIS solutions in these developments. These would include the likes of DSpace-CRIS and VIVO, which, being community managed, are harder to integrate in a conversation between aggregator services and vendors.

1.2 The impact of the forthcoming DSpace/DSpace-CRIS merger

A statement signed by the DSpace Governance Chair and Vice-Chair was issued in Nov 2025 announcing the forthcoming merger of the DSpace repository software and its extended DSpace-CRIS version for CRIS systems (Moore & Johns, 2025). The merger, which will happen over two major releases (v10 and v11), will dramatically expand the data model underpinning the most successful open-source repository software worldwide allowing it to collect, host and cross-link a much wider range of research entities than research outputs (publications, datasets and other outputs) and their authors.

Current DSpace-CRIS implementations such as the Vytautas Magnus University Research Management System (VDU CRIS) in Lithuania, <https://www.vdu.lt/cris/home>, or the Digital.CSIC institutional repository for the Spanish National Research Council (CSIC) in Spain, <https://digital.csic.es/?locale=en> already show the expanded data model at work. Both systems show for instance the institutional projects as an additional research entity linked to the other ones, making it possible to display researcher profiles that include not just research outputs but also their projects. Moreover, because the DSpace-CRIS data model also allows to code in the *OrgUnit* research entity, covering not just internal research institutes and departments or faculties, but also external organisations, it is for instance possible to search for funded projects by a specific funding agency as shown on figure 1 below for Digital.CSIC.

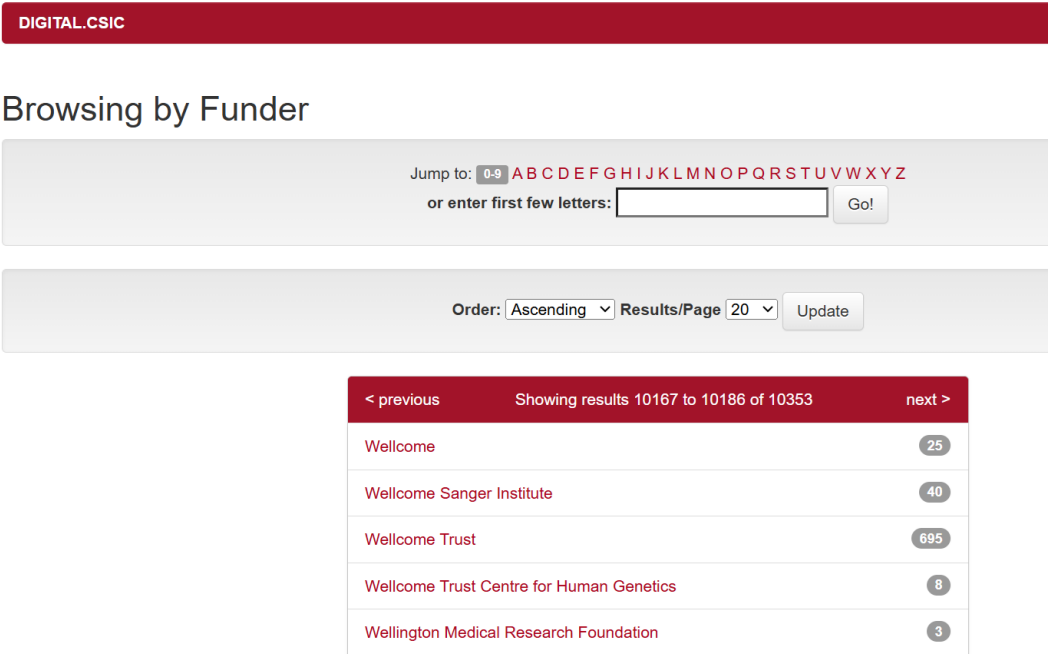


Figure 1: Search results for a query on funding agency on DSpace-CRIS-based Digital.CSIC

The fact that all DSpace repositories will eventually be able to rely on a much wider data model will offer institutions the possibility of expanding the snapshot they provide for the institutional research activity way beyond the traditional focus on research outputs. However, the data model expansion alone does not necessarily mean all repositories will in time become something closer to CRIS systems. As it is usually the case when discussing sociotechnical infrastructure, it is one thing for the underpinning software solution to allow the collection and hosting of data on projects, organisations and funding and

it is a different thing to be able to collect that additional research information, to code it into the system and to cross-link it to other already existing entities within it (such as authors).

