

CENDARI: What Next?

Dr Jennifer Edmond
Unique and Universal: Challenges for the
Manuscript Librarian
25th May 2016



Presentation Structure

- What is CENDARI?
- Three perspectives on 'next'
 - For the current CENDARI (sustainability)
 - For the next CENDARI (systemic alignment)
 - For future CENDARIs (new paradigms)
- Concluding thoughts





FP7 Integrating Activity for Infrastructure

14 Consortium Partners, 8 Countries

2012-2016, total budget €6.5M

- Freie Universität Berlin
- University of Birmingham
- Trinity College Dublin
- Czech National Library
- Università di Cassino
- The European Library
- Consortium of European Research Libraries
- King's College, London
- INRIA
- University of Stuttgart
- Goettingen State and University Library
- Mathematical Institute of the Serbian Academy of Sciences and Arts
- Fondazione Ezio Franceschini
- Società Internazionale per lo Studio del Medioevo Latino



Primary Aim of CENDARI

Pilot a research infrastructure leveraging analogue networks to integrate digital resources for historical research in a way that is easy to use/access and harmonised with researcher requirements

Two Pilot Areas

- World War I
- Medieval European Culture

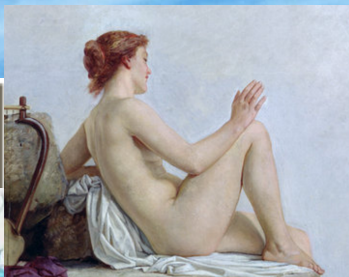




CENDARI

COLLABORATIVE EUROPEAN DIGITAL
ARCHIVE INFRASTRUCTURE

www.cendari.eu



Digitised Collections
Digital Methods
Digital Communications
Cross disciplinary networks
Data sharing protocols

Resources, Resources, Resources

- Lists of institutions, catalogues, finding aids
- Search and metasearch engines
- Databases (authority lists, standardised author names, shelf marks)
- Dictionaries
- Manuscript collections: ISOS, Manuscriptorium, Monasterium, eCodices,, Gallica, Mandrigoria...but all in silos
- Tools, to let you do cool things (virtual vellum, hyperimage, transcriptoria)
- Juxta, Collex, reading environments for annotation and parallel versions
- Projects and networks: more important as a group of people (COST IS 1005), Leeds/ Kalamazoo
- MESA, platform for resources to be peer reviewed and validated





CENDARI

COLLABORATIVE E
ARCHIVE INFRASTR

About: [Albertus Magnus](#)



Manuscript Digital Library

Juxta - welcome.jxt

File Edit View Collation Help



File System

- /Users/nicklaiacona/Library/Application
 - BlessedDamozel.jxt
 - blockcollation
 - daisy.jxt
 - damozel
 - damozel.xml
 - docs
 - 1-1847.morgms.rad.xml
 - 1-1847.princefrag.rad.xml
 - 1-1870.1pr.trox.rad.xml
 - 1-1870.1stedn.rad.xml
 - 1-1870.2ndedn.prin.rad.xml
 - 1-1881.1stedn.rad.xml
 - ap4.g415.1.rad.xml
 - hamlet
 - hamlet.jxt
 - orchard-pit
 - orchard-pit.jxt
 - renaissance
 - renaissance.jxt
 - sample-source

Morgan MS

s1 The blessed damsel leaned against
The silver bar of Heaven.
Her eyes knew more of rest and shade
Than a deep water, even—
She had three lilies in her hand
And the stars in her hair were seven.

s2 Her robe, ungirt from clasp to hem,
No wrought flowers did adorn,
But a white robe of Mary's gift
For service meetly worn;
And her hair lying down her back
Was yellow like ripe corn.

+ Add Selected Fragment

Notes

Base Text	Witness Text	Lemma	Notes
welcome1.txt	welcome2.txt	users' manual] user...	This is an example ...
welcome1.txt	welcome2.txt	is application. An] ~	Here you see the r...
welcome1.txt	welcome2.txt	^and good luck	Finally, here is an l...

