

DIGILAB

Implementation Plan

Livio De Luca, Anaïs Guillem

With contributions from: Isabel Bernal, Alberto Bucciero, Emanuel Demetrescu, Monica Dinu, Brenda Doherty, Wim Fremout, Sorin Hermon, Joseph Padfield, Sophia Sotiropoulou, Vania Virgili



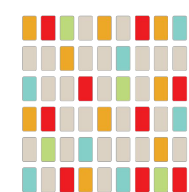
IMPLEMENTATION Phase



Source: Deliverable 5.1 DIGILAB Implementation Plan

Presentation outline:

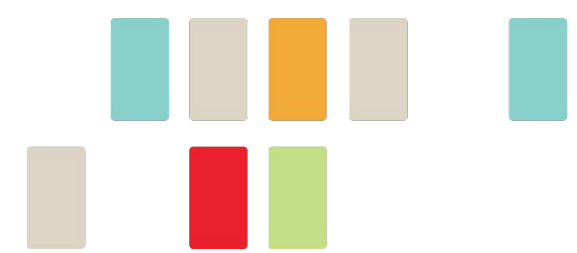
- 1- Understand the HS community and needs: E-RIHS Community Workshops
- 2- DIGILAB definition and overall schema
- 3- DIGILAB implementation layers
- 4- DIGILAB key needs
- 5- DIGILAB within the EU initiatives and timeline



E-RIHS

EUROPEAN RESEARCH INFRASTRUCTURE
FOR HERITAGE SCIENCE

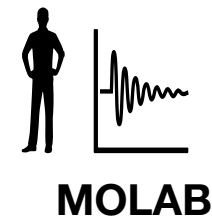
1- Understand the HS community and needs: workshops



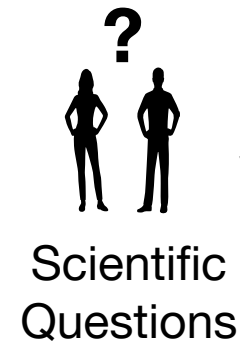
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E-RIHS Community Workshops: understanding the HS community

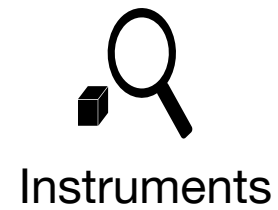
Research activities



MOLAB



Scientific Questions



Instruments

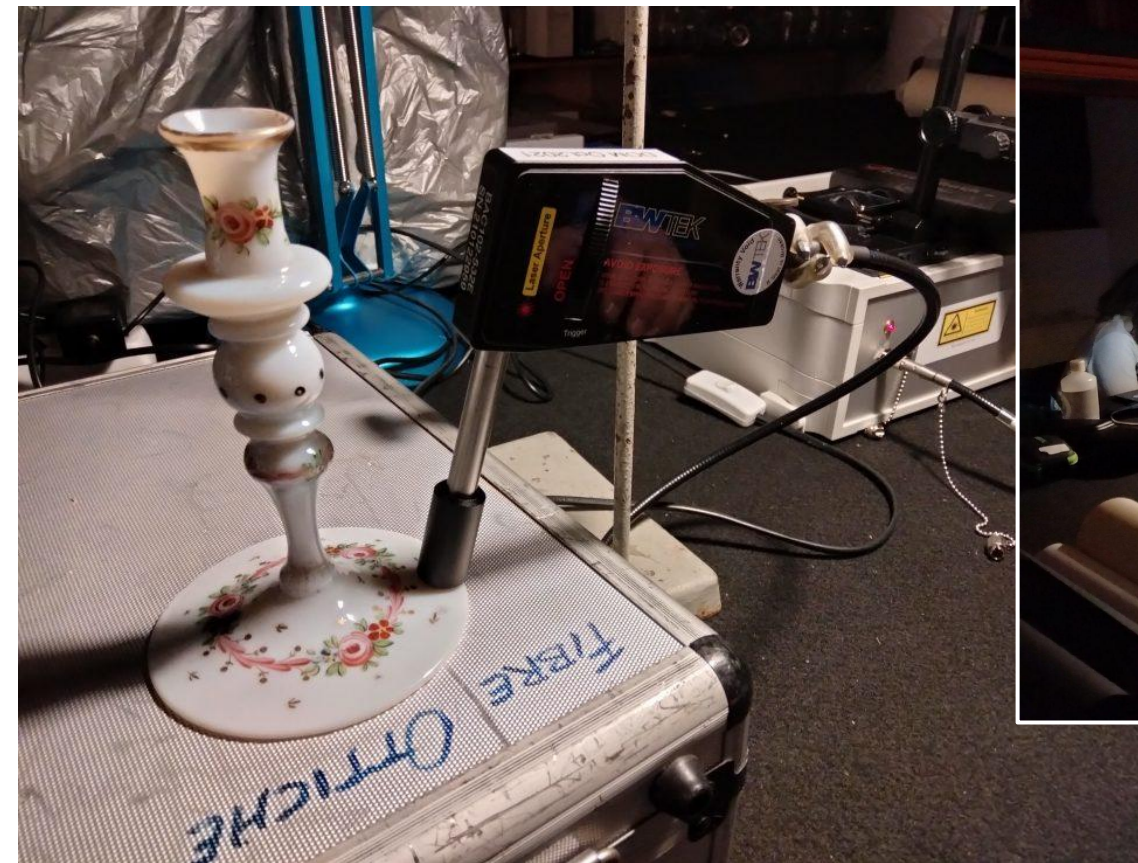


DIGILAB



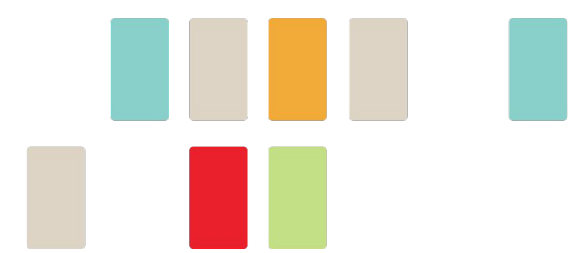
Heritage assets

- Data Nature and Management
- Research Objectives and Processes
- Challenges and Data Sharing
- Impact on Research



GRANJA– Teresa Palomar (Institute of Ceramic and Glass (ICV-CSIC)): _ Historical evolution of high-quality glass pieces from the Spanish Royal Glass Factory “La Granja” (IperionHS website)

1- Understand the HS community and needs: workshops



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E-RIHS Community Workshops

- Who participated in the workshops?