All this said, it's still extremely unusual to find research instruments and facilities integrated within the research graph provided by an institutional implementation of DSpace-CRIS as of today. This is due to the fact that the data model expansion that gave rise to DSpace-CRIS initially only targeted the so-called "core entities" in the CERIF standard: authors (researchers), organisations and projects. As an early adopter of DSpace-CRIS – its repository was implemented in 2014 – euroCRIS has first-hand experience on the evolution in its underpinning data model and has seen the opportunity that the merger provides to expand such data model to also include research equipment.

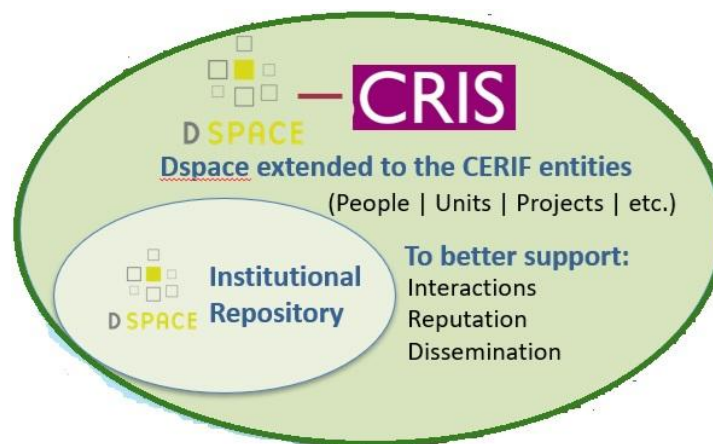


Figure 2: DSpace repository data model expansion to create DSpace-CRIS ([Mornati & Bollini, 2015](#))

At the front of the queue to potentially add research equipment as a new entity to their institutional CRIS within the remit of the INST-DSpace project would be those institutions already operating a DSpace-CRIS platform as the open-source software solution for their Research Information Management System. The euroCRIS-hosted Directory of Research Information Systems at <https://dspacecris.eurocris.org/explore/dris> currently shows 54 instances of DSpace-CRIS with a wide geographical distribution, see figure 3 below. While not all these instances are fully exploiting the expanded data model at present that allows them to provide information on their persons, organisations and projects, those among them who are using their DSpace-CRIS as their institutional CRIS could expand the coverage of their systems. Some have in fact already done it, see the case study for the Hamburg University of Technology (TUHH) in section 3 below.

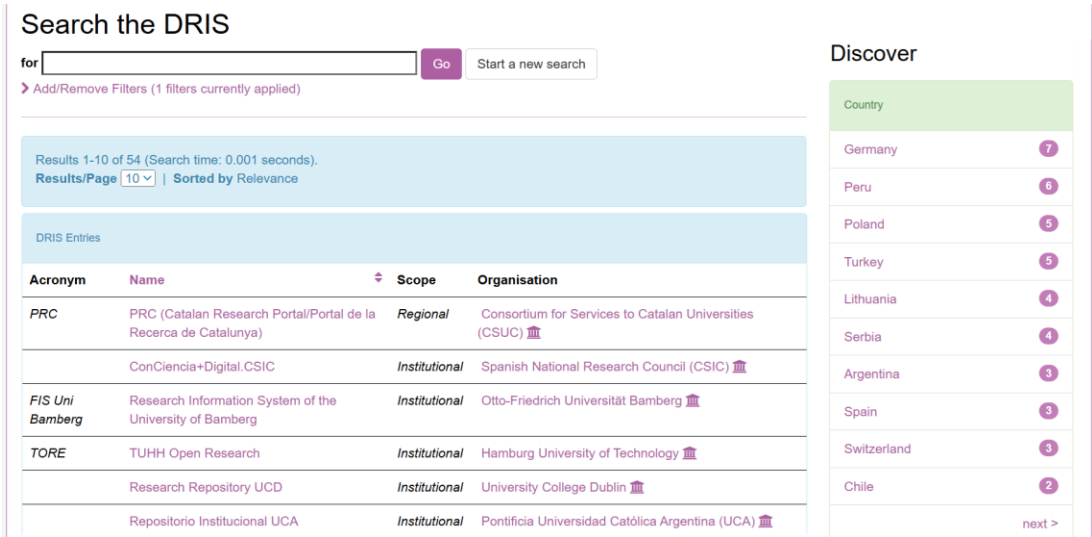


Figure 3: DSpace-CRIS instances and their distribution by country in the euroCRIS DRIS directory

