

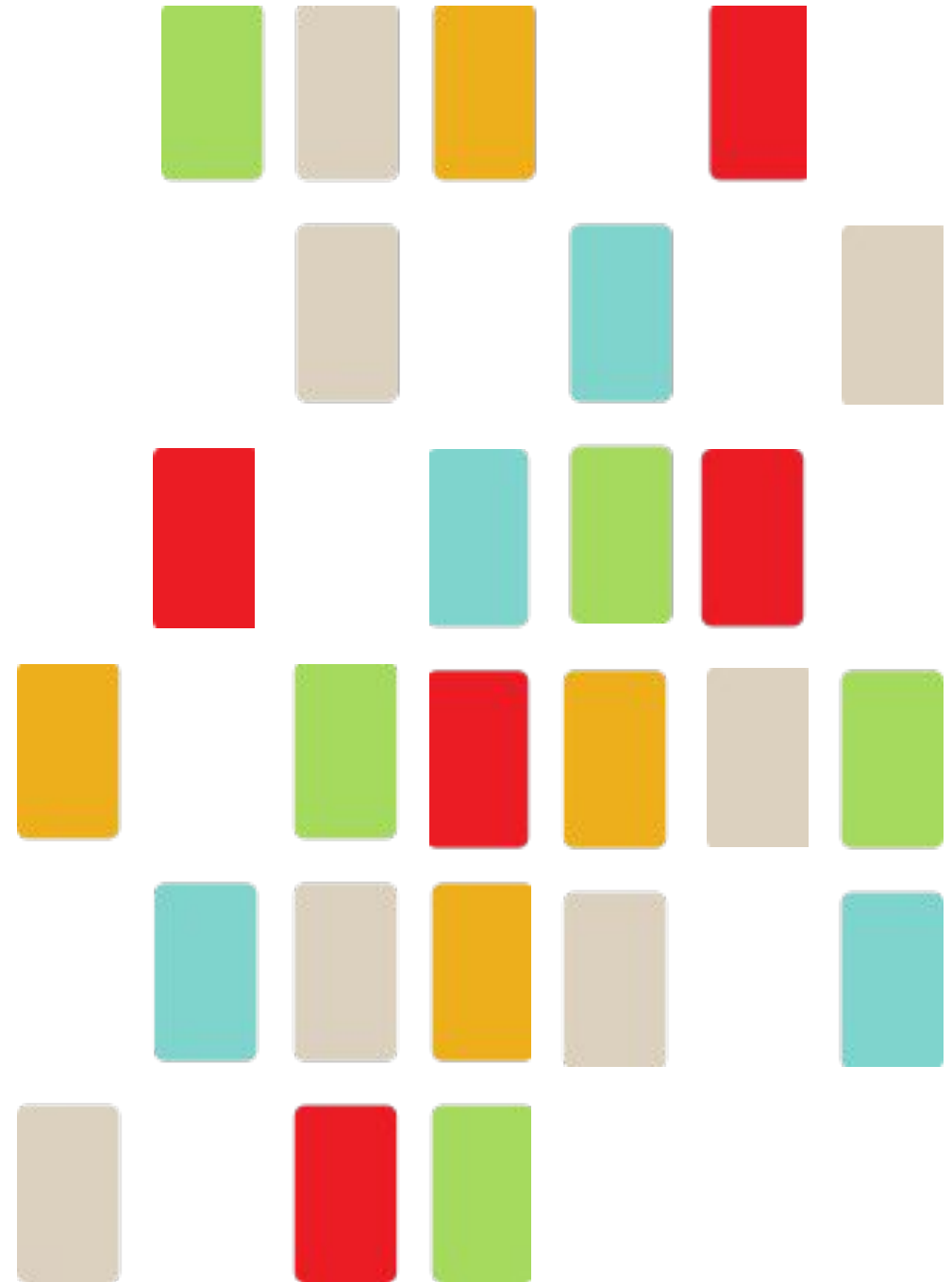
TOWARDS FAIR DIGITAL OBJECTS FOR HERITAGE SCIENCE DATA

Wim Fremout, *Royal Institute for Cultural Heritage, Brussels*

Joseph Padfield, *The National Gallery, London*

Sophia Sotiropoulou, *FORTH-IESL, Heraklion*

Wolfgang Schmidle, *Free University of Berlin, Berlin*





E-RIHS

EUROPEAN RESEARCH INFRASTRUCTURE
FOR HERITAGE SCIENCE

HERITAGE SCIENCE

... is the interdisciplinary domain of scientific study of cultural and natural heritage. It draws on diverse humanities, sciences and engineering disciplines.