Comparison Files

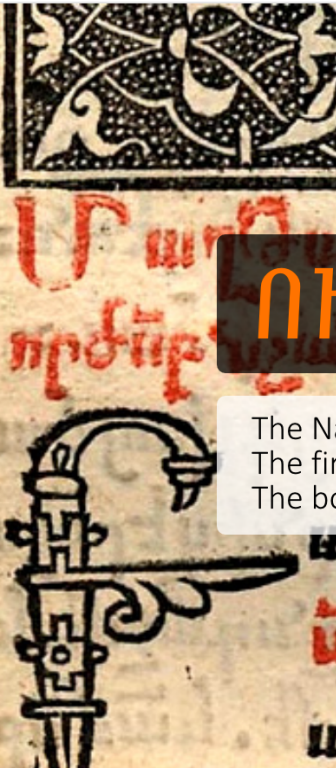
Notes Images Passages

juxta v1.2.2 - www.patacriticism.org/juxta

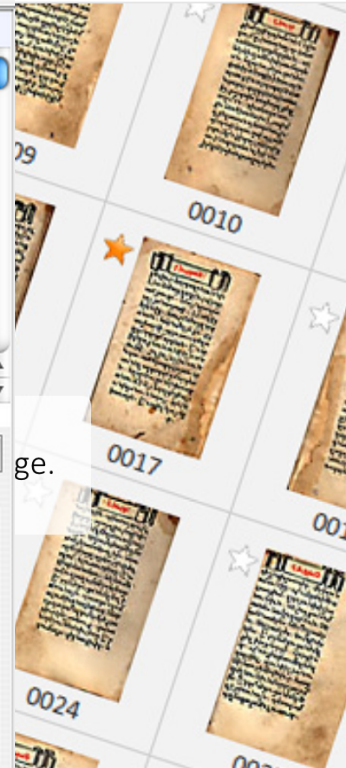
Digital Library

Blog

Sup



The N:
The fir
The bo



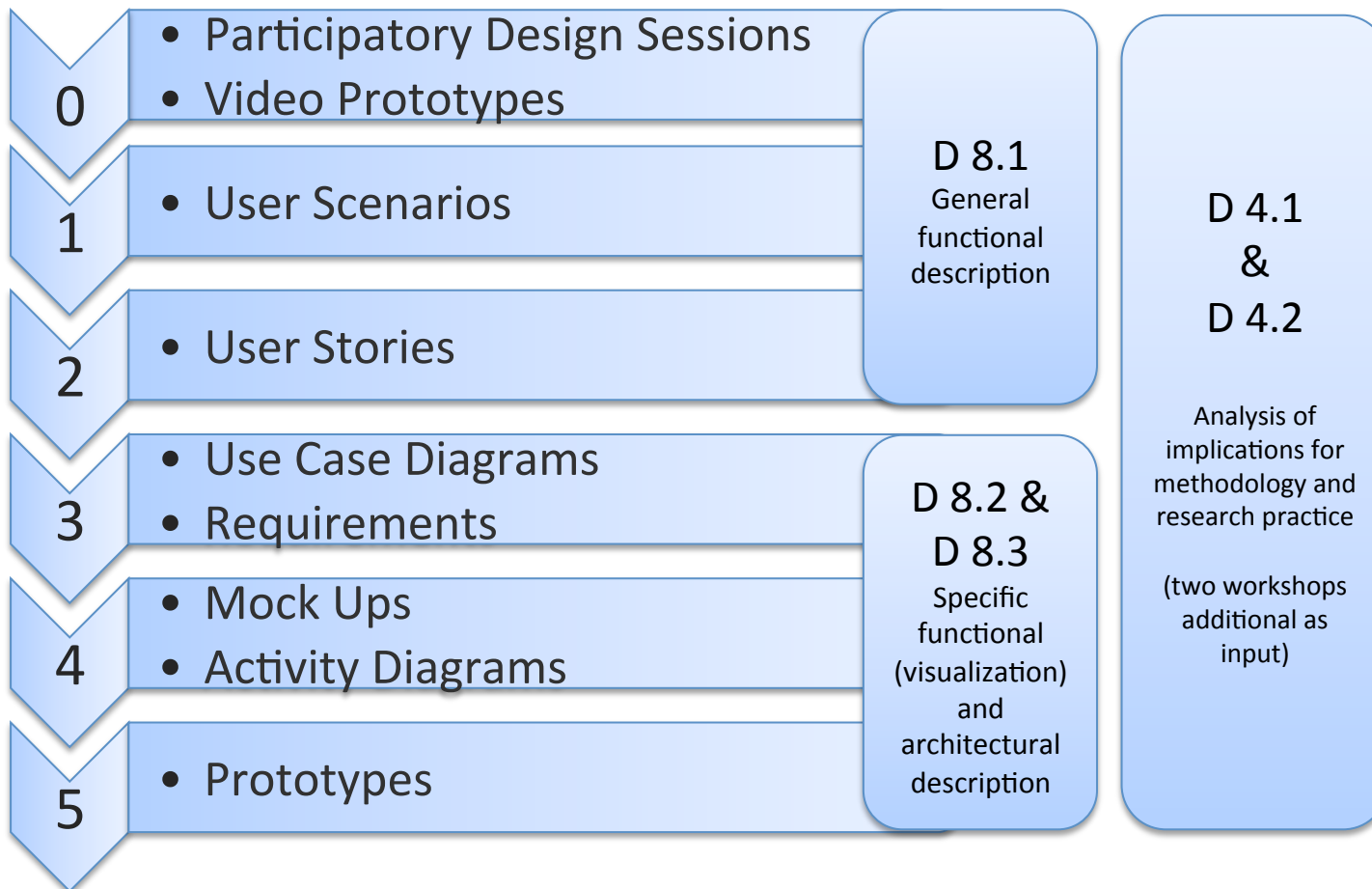
-as-form-and-substance/
ndo%20Deo%20-%20Latin%20and%

2. Person
Bibliotheksort,
Name
logische Verknüpfung der Begriffe

...but how? Infrastructure!



Process of understanding researchers and refining requirements



0a. Participatory Design Sessions



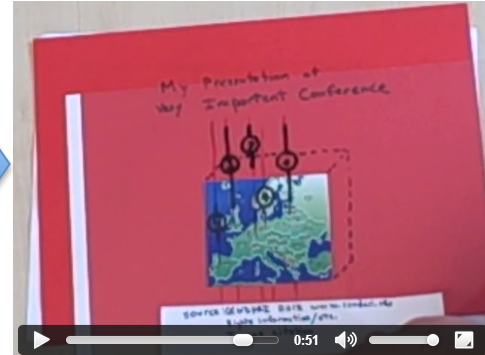
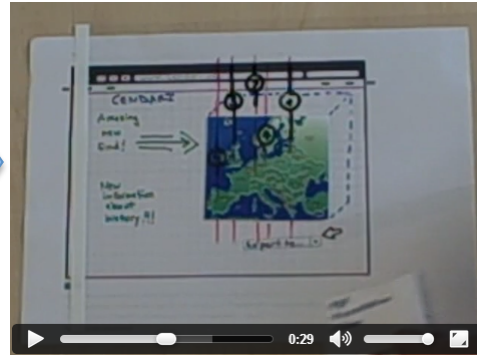
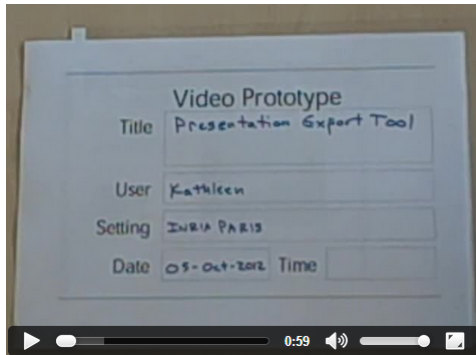
Paris, October 2012: WWI researchers

Florence, January 2013: Medievalists

Berlin, October 2013: Archivists, Librarians and Information specialists

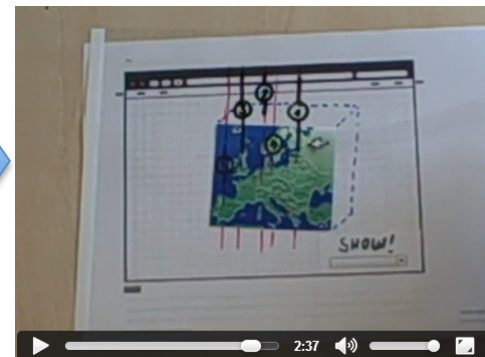
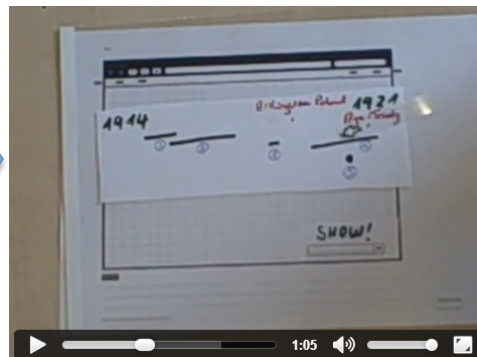
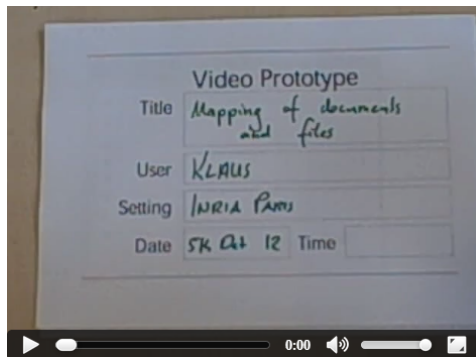