2 Coding research equipment into CRIS systems

The generic inclusion of research equipment and facilities in CRIS systems is not the objective of the INST-DSpace project. Some CERIF-compliant CRIS solutions already allow research equipment to be displayed as part of the institutional research graph and linked to other research entities in the system. This is made possible by the architecture of the CERIF 1.6 data model[†], which includes a *cfEquip* entity that allows research instruments and facilities to be modelled and connected to persons, organisations, projects and research outputs.

Instances of institutional CRIS systems like the Pure-based CRIS at the University of Strathclyde (the main author’s institutional affiliation) or the Converis-based CRIS at the Friedrich-Alexander-Universität Erlangen-Nürnberg[‡] already show entries for instruments and facilities – and these are often linked to research projects or outputs, see figure 4 below for a Strathclyde example.

What the INST-DSpace project aims to achieve is to allow this additional research entity to be coded into the DSpace-CRIS open-source solution. In the process of doing so, the project will also update the description of research equipment in CERIF by making sure it aligns with the metadata schema defined by the RDA PIDINST Working Group (for "Persistent IDentification of INSTRuments") and DataCite.

[†] euroCRIS CERIF data model, <https://eurocris.github.io/CERIF-DataModel/released/Tables.html>
[‡] An example of a FAU CRIS research equipment linked to a project is available at <https://cris.fau.de/equipment/313065761/>

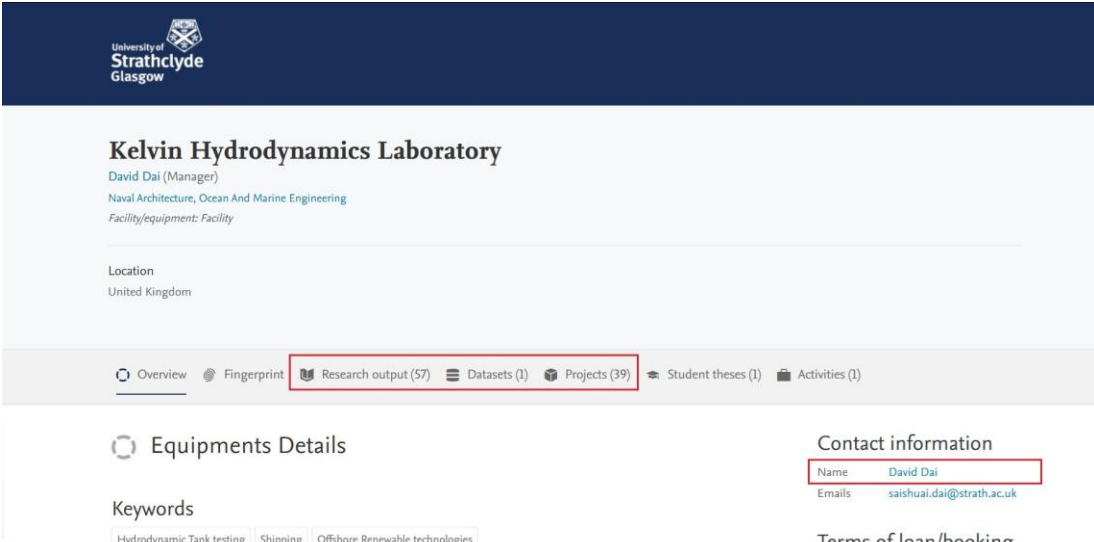


Figure 4: Example for research facility linked to projects and outputs on the Strathclyde Pure-based CRIS