- *Wikipedia*

E-RIHS: THE EUROPEAN RESEARCH INFRASTRUCTURE FOR HERITAGE SCIENCE

E-RIHS is a distributed Research Infrastructure with a formal structure and two operational levels: a Central Hub (or Headquarters) and 14 National Nodes.

We will take the legal form of a European Research Infrastructure Consortium (ERIC) early 2025.



SERVICES OFFERED BY E-RIHS



HS Academy

Training activities.



ARCHLAB

Access to organized scientific information in largely unpublished datasets and samples in archives of prestigious European museums, galleries and research institutions.



FIXLAB

Access to key fixed research facilities with sophisticated state-of-the-art instrumentation for advanced diagnostics and archaeometry.



MOLAB

Access to state of the art mobile equipment and related competencies, for in-situ non-destructive measurements of artworks, collections, monuments and sites.



DIGILAB

Online access to data predominately generated by E-RIHS, complemented with digital tools for processing, analyzing, and interpreting data.

CATALOGUE OF SERVICES

IPERION HS CATALOGUE

<https://www.iperionhs.eu/iperion-hsaccess/>

- Central list of facilities with detailed descriptions
- Online access application forms
- Online proposal management system

E-RIHS CATALOGUE

Under construction



Search

Platform
 View all ▼

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

MOLAB • CATEGORY: 2D/3D ANALYSIS

TECHNIQUE: 3D STRUCTURE-LIGHT SCANNER AND 3D LASER SCANNERS

TOOL: 3D STRUCTURE-LIGHT SCANNER AND 3D LASER SCANNERS SYSTEM 🛒

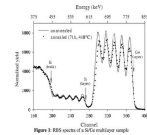
3D structure-light scanner: works with white light and does not acquire colour information. It is equipped with a CMOS 5 Megapixel camera and three different sets of lenses. The S60, with a field of view of 49x40mm and a maximum resolution of 0.02mm. The S125, with a field of view of 116x98mm and a maximum...

Provider: **Science and Technology in Archaeology and Culture Research Center** Country: **Cyprus**



FIXLAB > CATEGORY: Ion Beam analysis techniques

Rutherford Backscattering Spectroscopy (RBS)



Rutherford Backscattering Spectrometry (RBS) is a non-destructive analytical surface technique for the determination of the structure and composition of materials. RBS is based on the measurement of the backscattering of an energetic ion beam (typically protons or alpha particles of the MeV range) impinging on a sample. The energy of the backscattered particles depends on two parameters: i) the nature of the target atom (the heavier, the higher energy) and ii) its location from the surface (the incident particle loses energy in the material then is backscattered and loses energy again to get out of the material). The technique gives access to depth profile concentration of elements. It is particularly efficient for heavy elements on light substrates (glazings, lustrated ceramics, ...)

Fields of application

Cultural heritage
architecture, art, decorative arts, demo-anthropologic object, film, manuscript, mosaics, musical instrument, other, painting, papyrus, photo, sculpture, textile, archaeological object

Natural heritage
animal product, botanic collection, fossil, mineral object, in formalin, other, shell, skeleton, taxidermy collection

Materials

Inorganic
glass, stone, metal and metallurgical By-Products, ceramic (clay, mud brick, terracotta, earthenware, stoneware, porcelain), pigment

