Culture Collaboratory

Virtual Workspace for Interdisciplinary Collections Research and Management

Content

Cultural artifacts and works of art are multi-faceted objects with often rich and complex histories and meanings. This booklet presents Culture Collaboratory, the design concept of a software that helps unfold these complexities.

The software provides a virtual workspace that combines a research platform, management system, and digital repository for cultural artifacts collections. The design supports interdisciplinary collaboration and allows researchers to engage with collection objects, organize research processes, and share their knowledge.

Culture Collaboratory follows the philosophy of open access and promotes sustainable research, making science and culture accessible to all.
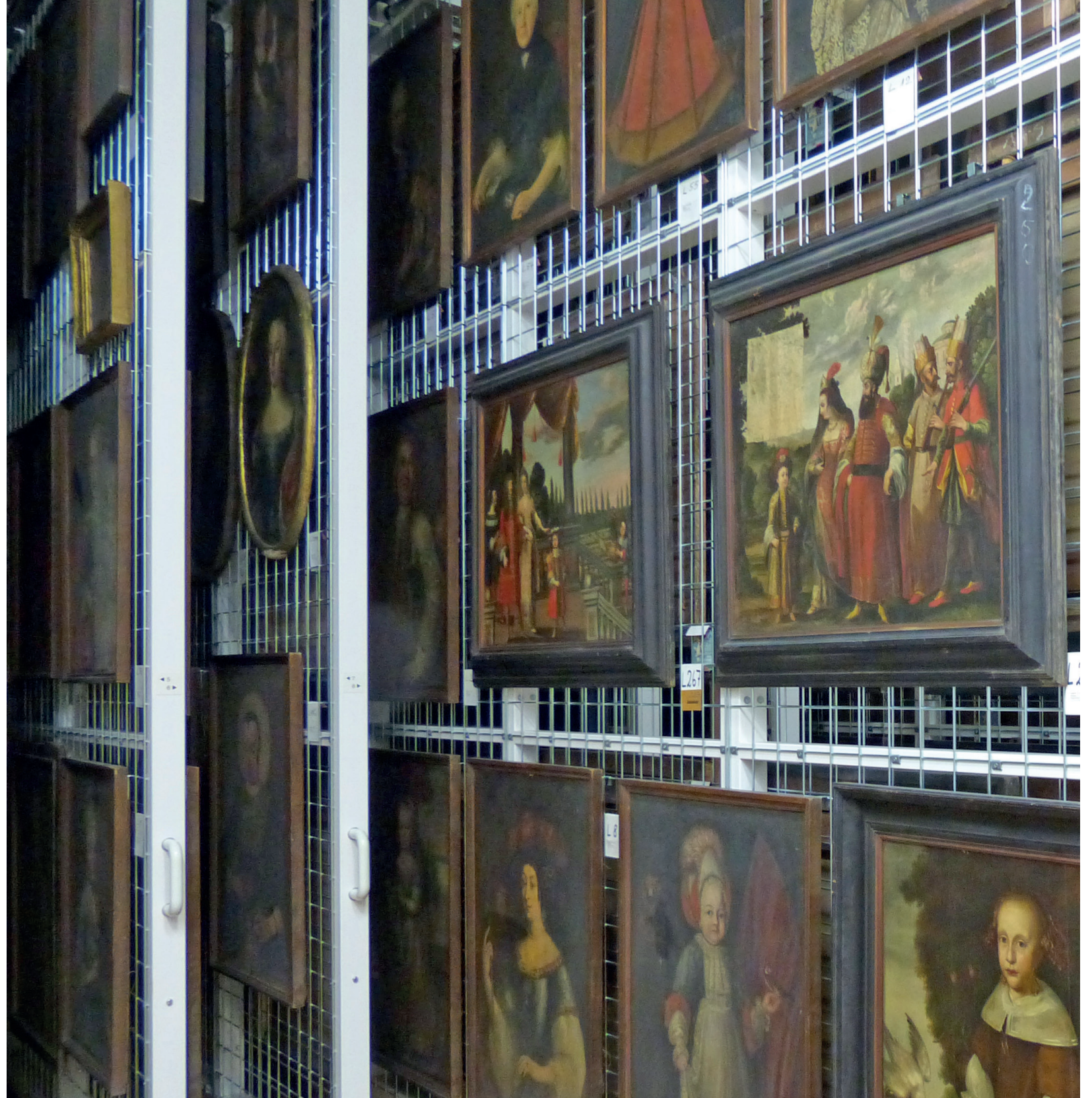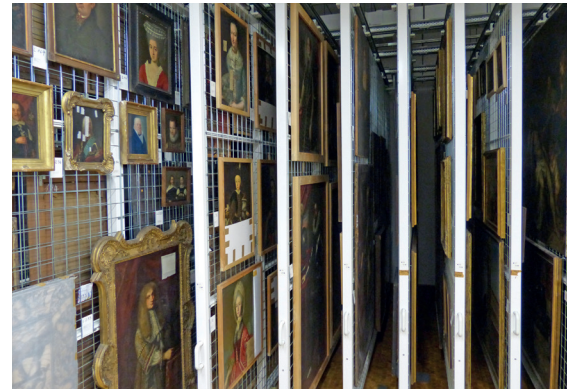
Research