0b. Result of Participatory Design Sessions: Video Prototypes



🕒 Presentation export tool

📍 Mapping of documents and files



I. User Scenarios

„**My project** examines how the rural-urban divide shaped Habsburg Austrian society’s experience of the war from about 1915 (when food and food shortages became increasingly politicized) [...]

I want to answer the following questions: How did the administration and realities of rationing vary between cities on the one hand, and between urban centers and the rural areas of their provinces on the other?

In terms of research, **I will first need to** map the changing structures of rationing and the incidence of food protests and related disturbances over the course of the war. [...]

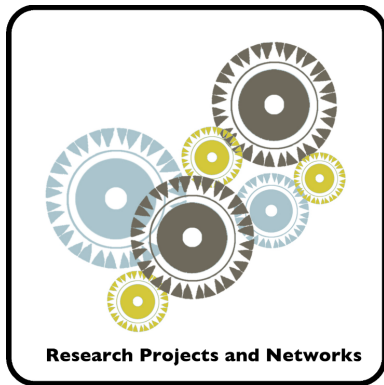
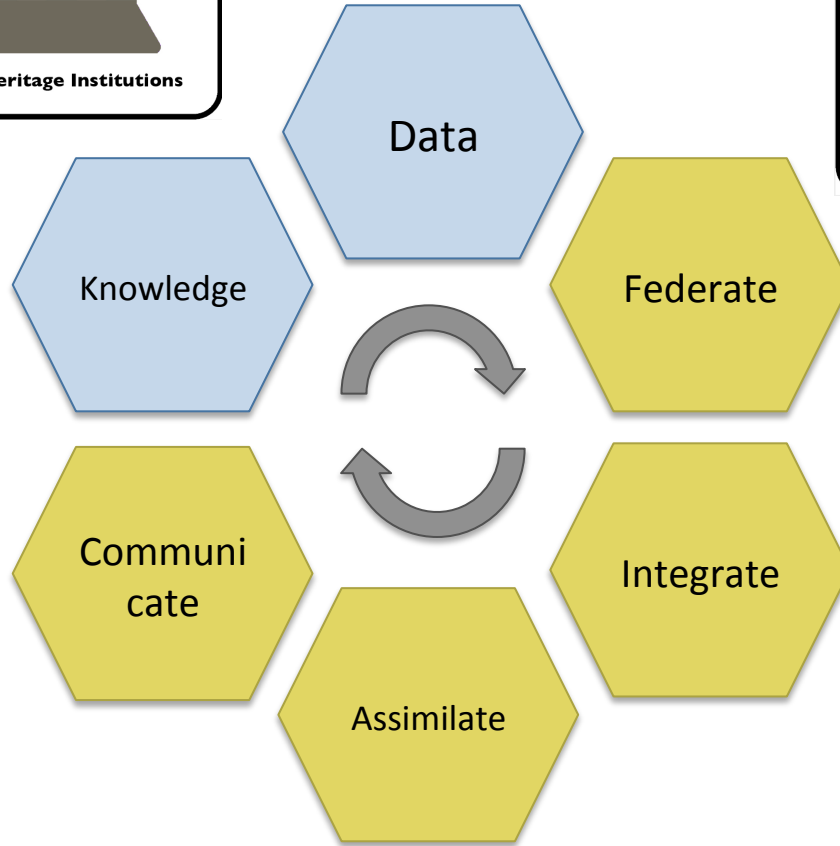
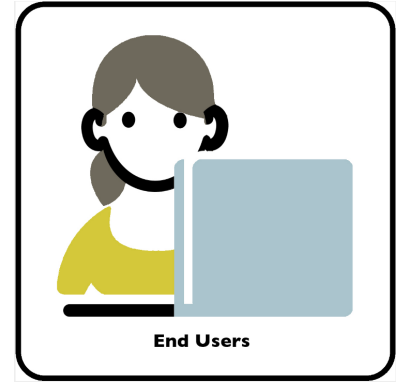
In the event that I locate a particularly rich vein of primary sources [...] **I would be interested in** digitizing them and subjecting them to **text-mining** analysis. Specifically, I could measure the changing occurrence of terms like “country” in the discourse of city-dwellers and “city” or “town” (or the name of a city) in rural discourse. [...] relative occurrence of such terms against other dividing categories such as the “nation” or “the rich.” [...]



2. User Stories

User Story Id	As a (role)	I want to (something)	So that (benefit)	Reference to Source
US-1.1	researcher	View and browse the stacks in "closed stack" collections	I can discover valuable materials that I would not have thought to search for specifically.	"Shelf Screenshot" Video Prototype
US-1.2	researcher	Search for archives and information about their history in a particular city or region	I can do research on a certain city or region	"Archival Network by Location" Video Prototype
US-1.3	researcher	Visualize my searches	I can see which archives I have visited and how often, and where they are located	"Visualizing Search Paths" Video Prototype
US-1.4	researcher	Search for translations/transcriptions of documents in CENDARI	I can see what translations/transcriptions have already been done by other CENDARI users	"Crowdsourcing Translation of Documents," part 1 Video Prototype
US-1.5	researcher	Work with other researchers online to translate/transcribe a document	I can create a better translation/transcription	"Crowdsourcing Translation of Documents," part 2 Video Prototype
US-1.6	researcher	View/manipulate/navigate documents (enlarge, reduce, rotate, etc.) and select/highlight parts of documents and add annotations	I can create translations/transcriptions linked to the original document	"Crowdsourcing Translation of Documents," part 2 Video Prototype
US-1.7	researcher	Search for archives by type in a particular location	I can see what kinds of archives are available	"Geo-Search" Video Prototype
US-1.8	researcher	View documents and files according to chronology (temporal), using a timeline or location (spatial), using a map	I can understand and display the spatial or chronological relationships between documents	"Mapping of Documents and Files" Video Prototype
US-1.9	researcher	View a 3D projection of documents that are mapped over both time and location (both chronological and spatial)	I can understand and present the spatial and chronological relationships between documents	"Mapping of Documents and Files," Part 2 Video Prototype