organic
wood, paper, textiles, parchment

Provider: **Ion Beams Laboratory**

TOOLS

FIXLAB • CATEGORY: AGEING TECHNIQUES

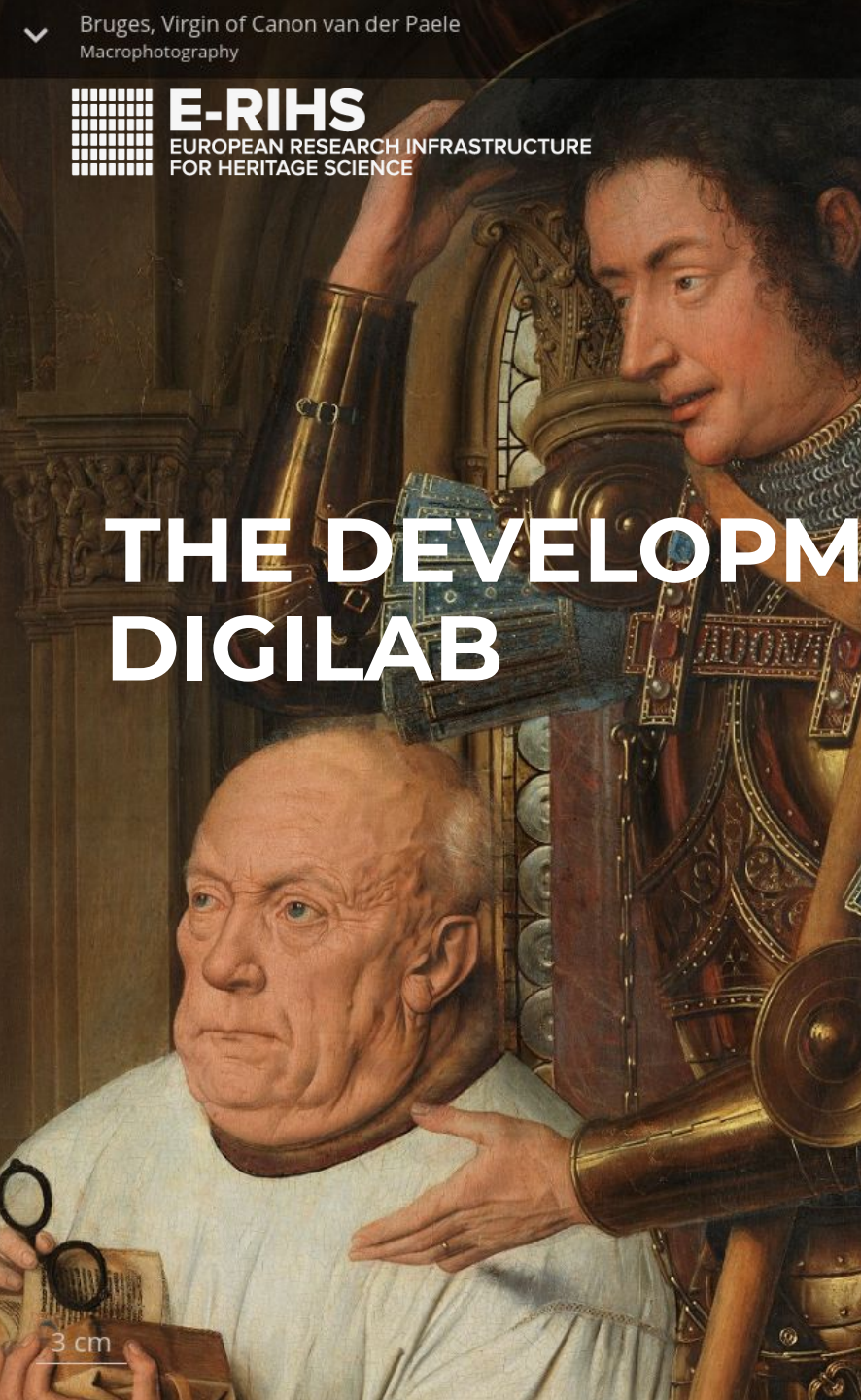
TECHNIQUE: ACCELERATED ARTIFICIAL AGEING FOLLOWED BY MECHANICAL TESTING AND SPECTROPHOTOMETRY

TOOL: ACCELERATED AGEING TOOL 🛒

Exposure of samples to artificial conditions for ageing studies using: - KBF climatic chamber from WBT Binder with controlled temperature and humidity; - Exposure to light for accelerate degradation using simulated sunlight (Hoenle solar simulator SOL lamp) or museum/gallery type lighting (LED or fluorescent).

Provider: Country:

THE DEVELOPMENT OF DIGILAB



CONCEPTUAL PLAN OF DIGILAB

STEP 1

Building the digital infrastructure

- Services for managing users and access
- Tools & services for Data Lifecycle (ingestion, indexing, storage, preservation)
- Linking heritage assets, questions and protocols with instruments & human skills belonging to 'services'