Users and providers from **MOLAB**, **FIXLAB** and **ARCHLAB**

- Format:

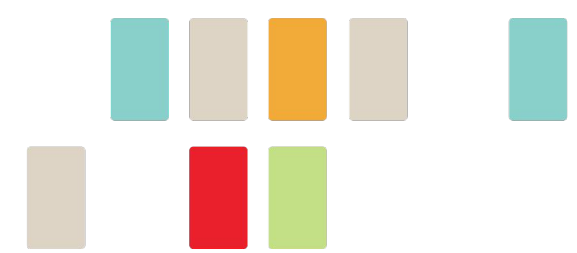
2-hour workshops dedicated to **MOLAB**, **FIXLAB** and **ARCHLAB**

online group discussion about experience sharing

-> bottom-up approach of community needs

Date	2024-02-08 10-12am CET	2024-02-15 10-12am CET	2024-02-22 10-12am CET
Workshop #	Workshop 1	Workshop 2	Workshop 3
	FIXLAB 	ARCHLAB 	MOLAB 
Workshop title	From FIXLAB to DIGILAB through Digital Data	From ARCHLAB to DIGILAB through Digital Data	From MOLAB to DIGILAB through Digital Data
Workshop participants	<p>USERS: Ina Reiche, Katarina Muller, Diego Quintero Balbas, Lucrezia Milillo</p> <p>PROVIDER: Marei Hacke</p>	<p>USERS: Romain Thomas, Francesca Gherardi, Marya Albrecht</p> <p>PROVIDERS: Ineke Joosten, Maria Martin Gil</p>	<p>USERS: Thea Winther, Crescenzo Violante, Teresa Palomar</p> <p>PROVIDERS: David Buti, Vincent Detalle</p>

1- Understand the HS community and needs: workshops



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Workshop outline and topics:

Welcome, Introduction, and icebreaker:
roundtable of introduction

Part1: Presentations: community feedback, experience, discussion

Part 2: Discussion: data and processes of the research

A/Data Production and Management

B/Objectives, Processes, and Impacts

C/Challenges and Data Sharing Practices

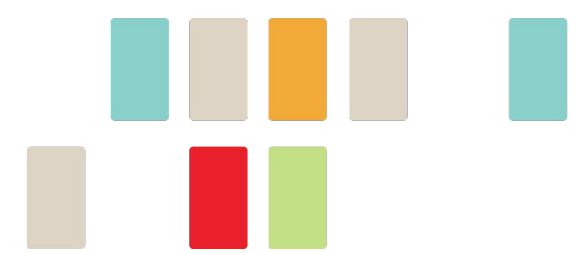
Conclusions

Example of workshop questions:

- Can you detail how the service used contributed to the production, management, and use of data in response to your research question?
- How were this data integrated into your research process?

- How were the objectives of your interaction with the data realized through the service?
- What processes did you implement to ensure the data effectively served your research goals?

- What challenges did you encounter in using the data for your research and in sharing these data?
- How did you overcome these obstacles?



E-RIHS Community Workshops: understanding the HS community

Are there obstacles in our field or in technology that could threaten your research project?

Results:

- Bottom-up data extraction offering a large-scale overview of HS community
- Hand-on challenges regarding digital data and services
- Identification of real-life use cases to guide the implementation phase
- Identification of key needs for implementation
- Identification of key elements for implementation

1- Understand the HS community and needs: workshops

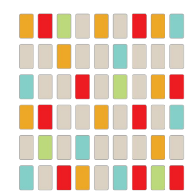


Key remarks:

#1-Digital and data are everywhere.

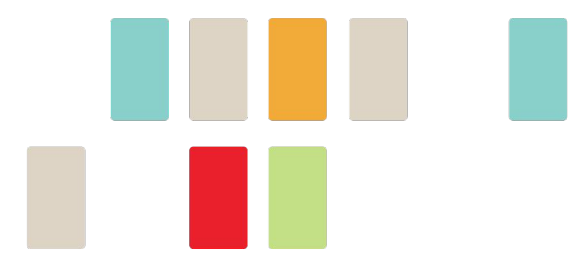
#2-The user/provider relationship is more than an access to a service: it is a co-construction of a shared experience, knowledge, and interdisciplinary expertise.

#3-The focus on the links between research questions, CH objects, and research activities is adopted to understand the needs of the research community and the needs about digital data and infrastructure.



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WHAT IS DIGILAB?

#1-Digital and data are everywhere.

#2-The user/provider relationship is more than the access to a service

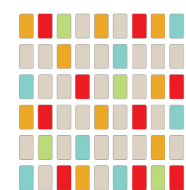
#3- Links between research questions, CH objects, and research protocols

DIGILAB is a **socio-technical platform** that digitally connects stakeholders with heritage objects and multidisciplinary studies, offering services for data centralization, curation, processing, visualization, and accessibility in heritage science.

It manages **data from other E-RIHS labs** (ARCHLAB, FIXLAB, MOLAB), generates its own data and knowledge, and provides tools within a virtual research environment for advanced scientific interpretation and analysis.

By promoting **shared protocols and harmonized workflows** and aligning with FAIR principles (Findable, Accessible, Interoperable, Reusable), DIGILAB aims to become the reference point for scientific documentation of heritage objects in conservation, restoration, and dissemination.