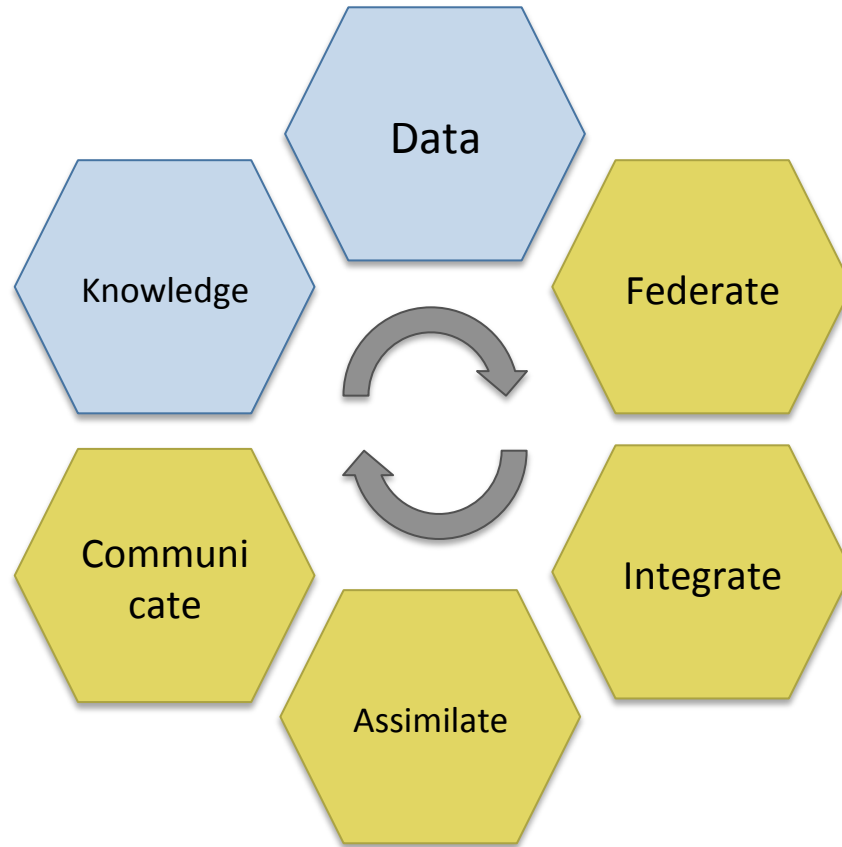


Challenges faced by archives in sharing data

'Crisis' of digital sustainability and reuse

Tensions in the publication environment

Subtlety of current practices (travel)



Participatory Design Methodology

'Data Soup' and hidden archives, frustration with silos

LOD and ULS approaches

Note-taking as a key mode of processing

What does the system do (for a user)?

- Support ‘enquiry’ phase
 - Search, Browse, Add Collections
 - Personal workspaces: combine system information with your own archival records, transcribe, annotate...
 - Explore themes through the Archival Research Guides





The screenshot shows a web browser window displaying the CENDARI Archival Directory website. The browser's address bar shows the URL <https://archives.cendari.dariah.eu/index.php/>. The website header features the 'atom' logo and the text 'CENDARI Archival Directory'. Below the header, there is a search bar and a 'Browse' dropdown menu. The main content area is divided into several sections:

- Browse by**: A list of categories including Archival descriptions, Archival institutions, Subjects, and Places.
- Popular this week**: A list of featured archives with their respective visit counts, such as 'Российский государственный военный архив' (56 visits) and 'CARTONS VERTS - POLOGNE (1916 - 1921)' (37 visits).
- The Archival Directory is a large database...**: A paragraph explaining the directory's purpose and its focus on the Medieval era and World War One.
- How to search**: Links for 'Archives selection criteria' and 'Frequently asked questions'.
- Join Us!**: A section with an image of a historical figure, inviting users to join the 'Trusted Users Group'.
- Take notes for your research**: A section with an image of a historical scene, promoting the 'CENDARI Notes taking Tool'.
- Introductory videos**: A section with an image of a historical figure, mentioning 'archival Directory introductory Videos'.

Archival Directory AtOM



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Cultural Heritage Institutions in the Archival Directory



The screenshot shows the 'atom CENDARI Archival Directory' interface. The search term 'budapest' is entered in the search bar, and the results are filtered to '6 results'. The left sidebar contains filter categories: LANGUAGE (Unique records: 6, English: 6), LEVEL OF DESCRIPTION (All: 2, Collection: 2, Fonds: 2, Part: 1, Item: 1), ARCHIVAL INSTITUTION (All: 2, Museo Storico Italiano della Guerra: 2, The European Library: 2, Museo Storico del Trentino: 1, Österreichisches Staatsarchiv - Krieg...: 1), and CREATOR (All: 2, Museo Storico Italiano della Guerra: 2, Anonimo: 1, Francesca Morselli: 1, Francesca Morselli: 1, Anonimo: 1). The main content area displays three search results:

- European Collections from the WW1 period kept by the British Library**
a0579 · Collection · 1914 - 1918
Selected for Europeana Collections 1914-1918, is a collection of books, newspapers, official documents, pamphlets, posters and leaflets primarily in Slavonic and East European languages, English and Esperanto. The majority of this collection was p...
British Library
- Virtual reconstruction of the Bibliotheca Corviniana (15th c.)**
a0110 · Collection · 15th century
This Collection administered by the National Széchényi Library of Hungary virtually rebuilds the Bibliotheca Corviniana (or Biblioteca Augusta) in Budapest in the 15th century. It makes available bibliographic descriptions of the Codices preserve...
Országos Széchényi Könyvtár
- Diario di un ufficiale austriaco ignoto**
Item · 1915 - 1918
Nota Biografica dell'autore anonimo: Forse ufficiale austriaco ignoto, dell' 87 fant, 4° batt. Nato a Sloveno, ha passato gli anni dell'infanzia a Vienna, la prima adolescenza in Boemia, due anni a Budapest, tre anni in Svizzera, poi Parigi... Il d...
Museo Storico Italiano della Guerra

Additional results are partially visible below:

- Neue Feldakten (NFA)**
AT-OeStA/KA FA NFA · Fonds · 1914-1918
Der Bestand Neue Feldakten umfasst jene operativen Akten des Weltkrieges 1914-1918, aber auch Akten über die Versorgung der Truppe, die bei den k. u. k. Kommanden im Feld entstanden sind, und zwar Unterlagen über Kampfhandlungen, Truppenverschiebu...
Österreichisch-ungarisches Feldheer
- "Diario di un ufficiale austriaco ignoto, rinvenuto in una trincea sul Carso. Il diario è guastato dall'umidità ed av...**
IT cndr - temporary_Museo Storico Italiano della Guerra Museo della Guerra DM. 15 · Part · 1915 - 1918 · draft
Il diario porta un'intestazione dalla quale si capisce che è stato rinvenuto in una trincea sul Carso da un italiano il quale descrive che il

CENDARI Repository CKAN

Currently 303,225 datasets, and more in process

Search the records:

<https://archives.cendari.dariah.eu/index.php/?module=repository>



Archive of the British
School at Athens

Holdings Quick search

Series Series 8. Philip Noel Baker

Subseries SUB-SERIES 1.1 - FAMILY

Series - Series 8. Philip Noel Baker

Identity area

Title	Series 8. Philip Noel Baker
Date(s)	<ul style="list-style-type: none"> 1900 - 1982 (Creation)
Level of description	Series
Extent and medium	11 boxes of items, containing 123 folders, 473 sub-folders, and 1683 items

Context area

Name of creator	Philip John Noel Baker
Name of creator	Philippa Currie
Repository	Archive of the British School at Athens

Content and structure area

Scope and content	Politician and Nobel prizewinner, Philip was born at Woodstock, Brondesbury Park, London, on 1 November 1889, the sixth and penultimate child of (Joseph) Allen Baker (1852-1918) and his wife, Elizabeth Balmer Moscrip. His father had moved to Britain from ... »
-------------------	--

Conditions of access and use area

Conditions governing reproduction	Permission to examine manuscripts is not an authorization to publish, display, reproduce, perform, distribute, or prepare derivative works of them. Researchers who plan to publish their work are urged to make inquiry concerning possible restrictions ... »
Language of material	<ul style="list-style-type: none"> English Greek Italian

Access points

Subject access points	<ul style="list-style-type: none"> WW1
Place access points	<ul style="list-style-type: none"> Greece Italy
Name access points	<ul style="list-style-type: none"> Philip John Noel Baker (Creator) Philippa Currie (Creator)

Description control area

Status	Draft
Level of detail	Full
Dates of creation revision	27.01.2015

[Reports](#)

Export

[Dublin Core 1.1 XML](#)

[EAD 2002 XML](#)

Related subjects

[WW1](#)

Related people and organizations

[Philip John Noel Baker \(Creator\)](#)

[Philippa Currie \(Creator\)](#)

Related places

[Greece](#)

[Italy](#)

Searching the
records:
Collection Level





Manual Creation of a Collection Description

Untitled

Identity area

Context area

Content and structure area

Conditions of access and use area

Allied materials area

Notes area

Access points

Description control area

Rights area

Administration area

Cancel

Create

page for the creation of the Institution (EAG):

<https://archives.cendari.dariah.eu/index.php/repository/add>

page for the creation of the collection (EAD):

<https://archives.cendari.dariah.eu/index.php/informationobject/add>





Home Browse About Issue Report Survey

Search

joerglehmann ▾

Resources

Sort by:
alphabetical creation last updated

My resources:

- My projects
 - andreizamoiski
 - caterinamenichetti
 - francescamorselli
 - irenetani
 - jakubbenes
 - joerglehmann
 - Notes (62)
 - Documents (0)
 - Entities (6)
 - robertagiacomi
 - rolandsczok

New Save Read Mode Delete

Note Description [Read Only] --- click here for Edit mode

Note's title
ARG Science and Technology in the First World War

Note's content

Science and Technology in the First World War

Picture to be added (functionality not yet there)

Author(s) Jörg Lehmann

Theme(s) World War I

Period(s) 1909-1938

Status draft version

Author

Jörg Lehmann

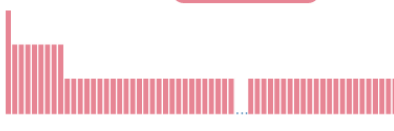
Abstract

The subject "Science and Technology in the First World War" has so far been treated from the perspective on inventions and the development of new weapons, and it has often been reduced to the topic of chemical warfare. The approach of this Archival Research Guide comes from the social sciences and focuses on the establishment of relevant scientific, military and governmental bodies and on the personal networks established during the war. This approach enables transnational perspectives and comparisons and takes the role of intellectuals into account, for whom scientific objectivity / neutrality and patriotic commitment seemed to have been no contradiction. It is remarkable that the First World War has led to the establishment of several institutions aiming at funding science through the state, most notably in the case of France (CNRS), the U.S. (NACA/NASA) and Russia (KEPS).

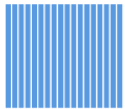
Introduction

Visualizations

Most Common Person Roman Dmowski 3 docs




Most Common Place Baranovichi 1 doc




Most Recent 11/07/1920 1920-11-7

Oldest 1795 1795-10-24



Most Common Place Baranovichi 1 doc



CENDARIs Note Taking Environment (NTE) and ARGs

<https://notes.cendari.dariah.eu>



Complete Menu ▾ Home About Partners Login ▾ Register Contact Us

Search with Trame

Set your search

Browse by list [Search Packages](#)

Is FIRB? Y N Select Souce Type: Archivio Biblioteca Portale

Show entries Search:

Check All Type Name

<input type="checkbox"/>		BAI (Mirabile) Biblioteca Agiografica Italiana
<input type="checkbox"/>		BDC: Beinecke Digital Collections
<input type="checkbox"/>		Biblioteca Apostolica Vaticana Manoscritti Digitalizzati
<input type="checkbox"/>		Biblioteca Apostolica Vaticana – Catalogo dei manoscritti
<input type="checkbox"/>		Biblioteca Medicea Laurenziana, Firenze – Teca digitale
<input type="checkbox"/>		Biblioteca Pinacoteca Accademia Ambrosiana
<input type="checkbox"/>		Bibliothèque nationale de France – Gallica, manuscrits
<input type="checkbox"/>		BISLAM (Mirabile) Bibliotheca Scriptorum Latinorum Medii Recentiorisque Aevi

Selected sources

Registered users can save search configuration and load search packages.