STEP 2

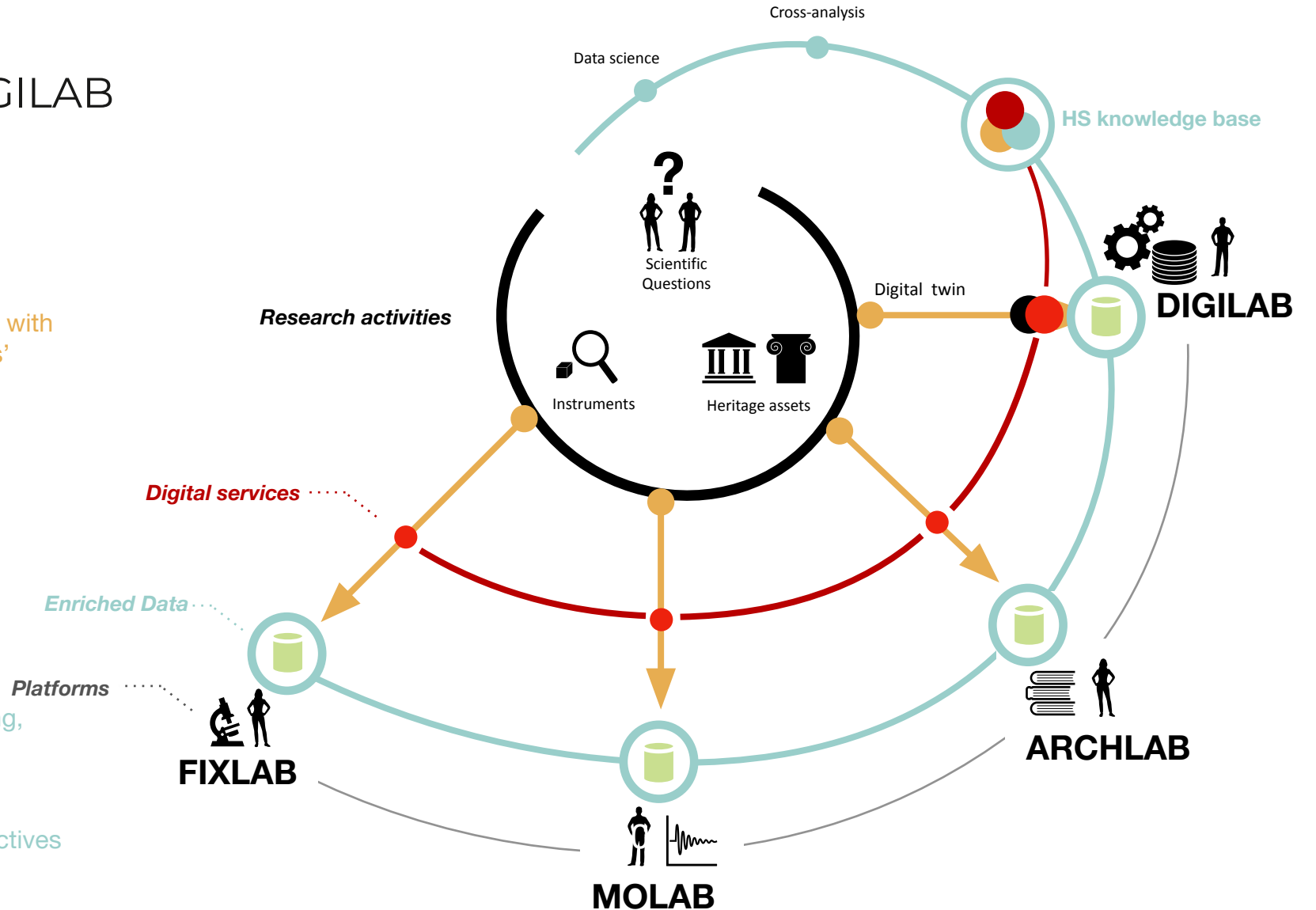
Building the digital research environment

- Integrated digital services
 - core services (DIGILAB)
 - tailored services (ARCHLAB, FIXLAB, MOLAB)
- Digital twin operational framework

STEP 3

Building the HS knowledge base

- Establish a co-production framework (data sharing, enrichment, re-use)
- Building digital commons (digital twins, data & knowledge)
- Towards cross-analysis and data science perspectives