The PIDINST WG operating within the Research Data Alliance (RDA) published version 1 of their "Metadata Schema for the Persistent Identification of Instruments" in March 2022 (Krahl et al., 2022). This metadata schema defined by a group of hands-on researchers and technicians quickly became the canonical approach to the description of research instruments and facilities when initiatives like DataCite and EUDAT teamed up with the PIDINST WG to enable the issuing of persistent identifiers (either DOIs or handles) for research equipment (Buys, M., 2022). This metadata description is ultimately aimed at allowing research equipment and their PIDs to be included in the wider research graph. The collaboration between the PIDINST WG and DataCite resulted in the release of the DataCite metadata schema 4.5 in January 2024, a schema that already included "Instrument" as a specific option in its range of general resource types. Prior to that, the early attempts to code research instruments in DataCite used either the *resourceTypeGeneral* "PhysicalObject" or "Other" in combination with a free-text element *resourceType* "Instrument" (Habermann, T., 2024).

Mapping PIDINST to Refactored CERIF						
			PIDINST			Refactored CERIF
ID	Property	Obl	Occ	Definition	Allowed values, constraints, remarks	
3	LandingPage	M	1	A landing page that the identifier resolves to	URL	Infrastructure.uri
4	Name	M	1	Name by which the instrument instance is known	Free text	Infrastructure.title
5	Owner	M	1-n	Institution(s) responsible for the management of the instrument. This may include the legal owner, the operator, or an institute providing access to the instrument.		Contribution_to_Infrastructure.agent where the concrete subtype is: - Infrastructure_Ownership for the legal owner, - Operating for the operator. - providing access to the instrument is not covered here, it should happen through a Service.
5.1	ownerName		1	Full name of the owner	Free text	Group_or_Organisation_Unit.name or Person.name
5.2	ownerContact		0-1	Contact address of the owner	Electronic mail address	TODO
5.3	ownerIdentifier		0-1	Identifier used to identify the owner	Free text, should be a globally unique identifier	Agent_Identifier
5.3.1	ownerIdentifierType		1	Type of the identifier		
6-10	Model information (see below)					Infrastructure.Instance.model

Figure 5: In-progress mapping of the PIDINST metadata schema to the refactored CERIF

The *cfEquip* entity included in version 1.6 of the Common European Research Information Format (CERIF) data model mentioned at the start of this section predates the work of the PIDINST WG though. This means that an important part of the INST-DSpace project is to update the *cfEquip* entity to align it with the PIDINST metadata schema. This update – see fig 5 above – takes place in the context of the CERIF Refactoring project ([Dvořák & Ivanović, 2021](#)) and involves the mapping of the PIDINST schema to the refactored CERIF. A new module for instruments will be included in the refactored CERIF as a result.

Once this CERIFed PIDINST metadata schema is available, it will be implemented in the euroCRIS DSpace-CRIS system at <https://dspacecris.eurocris.org/> where some testing will be performed for the cross-linking of research entities – connecting research projects and outputs to specific instruments and facilities.

3 Equipment in the Hamburg University of Technology TORE

The DSpace-CRIS-based institutional CRIS TORE (TUHH Open Research) at the Hamburg University of Technology at <https://tore.tuhh.de/> is the sole instance of DSpace-CRIS at the time of writing that already includes research equipment in its institutional research graph. Moreover, the TORE system managers have also minted DataCite DOIs for the instruments and facilities contained in their institutional CRIS. As a result, the TUHH is the only organisation operating a DSpace-CRIS system featured on the list of institutions compiled by the PIDINST WG that have already issued persistent identifiers for their research equipment (snapshot below taken on 30 June 2026).

▼ Owner frequency by PID provider

Show individual owners

Owner	DataCite (n)	B2INST (n)
University of Rostock	0	1420
► Helmholtz Centre for Environmental Research - UFZ	0	804
Cardiff University 	518	0
► Karlsruhe Institute of Technology (KIT)	0	286
Helmholtz Centre Potsdam - German Research Centre for Geosciences GFZ	0	164
University of Oxford 	156	0
Forschungszentrum Jülich GmbH	0	127
Center for Open Science 	110	0
University of Reading 	58	0
University of Glasgow 	48	0
TUHH Universitätsbibliothek	40	0
Science and Technology Facilities Council 	37	0
Princeton Center for Complex Materials	34	0

Figure 6: PID-issuing institutions for their research equipment via DataCite (DOIs) or B2INST (handles)

The metadata schema applied for the description of instruments in TORE is also aligned with the PIDINST schema – including elements such as manufacturer and model. The example record on figure 7 below shows the first entity cross-linking too, with an instrument connected to its manager (a ‘person’ entity in the CERIF model) and to the TUHH Department where the instruments sits (‘OrgUnit’ in CERIF terms).