DIGILAB **enhances connections between research projects, data, and collaborative opportunities**, integrating cultural and historical contexts through humanistic inquiry to ensure a comprehensive understanding of heritage objects.



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Foundational Aims

To produce and integrate data representing the **complex physical and semantic features of heritage objects** from multiple disciplinary perspectives, as generated by E-RIHS-related scientific processes



Key Elements for Implementation

Digital twins. Bridge tangible (or intangible) heritage objects and their digital representations, structuring data and related knowledge.

To ensure the **maintenance and accessibility** of digital data and processes over time, supporting preservation and re-use of data.



Data production and continuous enrichment. Support the generation, enhancement, and analysis of data across ARCHLAB, FIXLAB, MOLAB and DIGILAB

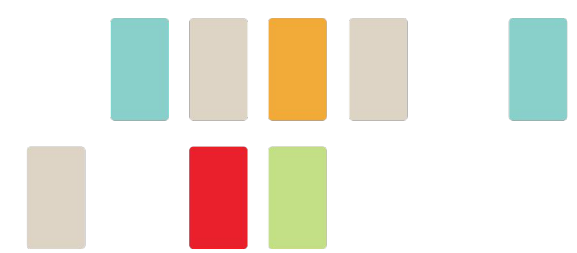
To build an **open and adaptable socio-technical system** that evolves with user needs, enabling continuous improvement and service adaptation



Research protocols. Combine heritage objects, scientific questions, and instruments within a unified framework.

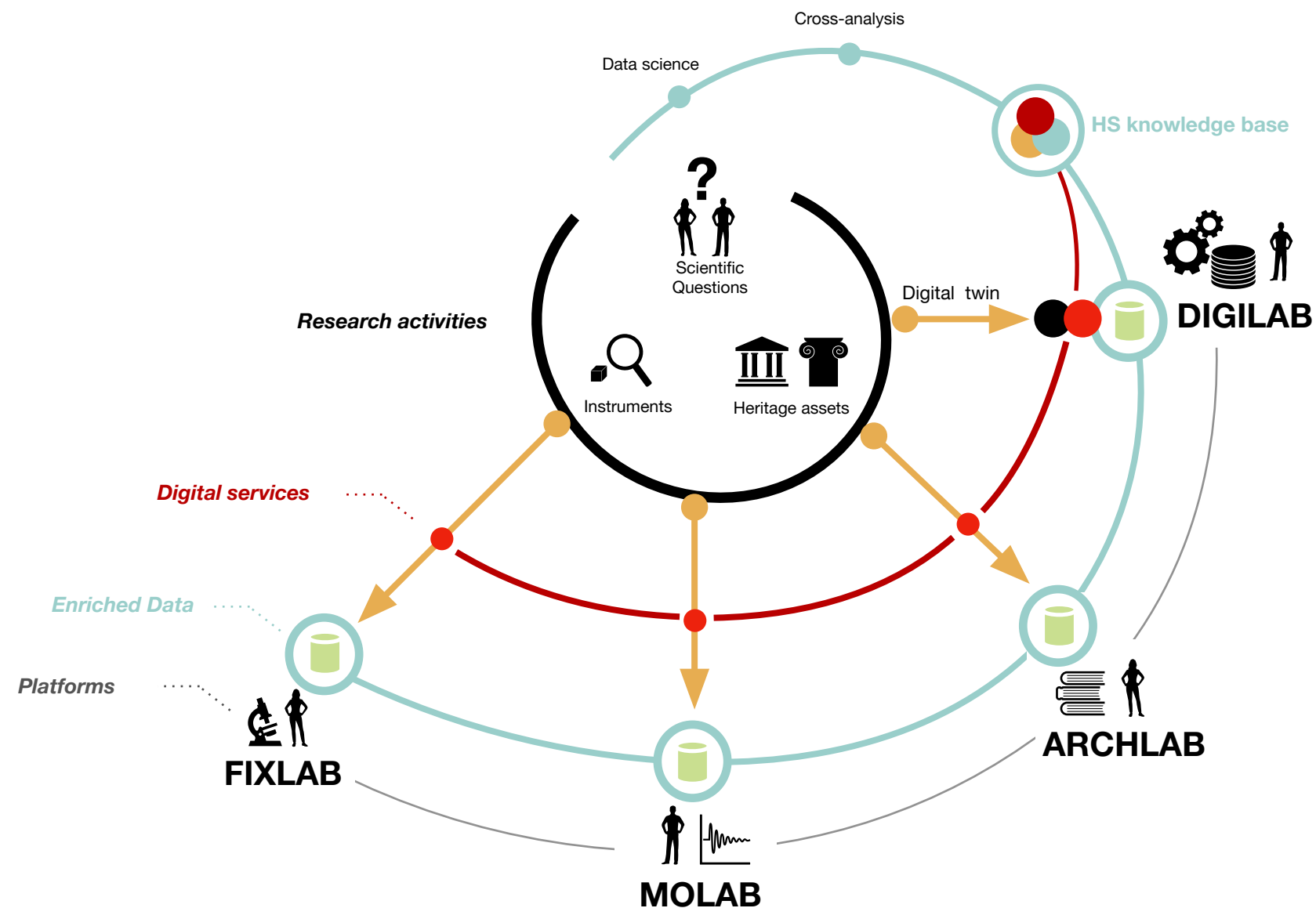
To actively promote and disseminate digital tools and services that not only support but also conduct Heritage Science research autonomously

2- DIGILAB definition and overall schema

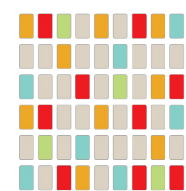


IMPLEMENTATION Phase

OVERALL SCHEMA



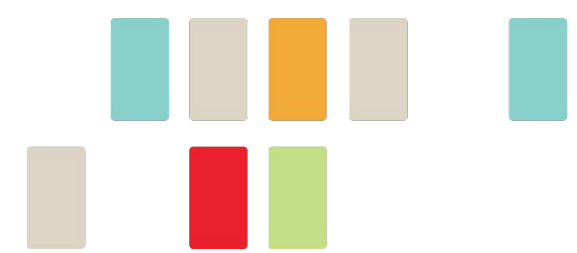
DIGILAB will interconnect *heritage objects, actors, scientific activities, and data into a cohesive system*, enabling extensive data analysis that reveals new patterns and relationships.