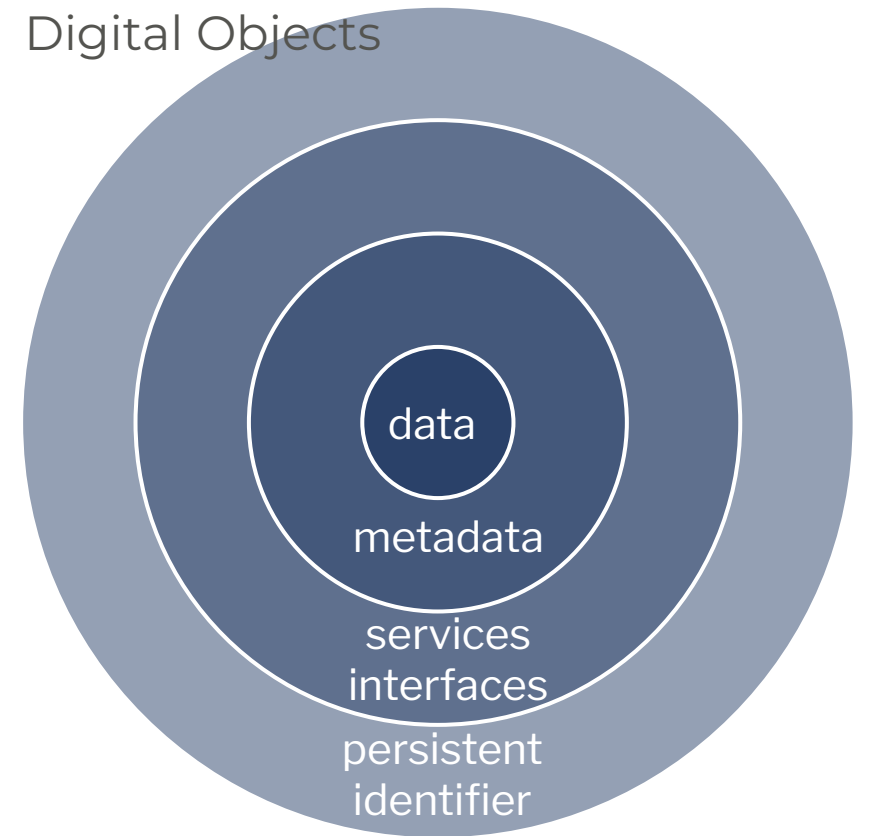


PRACTICAL APPROACH

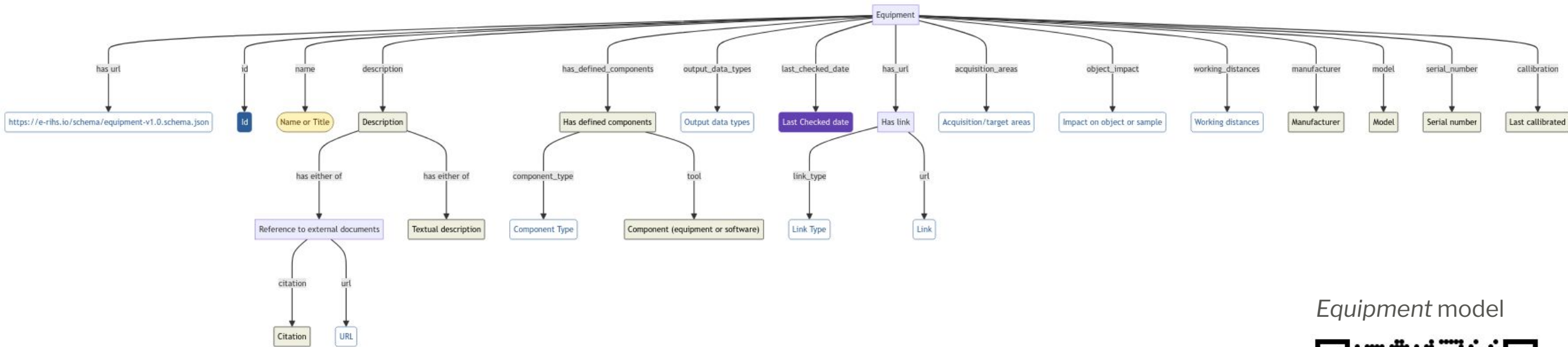


- Embracing the concept of FAIR digital objects
- Modelling of (interlinked) data types
 - Services
 - Methods, Techniques, equipment, software
 - Persons, Organisations
 - Catalogues
 - Projects
 - Research focus, Object, Sample
 - Research Activity
 - Examination
 - ...