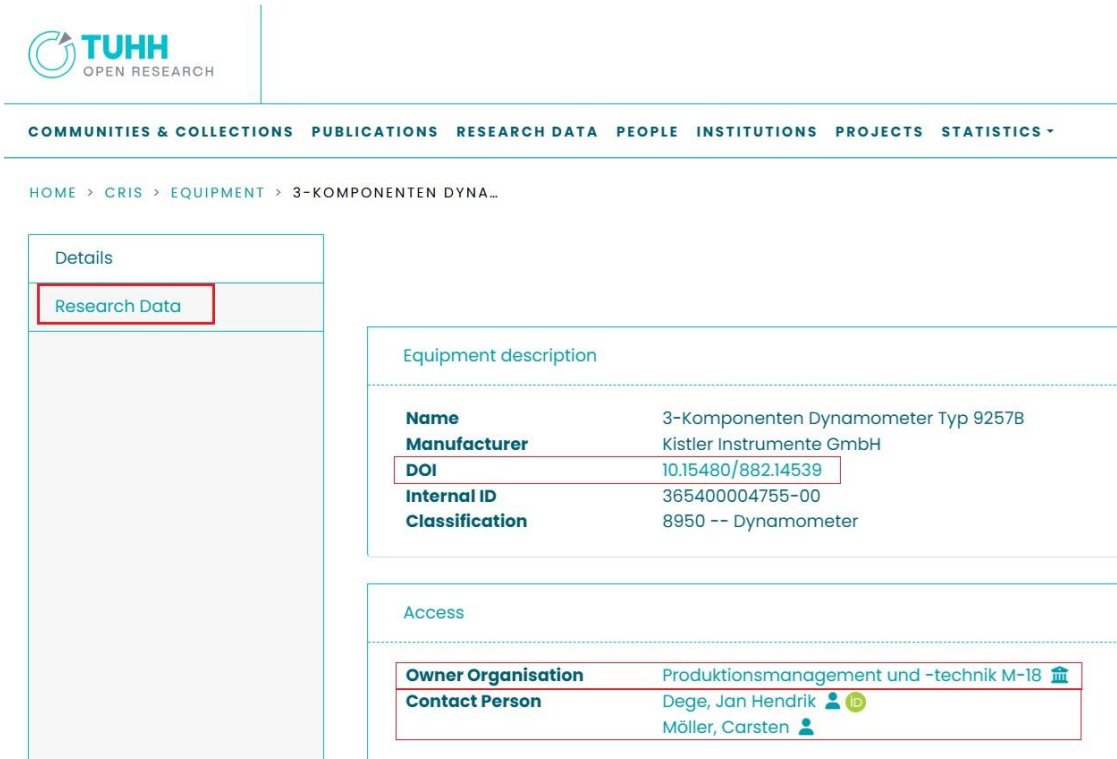


Figure 7: Example for research equipment record in the DSpace-CRIS-based TORE CRIS at the TUHH

Once the research equipment has been added to the system and linked to its research staff and department, the next step is to cross-link the instruments and facilities to other research entities, such as projects and research outputs. These outputs include research publications and datasets alike, plus potentially other categories such as software. This deeper cross-entity linking work is already underway at the Hamburg University of Technology, where datasets arising from the use of specific research equipment are already being connected to the equipment record in the system as shown on figure 8 below. This is being achieved by including an additional metadata element for equipment in the metadata sets for publications or datasets.