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3- DIGILAB implementation layers

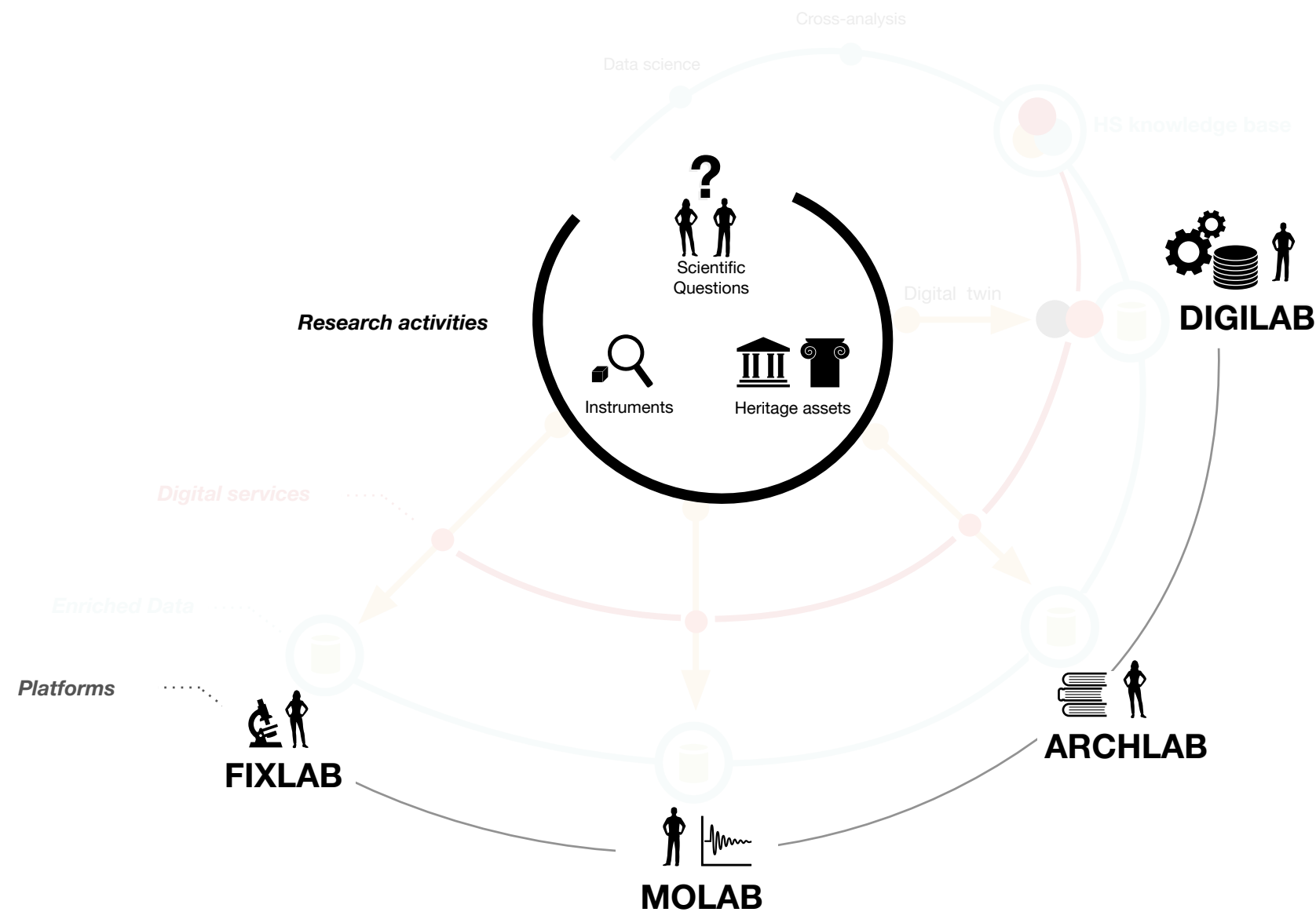


IMPLEMENTATION Phase

DIGILAB Implementation Layers

Layer 0 Community Building and Initial Digital Services Identification

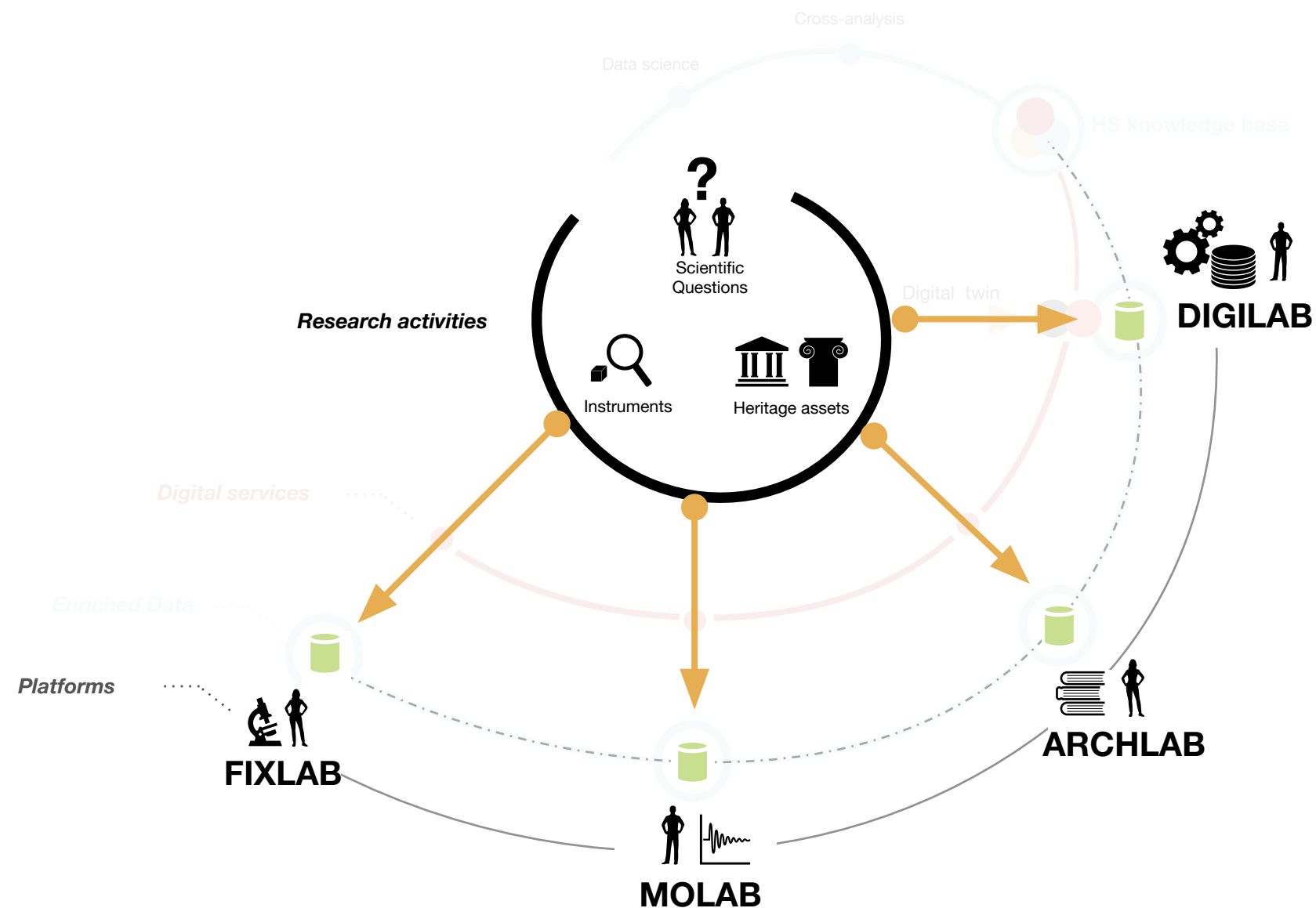
- creating a collaborative community within E-RIHS
- ensuring active engagement from stakeholder



3- DIGILAB implementation layers



DIGILAB Implementation Layers