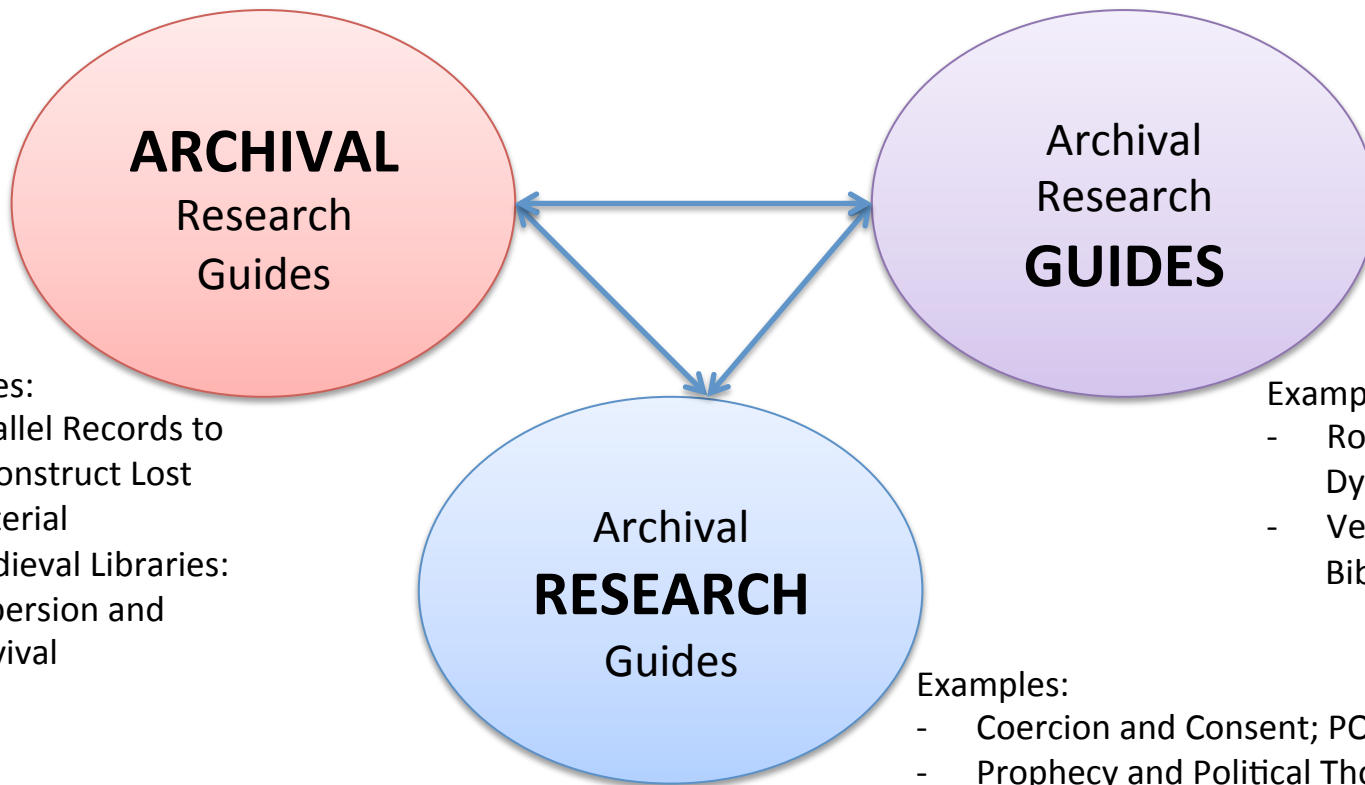
[Log in](#) [Register](#)

[Perform your Search](#)

TRAME II

<http://trame.fefonlus.it/trame/index.html>

Methodologies emphasizing



Examples:

- Parallel Records to Reconstruct Lost Material
- Medieval Libraries: Dispersion and Survival

Examples:

- Romanov Dynasty
- Vernacular Bibles

Examples:

- Coercion and Consent; POW
- Prophecy and Political Thought in the Medieval Age





New ▾ Save Edit Mode

Delete

New Note

Entities (0) Status (Open) Authorship

ARG Transcribing Medieval Manuscripts and Archival Material

Table of contents ([show](#))

Abstract

The aim of this Archival Research Guide is assist the user when reading primary sources and transcribing them into their own notes onto the Virtual Research Environment platform of CENDARI. It complements the many thematic medieval Archival Research Guides already uploaded by researchers onto the system. As this guide is focused on online resources, the lack of stability of such resources must be stressed: Links might be broken, software might be non-compatible, etc.

Introduction

Palaeography is the study of ancient handwriting. Letter forms make up a 'script', a particular type of handwriting for a certain place and time. The way in which each individual scribe writes a script is called a 'hand'. Hands can be divided into 'book' and 'documentary' hands, depending on the source. Codicology is the study of the codex, and examines the book as a physical object and how it was produced. Objects of study could include writing material (parchment, paper), ink, binding, the folding and division of the leaves, page layout, the illumination, the book's 'history' (ownership), marginalia, etc. Details of all of these concepts and their presentation in primary source materials can be found in the digital resources presented in this guide and in the bibliography. Nomenclature often varies from one author to another. Palaeography is an essential skills for medieval scholars, as nearly all of source material predates the invention of printing.

Note of the author

The digital resources listed in this Archival Research Guide were selected as relevant sources for training and teaching transcription. It is aimed to assist researchers who are starting to work on original documents. A few relevant resources for early modern historians have also been included. This guide does not aim for completeness and does not cover all digital resources on manuscript transcription currently available. Future contributors are encouraged to add new digital resources if they cover the following subjects: palaeography, codicology, digitisation of medieval manuscripts, and medieval book history. Similarly, if the digital resource linked to the ARG is no longer extant, contributors may delete the entry.

Palaeography Tutorials

There are various online tutorials and training materials available to improve palaeographical skills. They are also helpful if the researcher wishes to practice transcribing digitised documents.