Model for FAIR Digital Objects



PRACTICAL APPROACH

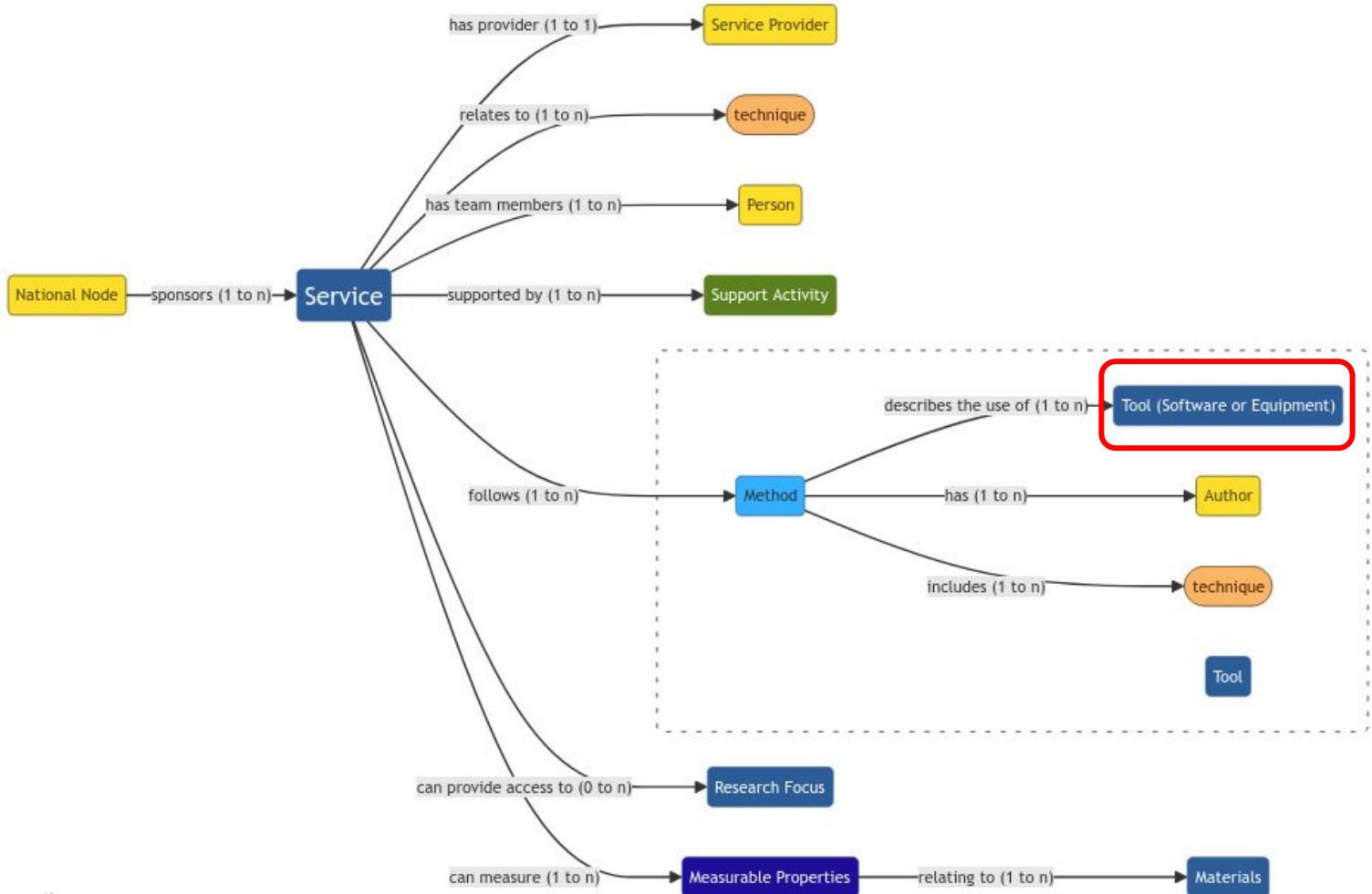


Equipment model



Simple Dynamic Modelling tool: <https://research.ng-london.org.uk/modelling>
Code: <https://github.com/ipadfield/dynamic-modelling> (MIT)

PRACTICAL APPROACH



Service links



PRACTICAL APPROACH



```

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    "description",
    "last_checked_date"
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    },
    "id": {
      "type": "string",
      "cordra": {
        "type": {
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        }
      }
    },
    "name": {
      "title": "Name or Title",
      "description": "The simple name or title for this particular piece of equipment in a particular organisation and that is often equipped with a unique set of optional parts. The main goal of this name is to enable you to easily identify the equipment when referring to it from within another description. It is generally not a good idea to
  
```



Schema repository:
<https://e-rihs.io/schema>

Equipment schema v1.0



PRACTICAL APPROACH



KIK-IRPA SEM-EDS-WDS

Id: 21.11158/TEST/01ba-dfb8-03dc-9f39

Type: Equipment

OBJECT
ACL
VERSIONS
METHODS
DO VIEW / DETAILS
RELATIVES

Edit

View JSON JSON

Equipment

id
21.11158/TEST/01ba-dfb8-03dc-9f39

Name or Title *
KIK-IRPA SEM-EDS-WDS

The simple name or title for this particular piece of equipment in a particular organisation and that is often equipped with a unique set of optional parts. The main goal of this name is to enable you to easily identify the equipment when referring to it from within another description. It is generally not a good idea to use the technique name or the commercial name of the equipment, since these might not be unique within E-RIHS. One general recommendation is to prepend the name with your organisation acronym.