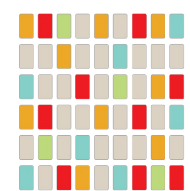


Layer 0 Community Building and Initial Digital Services Identification

- creating a collaborative community within E-RIHS
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Layer 1 Managing the Data Lifecycle

- establishing a framework that interlinks tools and services
- facilitating integration and interoperability



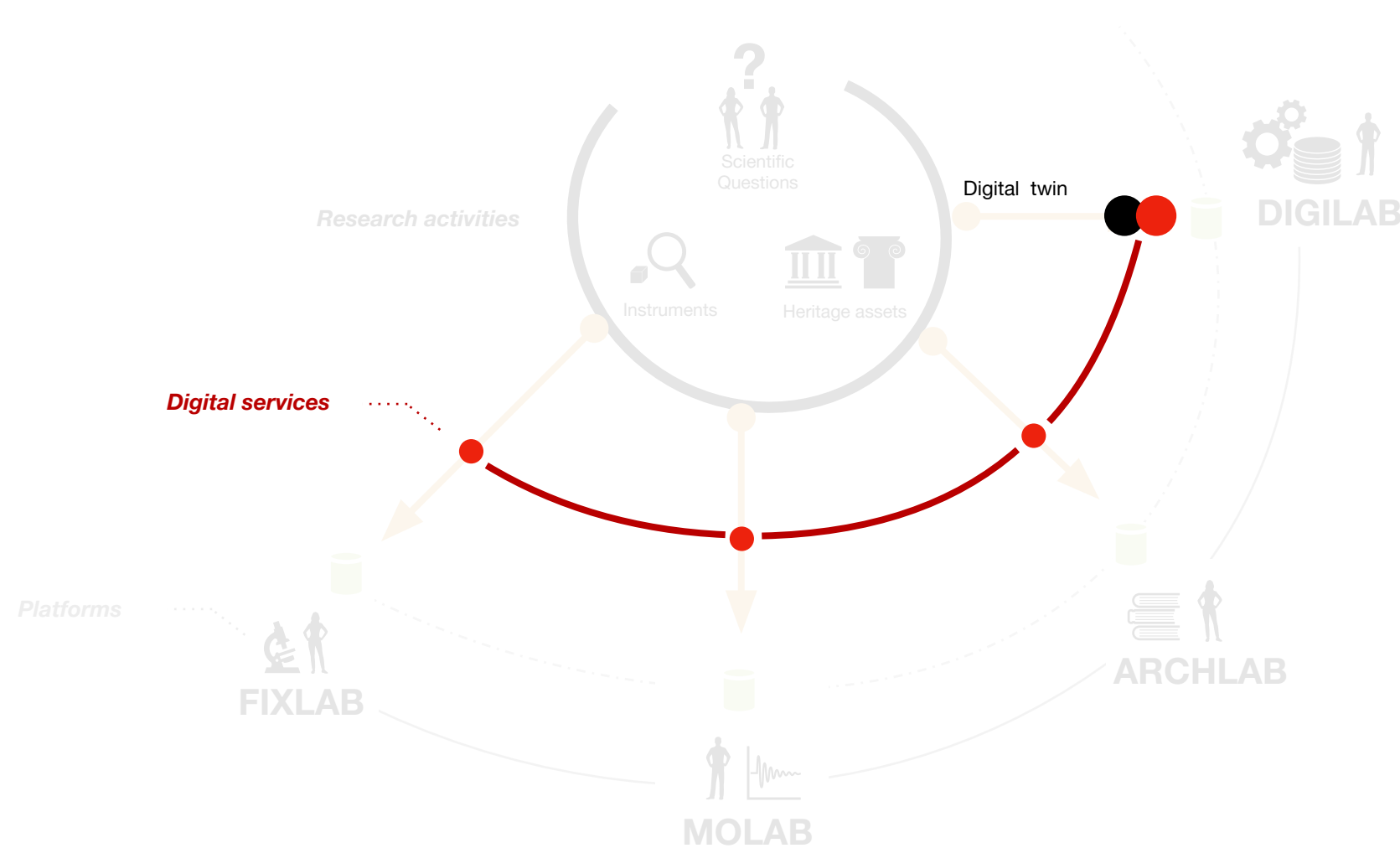
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3- DIGILAB implementation layers