Tutorials for medieval material

[Tutorials on Medieval Palaeography](#) (developed by the University of Leicester, now hosted by the Anglo-Norman Online Hub)

[Medieval Writing](#)

[Course in Latin and Syriac palaeography and transcription, Hill Museum and Manuscript Library](#) (also see site for a lexicon and annotated manuscripts for training)

[The Medieval Handwriting App](#) (developed by the University of Leeds)

Transcribing Medieval Manuscripts and Archival Material



© The British Library

Author	Kathleen Walker-Meikle
Collaborators	Lorenza Tromboni, Tomáš Klimek, Martin Hlouch, Silvia Nocentini
Theme(s)	Medieval Culture
Period(s)	300-1500
Status	Final version

ARG Transcribing Medieval Manuscripts and Archival Material

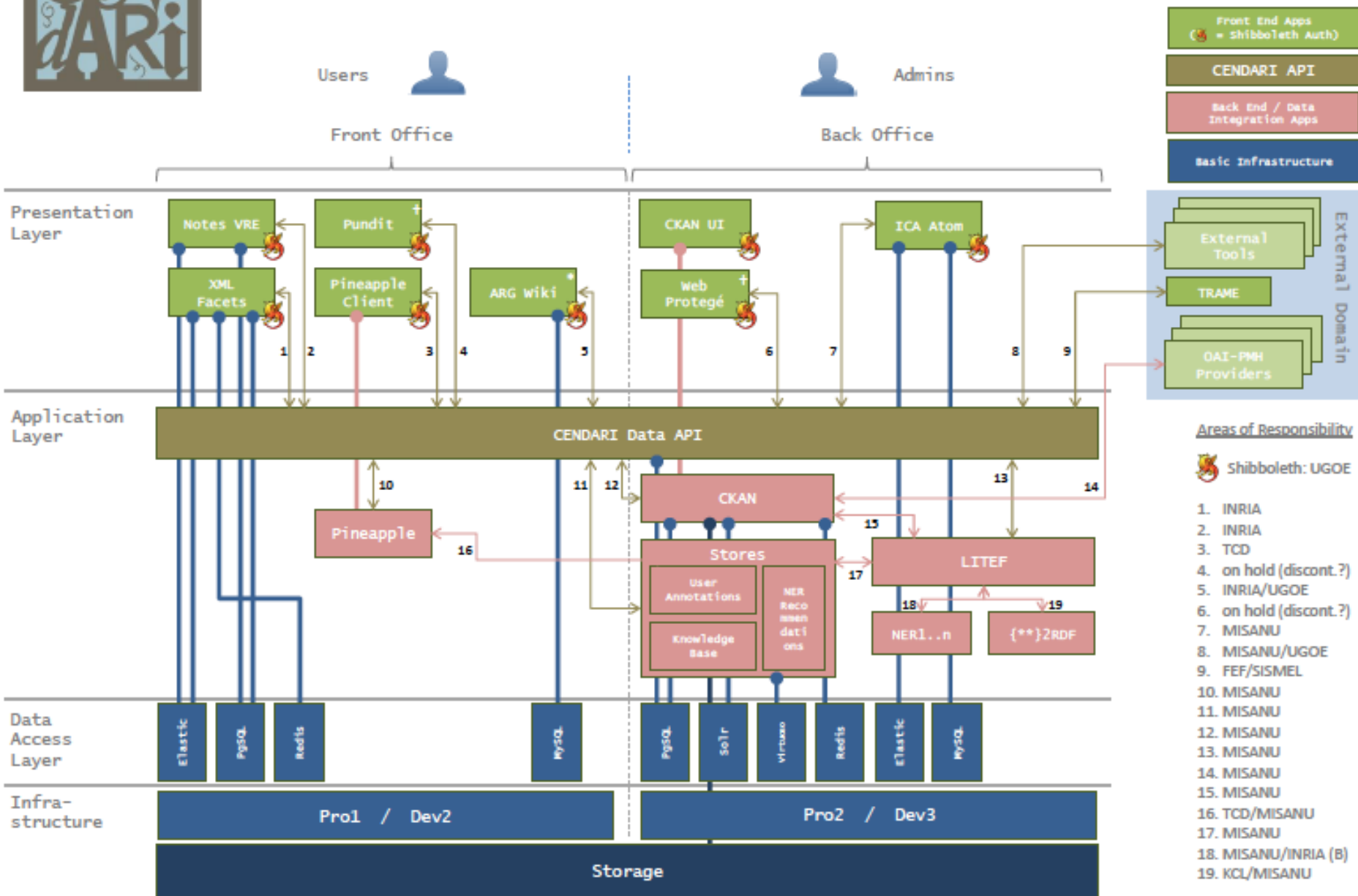
What else does the system do?

- Ingest and harmonise data and descriptions from heterogenous sources without investment in new metadata description
- Utilise a central data API to coordinate between data sources and services
- Self-monitor for changes in content and apply basic transformations
- Harness LOD to create intelligence across the system