Description *Textual description*
Scanning electron microscope equipped with secondary electron detector (SE), backscattered detector (BSE), energy-dispersive x-ray detector (EDS) and wavelength-dispersive x-ray detector (WDS). Two types of thermionic electron sources can be fitted: tungsten or lanthanum hexaboride. Working modes: high vacuum, "variable pressure" (10 - 375 Pa) and "extended pressure" (375 - 4000 Pa). In EP, the system can be optionally operated with a peltier cooled stage and a water vapour kit.

A longer description of the equipment, or a reference to an external document.

Output data types

The type of output data that the equipment creates. This dropdown list gives a few examples, but if required, you can enter a different value here.

Output data type 1 *
Image/Gray scale

Output data type 2 *
Dataset/Data package (images, spectra, other)

Output data type 3 *



Cordra is a highly configurable open source software offered to software developers for managing digital objects with resolvable identifiers at scale.

Optimized for handling NoSQL information.

Integrates popular storage and indexing solutions, and presents a unified interface.

Provides configurable hooks to validate and update information at various stages of a digital object lifecycle.

<https://www.cordra.org/>

DIGILAB PILOT SERVICES

data.e-rihs.io

- Metadata and paradata storage
- Data storage through central (Zenodo?) and federated repositories
- API access and administrative user interface
- Scalability
- Supports powerful search indexers (Lucene, Solr, Elasticsearch)
- ORCID authentication



vocab.e-rihs.io

- Currently: providing controlled lists to schemas
Using script developed by NG
- Future: E-RIHS vocabularies
- Link to terms in other relevant vocabularies (e.g. AAT)
- SKOS compliant



hdl.e-rihs.io*

- Persistent identifiers
- Prefix (21.11158) supplied by PIDconsortium
- Highly reliable and scalable
- Integrates with Cordra, OpenTheso...



(* URL not yet active)