Sammlungserschließung
Methodology
Observations
Concept Development

Sammlungs-erschließung

Culture Collaboratory grew out of the research project *Sammlungserschließung* at *Image Knowledge Gestaltung. An Interdisciplinary Laboratory* at Humboldt-Universität zu Berlin. Over the three-year term of this project, a team of art historians, conservators, and material scientists studied a collection of over 500 paintings. They interpreted the histories and meanings of these works and examined their physical properties. The team also included interaction designers who analyzed their colleagues' research practices and conducted extensive workplace studies and prototyping sessions. The aim of this project was to better understand the processes of interdisciplinary research, and to develop a virtual workspace to support this work.

Methodology

In order to create the virtual workspace we followed an extensive research strategy. Interviews with members of *Sammlungs-erschließung* provided a jumping-off point for a more detailed analysis of disciplinary methods, tools, and workplaces. We investigated the scientific analyses and research instruments used by the conservation and material sciences and studied the research strategies and interpretative methods employed in art historical analysis. We also reviewed the software most commonly used to generate, evaluate and interpret the results of this research. Totaling 72 hours of onsite workplace and workflow studies, the design research gave us a clear picture of the requirements for the virtual workspace. The ongoing feedback loop between researchers and designers, moreover, allowed us to develop and refine the design concept through several iteration stages.
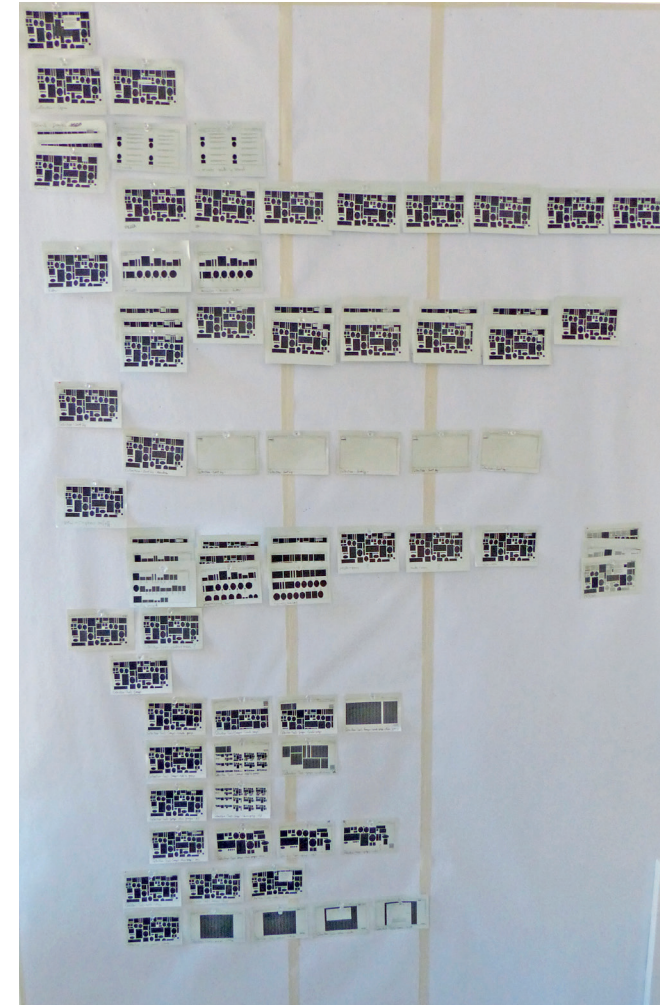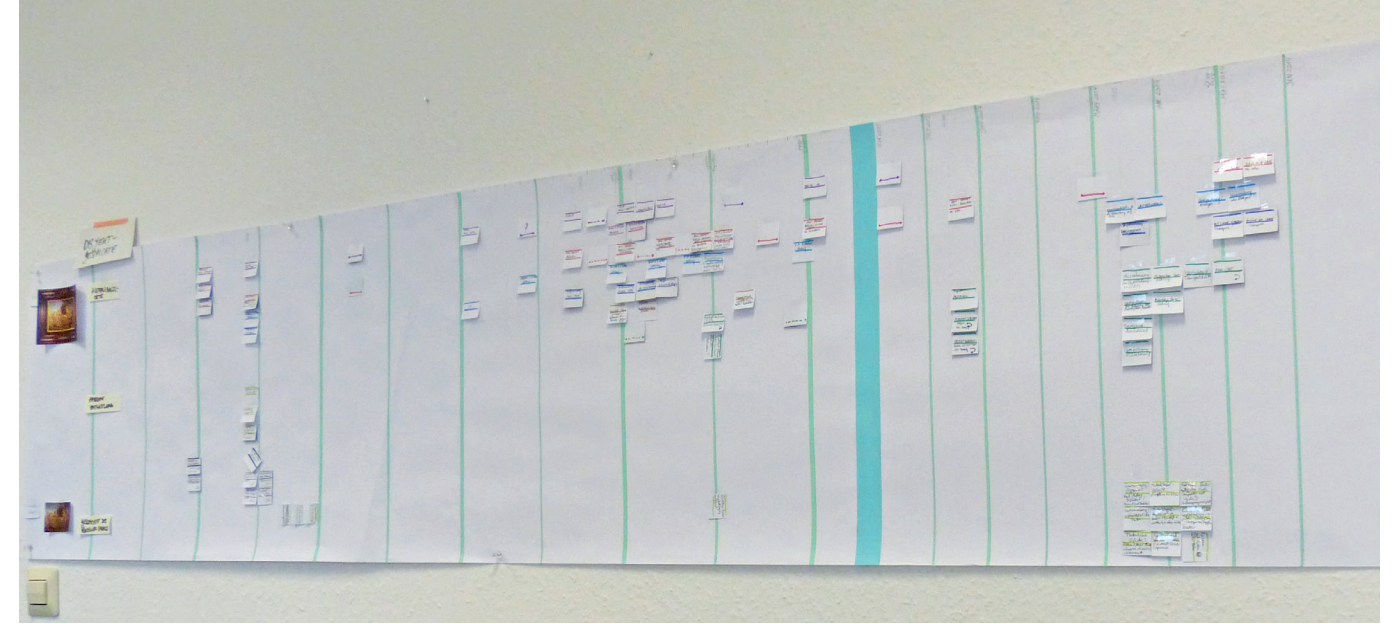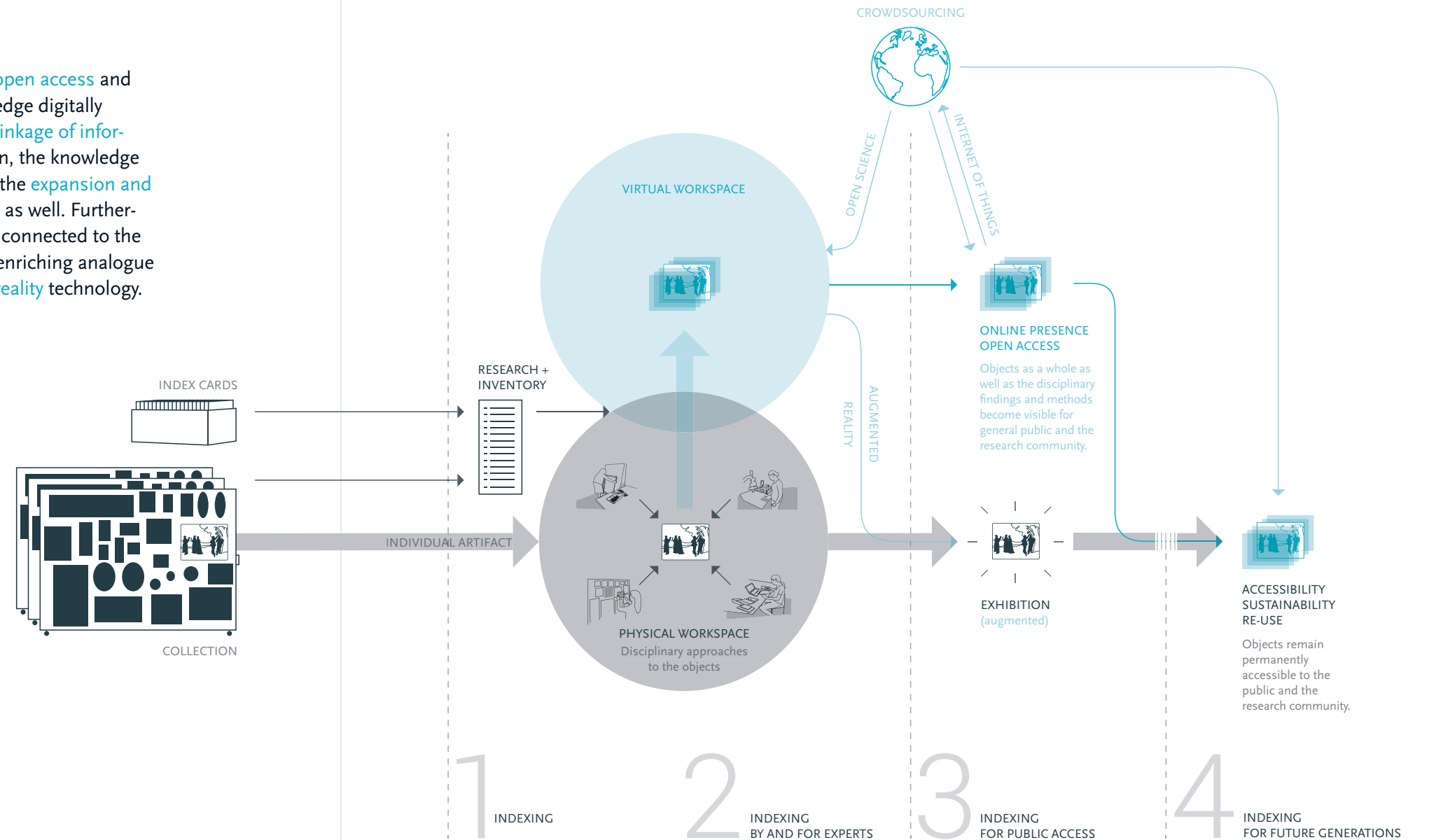
Observations