CENDARI Infrastructure Layer Model v0.7



* planned, currently on its own server

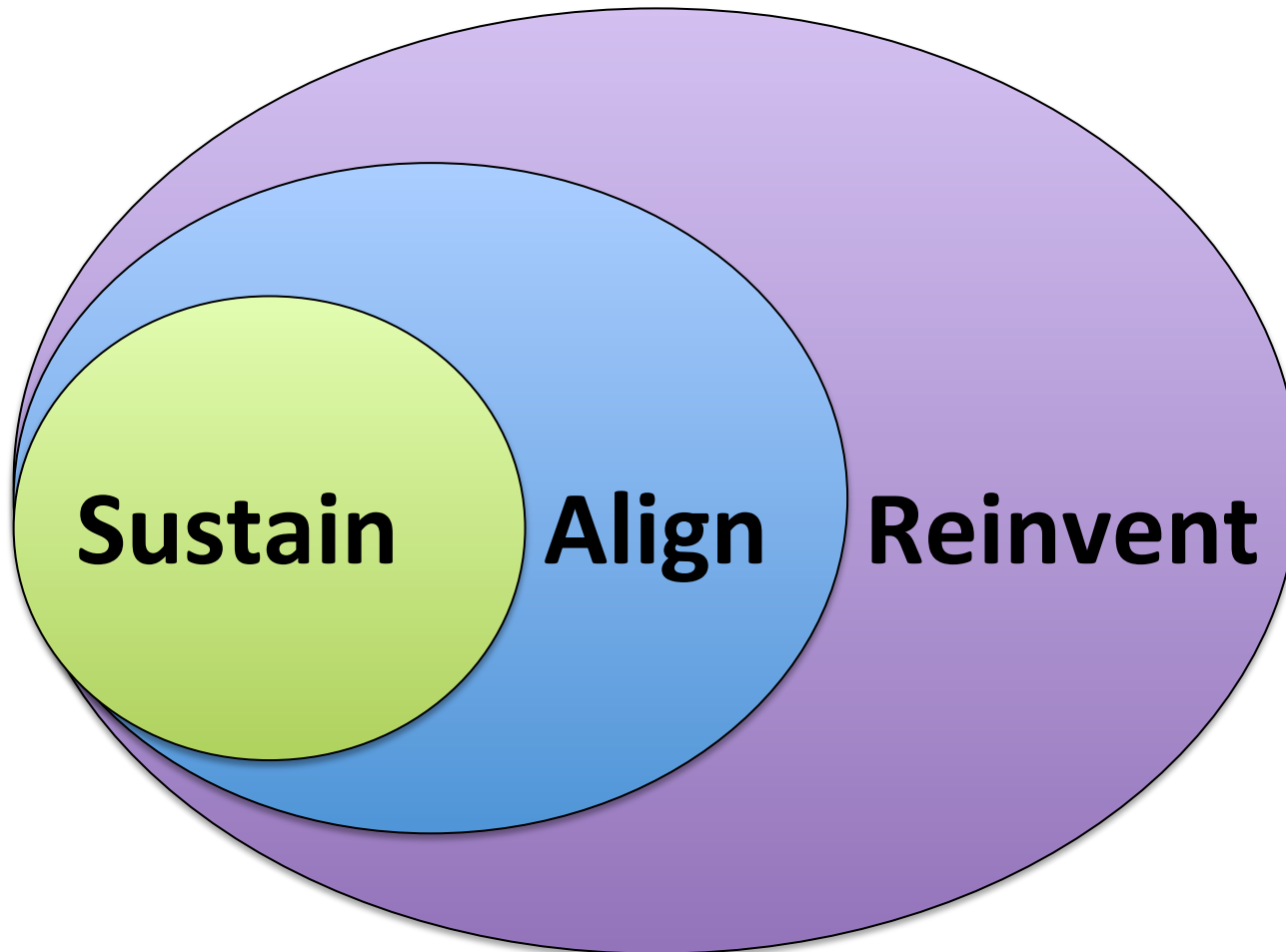
† on hold, possibly discontinued

What else has the project done?

- CENDARI promotes systemic change in the following areas
 - Development of instruments for coordinating between these levels
 - Promote change in publication patterns
 - Working with DARIAH to embed new perspectives on sustainability of digital projects



So, what next?



The CENDARI Sustainability Model

- Many models for sustainability, each dependent on a project's self image
 - An organisation (sustain people, funding)
 - A technical infrastructure (sustain software)
 - Data (sustain bits, access)
 - A user community ('commons' or 'foundation' model)



Reuse = Sustainability

- Research infrastructures are not digital libraries
- Most RI initiatives are not optimised for the long term
- DARIAH provides an exception to this rule, and an opportunity for a different approach to sustainability



CENDARI's 'Asset Register'

- Technical Infrastructure: Portal, Services (VM) and Tools
- Research Data: Unique and Aggregated
- Internal Publications and Knowledge: Scientific Publications (ARGs) as well as 'Tacit Knowledge'
- Communities: People, Networks and Relationships



CENDARI's Recommendations for Future Projects

1. Proposals should provision a sustainability process, including (at minimum) a midpoint meeting of stakeholders and agreed final plan
2. DARIAH affiliated projects should have DARIAH representation/participation at VCC level
3. Projects should use common platforms and ...
4. apply known and accepted standards in their work
5. Project publications should cover scientific, technical and management aspects of the project, with different audiences in mind for different pieces
6. Every project should have a data management plan
7. Projects should be able to guarantee the availability of their basic technical formats for 3 or 5 years after close
8. Successor funding projects should build, rather than just maintain, open up to new user groups and/or new functionalities



What would CENDARI do next?

6. Lobby for greater acceptance of non-traditional publications
5. Open up the API
4. Improve look and feel of the NTE
3. Complete work on LOD elements (reduce up-front investment in description)
- 2.
- 1.



What would CENDARI do next?

2. Work to understand historians better
 - CENDARI's robust participatory design and development process was not fundamental enough
 - How do we meet a desire for 'completeness'
 - How do we support non-developers to understand what is at stake in their methodologies?



What would CENDARI do next?

1. Work to understand CHIs better

- How to harmonise national/local contexts with transnational requirements?
- How to assist with resource barriers?
- How to harness immense tacit knowledge?
- How to build trust? How to harmonise policies so as to facilitate reuse?
- CENDARI 'White Book' and the Open History report on 'Sustainable Digital Publishing of Archival Catalogues'



What does the future hold?

1. On the one hand, digital data needs to be open to individual or community remix and curation (eg. through open APIs)
2. On the other hand, we **MUST** become better at expressing the uniqueness of humanities research and cultural data





CENDARI

COLLABORATIVE EUROPEAN DIGITAL
ARCHIVE INFRASTRUCTURE

www.cendari.eu

Big Data is Everywhere...

ANALYSING BIG DATA. THAT'S THE SECRET TO LIVING HAPPILY EVER AFTER.

A woman in a pink dress is performing on a stage. The scene is overlaid with various data visualization elements, including a clock showing 23:59:57, a 'PHYSICAL STATISTICS' panel with 'STEP COUNT' and 'HEARTBEAT' graphs, a 'TRAFFIC HISTORY' panel, and a 'SUBJECT PROFILE' panel with 'NAME' and 'AGE' fields. The Winton logo is visible at the bottom.

WINTON

Less guessing. More knowing.
Analytics. Delivered.

An aerial view of a road intersection with a car. The image is overlaid with a grid of yellow and green data points, suggesting a data-driven analysis of the environment.



How do we get to 'big enough' data?

- Better collaboration and communication between computer science, information science and historians, involving interaction and dialogue, but also self-reflection.
 - How can we better express what the knowledge creation process for the humanities is?
 - Why are there summer schools for humanists to learn python, but none for computer scientists to learn humanistic approaches?
 - How do we deal with the imperative for open science when we have entire disciplines with no raw data?



How do we get to 'big enough' data?

- New mental models: for example what would a hybrid system for historical research (rather than only a system where all content is digitised) look like?
 - Google Streetview? IOT? Aircraft autopilot?
- What might 'big enough' data look like?
 - Above the project level
 - Beyond linked open data (dictionaries and concordances)



How do we get to 'big enough' data?

- Build systems that support trust.
 - Content holders need to trust that new pathways for the use of their materials will not lead to the exploitation of individuals or of the resources themselves
 - Researchers need to feel confident in collections and their ability to use them
 - Scholars need trust systems to make their underlying limitations and assumptions transparent