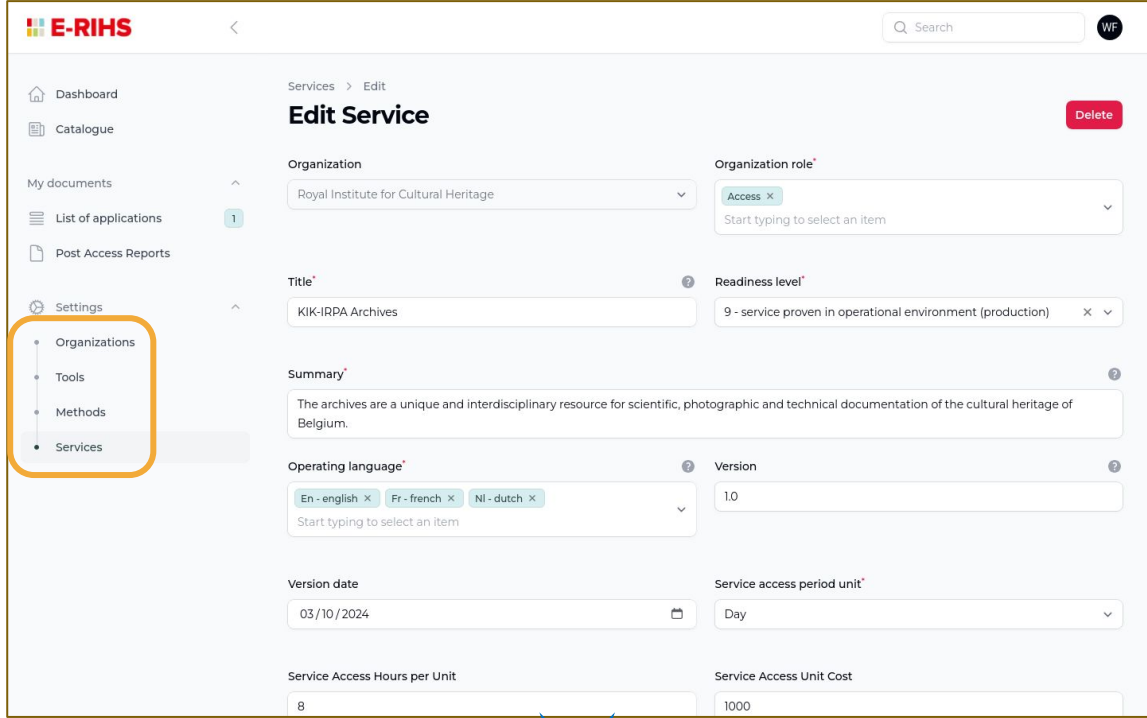
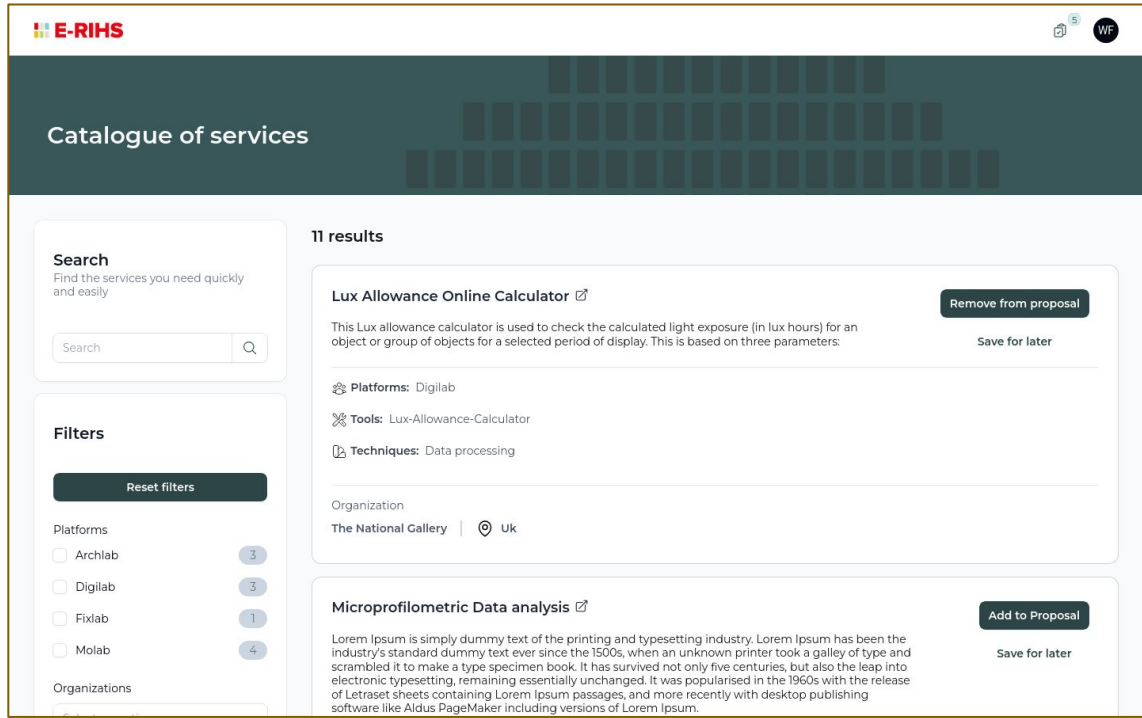
THE NEW CATALOGUE OF SERVICES



THE NEW CATALOGUE OF SERVICES

 e-rihs.io/schema

 vocab.e-rihs.io



Developed by Net7 for E-RIHS,
currently being tested before release.

 data.e-rihs.io

CONCLUSIONS & FUTURE WORK

- Modelling work done on a large part of the E-RIHS knowledge graph
 - From models to JSON Schema
 - Pilot services set-up: Handle, Cordra, Opentheso
 - Soon to be used for the E-RIHS Catalogue of Services
- Future work
 - More work to be done, e.g. on metadata for scientific experiments
 - Integration of E-RIHS data in the European Collaborative Cloud for Cultural Heritage (ECCCH - EC initiative); participation in the ECHOES project
 - Mapping to CIDOC-CRM ontology
 - Towards FAIR Digital Objects (FDOs)





THANK YOU

wim.fremout@kikirpa.be

joseph.padfield@nationalgallery.org.uk

sophiaso@iesl.forth.gr

wolfgang.schmidle@fu-berlin.de



Royal Institute for
Cultural Heritage

THE
NATIONAL
GALLERY



FORTH
FOUNDATION FOR RESEARCH AND TECHNOLOGY - HELLAS

Freie Universität  Berlin



E-RIHS

EUROPEAN RESEARCH INFRASTRUCTURE
FOR HERITAGE SCIENCE