DIGILAB Implementation Layers



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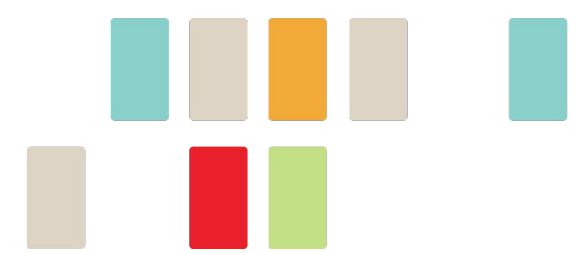
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Layer 2 Towards an Integrated Virtual Research Environment

- supports advanced research capabilities
- visualisation, annotation, and documentation



DIGILAB Implementation Layers



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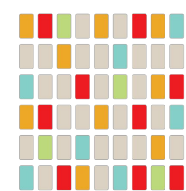
- establishing a framework that interlinks tools and services
- facilitating integration and interoperability

Layer 2 Towards an Integrated Virtual Research Environment

- supports advanced research capabilities
- visualisation, annotation, and documentation

Layer 3 Towards a Heritage Science Knowledge Base

- consolidates data and insights from heritage science research
- enabling advanced data analysis and knowledge discovery



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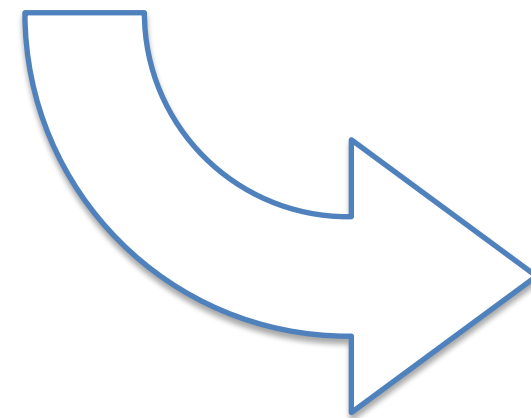
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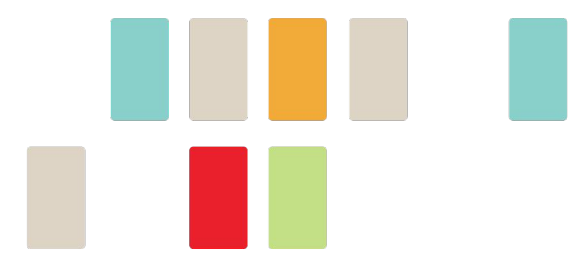
Layer 1 Managing the Data Lifecycle

Layer 2 Towards an Integrated Virtual Research Environment

Layer 3 Towards a Heritage Science Knowledge Base



1. Socio-Technical Challenges
2. Community Key Needs
3. Confrontation with Community Survey Results
4. Strategy for Implementation



DIGILAB Key needs and existing/planned solutions

Layer 0. Community Building and Initial Digital Services Identification

- **KN_A1** Community Integration and Collaboration
- **KN_A2** Virtual and Specialised Communication
- **KN_A3** Unified Access and Authentication
- **KN_A4** Identifying and Gathering Initial Digital Services

Layer 1. Managing the Data Lifecycle

- **KN_B1** Data Ingestion and Normalisation
- **KN_B2** Data Storage, Organisation, and Retrieval
- **KN_B3** Long-Term Digital Data Preservation
- **KN_B4** Contextual Data Acquisition
- **KN_C1** Comprehensive Data Selection and Indexing
- **KN_C2** Data Corpora Exploration and Integration
- **KN_C3** Controlled Vocabulary Management

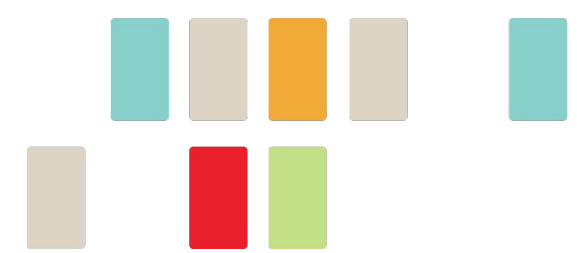
Layer 2. Towards an Integrated Virtual Research Environment

- **KN_D1** Advanced Visualisation and Annotation
- **KN_D2** Integration of Physical and Digital Information
- **KN_D3** Lifecycle Paradata and Provenance Management
- **KN_D4** Digital Twins and Continuum Management

Layer 3. Towards a Heritage Science Knowledge Base

- **KN_E1** Structured Workflow and Resource Models
- **KN_E2** Semantic Mapping for Interoperability
- **KN_E3** Automated and Manual Workflow Population
- **KN_F1** Multimodal and Dynamic Data Representation
- **KN_F2** Multi-Dimensional Visualisation and Knowledge Graphs
- **KN_F3** Comprehensive Search Engine Integration