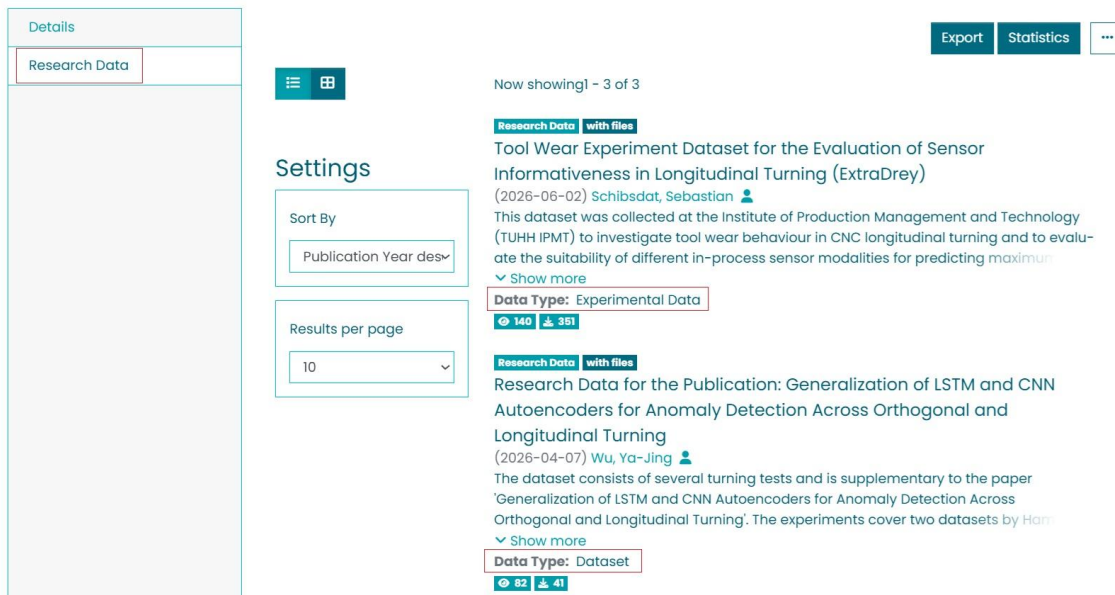


Figure 8: Research datasets linked to the research equipment record in TORE shown on fig 6

Besides the configuration of the metadata sets for their research equipment and connected entities, the work to incorporate these instruments and facilities onto TORE done at the TUHH is also a good example for the demanding nature of the information collection workflows for these specific objects. As mentioned elsewhere (De Castro et al., 2023), PIDs for instruments and facilities are a difficult area to navigate due to the highly distributed network of institutional services involved in the procurement, management and operation of these objects. It's in fact far from clear that the research library should systematically have any access to the research information on instruments and facilities – this would in a best-case scenario sit with the institutional research office and especially with the researchers themselves, but typically in a fragmented manner where each institutional unit takes care of a different side of the research equipment-related operations mentioned above.

In a 2025 blog post (Siemers & Weidt, 2025), a member of the TORE management team described the process to add large-scale research instruments and facilities at the TUHH to their TORE CRIS. This was first and foremost made possible by the fact that the university had previously created an institutional equipment database (linked at the top of the blog post by Gunnar Weidt) by importing the relevant information from the asset accounting system (running on SAP). This asset accounting system would typically be operated by the institutional finance team, so the whole process for including these instruments and facilities in the institutional CRIS is testament to the very successful internal coordination between different services at the TUHH – it's noteworthy in this regard that the blog post is co-authored with the researcher leading the 'Zentrallabor' service at the university at <https://www.tuhh.de/zentrallabor/zentrallabor>.

There are hence several overlapping use cases being simultaneously addressed by the inclusion of instruments and facilities into the institutional research graph at the TUHH, some of them sitting on the research side – such as more visibility for the equipment and increased opportunities for internal and external research collaborations – and some others on the research information management side, like openly linking the instruments and facilities to their managers and departments or – eventually – being able to provide on-the-fly reports on the usage of research equipment for the production of research outputs.