4- DIGILAB key needs



IMPLEMENTATION Phase

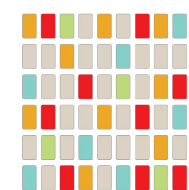
DIGILAB Implementation Layers

key needs >< tools and services (existing, already planned and to plan)

KEY NEEDS	TOOLS AND SERVICES		
	Existing (or starting point)	Already planned	To plan/implement
KN_A1 Community Integration and Collaboration	Software solutions for managing social networking, already experimented in research projects		A dedicated Forum, by using https://e-rihs.io as a starting point (organize online workshops and webinars to introduce and demonstrate the forum; develop a best practices guide for effective communication and collaboration; establish a feedback mechanism to gather user input and improve the platform).
KN_A2 Virtual and Specialized Communication	Platforms for Visio conferencing Web channels for archiving virtual events		Integrate Platforms for Visio conferencing and Web channels for archiving virtual events (develop a centralized scheduling and management system; implement a comprehensive archiving solution with metadata tagging; establish partnerships with existing conferencing platforms for tailored solutions).
KN_A3 Unified Access and Authentication	Several solutions already deployed at national level (or EU project level) ORCID OAuth2 as a single-sign-on service		A dedicated platform for social networking; develop a centralised user management system;
KN_A4 Identifying and Gathering Initial Digital Services	First survey done		Dedicated workshops for identifying and integrating existing and future digital services (organize thematic workshops with key stakeholders to map existing digital services and identify gaps; develop a collaborative digital catalog for existing services, tools, and datasets; establish a task force to monitor and evaluate new digital services for integration into DIGILAB).

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KN_B3 Long-Term Digital Data Preservation	CINES DIGITAL.CSIC HESCIDA/H-SEARCH	DIGILAB.it: Data processing and curation module (E-RIHS@H2IOSC)	Design a decentralised preservation repository network
KN_B4 Contextual Data Acquisition	Experimental tools: Memos (FSP-CNRS), OpenAire Broker in DIGITAL.CSIC - to manage suggestions for semantic enrichments of research outputs		Design a framework for contextual data acquisition using federated systems

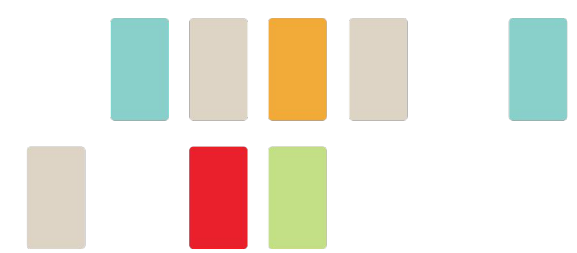
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KN_C2 Data Corpora Exploration and Integration	Extended Matrix	DIGILAB.it (Semantic Data module) (E-RIHS@H2IOSC)	Plan to connect DIGITAL.CSIC with Jupyter Notebook Promote a federated approach to data exploration; enable cross-repository search and retrieval capabilities.
KN_C3 Controlled Vocabulary Management	Existing tools already used in HS projects (e.g. THEMAS, OPENTHESO, ...) API Integration of UNESCO AGROVOC and SDG vocabularies in DIGITAL.CSIC deposit form Enrichment of DIGITAL.CSIC outputs with JEL, DDC, arXiv controlled vocabularies through OpenAire Broker	DIGILAB.it (Semantic Resources Manager module) (E-RIHS@H2IOSC)	Develop and deploy vocab.e-rihs.io as the central vocabulary service for E-RIHS (build on the existing prototype based on Opentheso). Establish a decentralised vocabulary management framework (allow contributions and updates from multiple national and institutional repositories; ensure consistency and interoperability of controlled vocabularies across the E-RIHS network). Design and Implement continuous enrichment processes to support multilingual and cross-disciplinary vocabularies to cater to diverse research needs.



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4- DIGILAB key needs



IMPLEMENTATION Phase

DIGILAB Implementation Layers

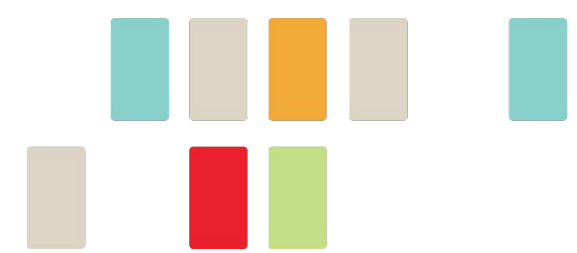
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4- DIGILAB key needs



IMPLEMENTATION Phase

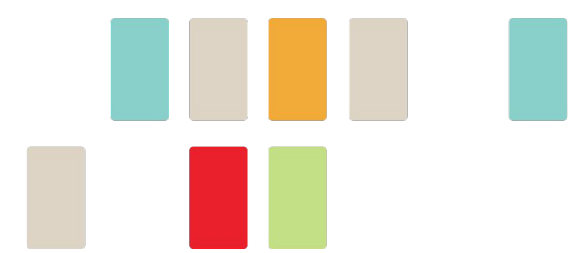
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NEEDS	TOOLS AND SERVICES		
	Existing (or starting point)	Already Planned	To plan/implement
KN_C1 Comprehensive Data Selection and Indexing	Existing tools already used in HS projects: Synthesis, ArcheoGRID	DIGILAB.it (DIGILAB-Data Infrastructure module) (E-RIHS@H2IOSC)	Design/deploy federated indexing services (allow decentralised indexing across repositories by ensuring interoperability and seamless integration of data from diverse sources).
KN_C2 Data Corpora Exploration and Integration	Extended Matrix	DIGILAB.it (Semantic Data module) (E-RIHS@H2IOSC)	Plan to connect DIGITAL.CSIC with Jupyter Notebook Promote a federated approach to data exploration; enable cross-repository search and retrieval capabilities.
KN_C3 Controlled Vocabulary Management	Existing tools already used in HS projects (e.g. THEMAS, OPENTHESO, ...) API Integration of UNESCO AGROVOC and SDG vocabularies in DIGITAL.CSIC deposit form Enrichment of DIGITAL.CSIC outputs with JEL, DDC, arXiv controlled vocabularies through OpenAire Broker	DIGILAB.it (Semantic Resources Manager module) (E-RIHS@H2IOSC)	Develop and deploy vocab.e-rihs.io as the central vocabulary service for E-RIHS (build on the existing prototype based on Opentheso). Establish a decentralised vocabulary management framework (allow contributions and updates from multiple national and institutional repositories; ensure consistency and interoperability of controlled vocabularies across the E-RIHS network). Design and Implement continuous enrichment processes to support multilingual and cross-disciplinary vocabularies to cater to diverse research needs.



DIGILAB Implementation Layers

key needs >< tools and services (existing, already planned and to plan)

KEY NEEDS	TOOLS AND SERVICES		
	Existing (or starting point)	Already planned	To plan/implement
KN_A1 Community Integration and Collaboration	Software solutions for managing social networking, already experimented in research projects		A dedicated Forum, by using https://e-rihs.io as a starting point (organize online workshops and webinars to introduce and demonstrate the forum; develop a best practices guide for effective communication and collaboration; establish a feedback mechanism to gather user input and improve the platform).
KN_A2 Virtual and Specialized Communication	Platforms for Visio conferencing Web channels for archiving virtual events		Integrate Platforms for Visio conferencing and Web channels for archiving virtual events (develop a centralized scheduling and management system; implement a comprehensive archiving solution with metadata tagging; establish partnerships with existing conferencing platforms for tailored solutions).
KN_A3 Unified Access and Authentication	Several solutions already deployed at national level (or EU project level) ORCID OAuth2 as a single-sign-on service		A dedicated platform for social networking; develop a centralised user management system;
KN_A4 Identifying and Gathering Initial Digital Services	First survey done		Dedicated workshops for identifying and integrating existing and future digital services (organize thematic workshops with key stakeholders to map existing digital services and identify gaps; develop a collaborative digital catalog for existing services, tools, and datasets; establish a task force to monitor and evaluate new digital services for integration into DIGILAB).

NEEDS	TOOLS AND SERVICES		
	Existing (or starting points)	Already planned	To plan / implement
KN_B1 Data Ingestion and Normalization	DIGITAL.CSIC HumaNum (CNRS) ISPC Dataspace HESCIDA/DIGILAB.be	DIGILAB.it Heritage Data Integration module (E-RIHS@H2IOSC)	Design a federated metadata normalization processes for ensuring compatibility with E-RIHS digilab framework
KN_B2 Data Storage, Organization, and Retrieval	Archeovision collaborative platform ArcheoGRID DIGITAL.CSIC ISPC Dataspace HESCIDA/DIGILAB.be	DIGILAB.it Heritage Data Integration module (E-RIHS@H2IOSC)	A federated E-RIHS PID service (utilise the work already done with handle.net; establish decentralised PID nodes across national and institutional repositories for consistent referencing and retrieval). Enhance existing storage solutions with a federated approach (extend capabilities of existing platforms to support decentralised data storage and organisation)
KN_B3 Long-Term Digital Data Preservation	CINES DIGITAL.CSIC HESCIDA/H-SEARCH	DIGILAB.it: Data processing and curation module (E-RIHS@H2IOSC)	Design a decentralised preservation repository network
KN_B4 Contextual Data Acquisition	Experimental tools: Memos (FSP-CNRS), OpenAire Broker in DIGITAL.CSIC - to manage suggestions for semantic enrichments of research outputs		Design a framework for contextual data acquisition using federated systems

NEEDS	TOOLS AND SERVICES		
	Existing (or starting point)	Already Planned	To plan/implement
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DIGILAB within the EU initiatives landscape

DIGILAB and ECHOES Future European Collaborative Cloud for Cultural Heritage

- ECHOES will offers new modular tools and services
- DIGILAB will focus on HS data lifecycle and knowledge base

DIGILAB and the European Open Science Cloud (EOSC)

- convergence towards a common EOSC Interoperability Framework,
- experiences and recommendations from initiatives (e.g. EOSC Pillar, EPOS (Earth Science), and ELIXIR (Life Sciences))
- adherence to European and international legislation on data protection and IPR

Tentative Timeline

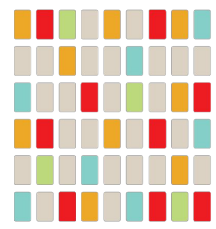
Year 1: Foundation and Planning. Core working groups and governance structure / community surveys / community platform (design) / pilot projects (plan)

Year 2: Initial Implementation and Testing. Community platform (beta) and first pilot projects / (beta) services for data ingestion, storage, and retrieval systems.

Year 3: Expansion and Refinement. Expand pilot projects / services for data indexing, semantic enrichment, Knowledge Base.

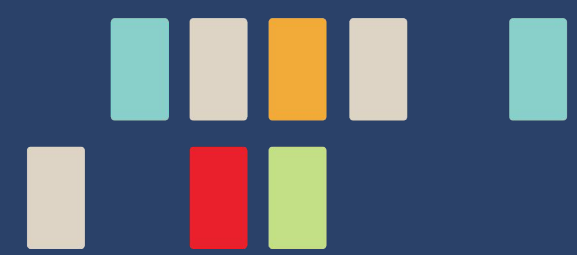
Year 4: Full-Scale Implementation. Experimenting with VRE on pilots / (Start) Knowledge Base for community use / (beta) Data analysis + AI-based data processing tools /

Year 5: Optimization and Evaluation. Evaluation / Optimisation / Extension



E-RIHS

EUROPEAN RESEARCH INFRASTRUCTURE
FOR HERITAGE SCIENCE



Thanks

for your attention

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CNRS UPR2002 MAP



IMPLEMENTATIONPhase

www.e-rihs.eu



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