4 A few areas where the inclusion of equipment in the research graph could make a difference

While the INST-DSpace project is primarily about DSpace-CRIS systems being able to expose information on institutional research equipment and facilities, there is a number of areas downstream of the project that the expansion of the practice proposed in it would help reinforce. Some of these areas are:

1. The ability of open-source software solutions like DSpace-CRIS to contribute to national/regional-level aggregations for available research infrastructure for visibility and reporting. There are examples for both national and international pooling of research equipment to benefit from the economy of scale. The Jisc Equipment Data Service in the United Kingdom referenced in [4] is a good example for the former, while several European University Alliances that have already managed to put together joint equipment databases (see an example on figure 9 below) showcase the value of this development to further promote cross-institutional, cross-country research collaborations within the alliance ([De Castro et al., 2025](#)).

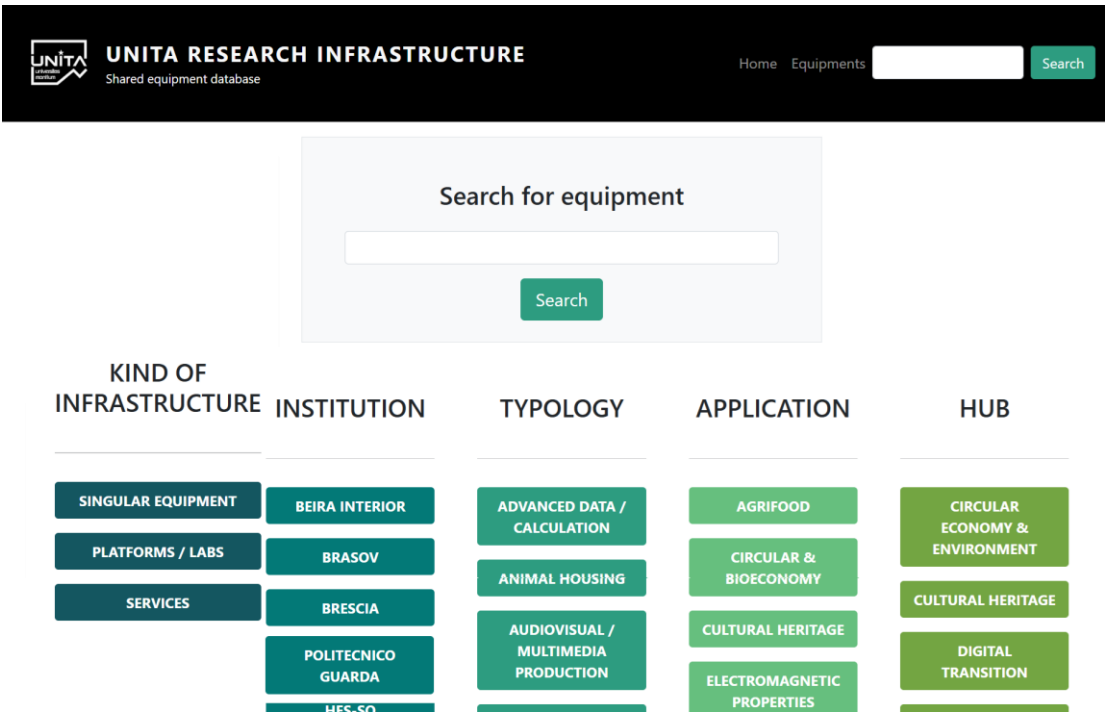


Figure 9: Shared equipment database for the UNITA University Alliance, <https://reunitaresearchinfrastructure.i3a.es/>

2. To map (and eventually report on) the use of equipment/facilities, including collaborations with Industry. This aspiration occurs within a wider European-wide momentum to try and monitor the impact of large-scale instruments and facilities on the socio-economic activity in the

geography where these research infrastructures are physically located. The recent ‘input note’ [for the European Commission] published by the CESAER Association of Universities of Science and Technology (CESAER, 2026) provides a good example. This note suggests a number of Key Performance Indicators (KPI) for the monitoring of and reporting on technology infrastructures. With their characteristic wealth of research information, CRIS systems are particularly well placed to collect the data and produce the reporting *on a live basis* that this note calls for.

3. To visibilise the contribution of technicians to the research endeavour. Even after the CRediT Contributor Role Taxonomy was devised at <https://credit.niso.org/>, technicians operating specific research equipment are frequently left out of the list of coauthors for the publications or datasets produced by means of that instrument or facility. The addition of research equipment to the institutional research graph will increase the opportunities for this contribution to become more visible.

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