Analyzing the entire process of collection research and the various discipline-specific approaches, we saw that existing software does not harness the possibilities of digital technology.

We identified four steps integral to this complex research process, beginning with (1) the first surveying, indexing, and researching of artifacts, followed by (2) processing research data to be used by experts in the field, to (3) the preparation of information for the public, and ending with (4) provisions for future re-use.

Regarding the crucial research step in this process we saw that researchers work in both physical and virtual workspaces using physical as well as digital tools. But there are no software solutions that reflect this overlap of physical and digital work practices and that support the actual needs of the researchers. Besides facilitating active research practices, a virtual environment allows for a wide range of other digital and innovative possibilities: digital solutions can facilitate a sustainable and transparent documentation of cultural artifacts, findings, and methods for future generations especially for future researchers. The collected knowledge can be published in online repositories, to make it permanently accessible and understandable to the research community and public.

Following the philosophy of open access and open science, sharing knowledge digitally promotes the exchange and linkage of information worldwide. In addition, the knowledge of the crowd can be used for the expansion and diversification of information as well. Furthermore, the virtual data can be connected to the physical world again, e.g. by enriching analogue exhibitions with augmented reality technology.

CROWDSOURCING

OPEN SCIENCE

INTERNET OF THINGS

VIRTUAL WORKSPACE

AUGMENTED REALITY

ONLINE PRESENCE
OPEN ACCESS
Objects as a whole as well as the disciplinary findings and methods become visible for general public and the research community.

INDEX CARDS

RESEARCH +
INVENTORY

INDIVIDUAL ARTIFACT

COLLECTION

PHYSICAL WORKSPACE
Disciplinary approaches
to the objects

EXHIBITION
(augmented)

ACCESSIBILITY
SUSTAINABILITY
RE-USE
Objects remain permanently accessible to the public and the research community.

1
INDEXING

2
INDEXING
BY AND FOR EXPERTS

3
INDEXING
FOR PUBLIC ACCESS

4
INDEXING
FOR FUTURE GENERATIONS

Observations

The research phase yielded two central observations that form the basis for the Culture Collaboratory design concept.

1 The complex nature of cultural artifacts requires interdisciplinary research.

Cultural artifacts are complex objects that can be understood from a multitude of viewpoints. They can be analyzed in regard to their material properties as well as their historical function and meaning. To create a holistic understanding of these artifacts, it is important to combine the different viewpoints of art history, conservation and material science. In order to achieve this, researchers of the different disciplines have to work together.

2 Research practices and outcomes vary greatly among disciplines.

According to their different viewpoints and research interests, the disciplines use specialized methods and terminologies to make sense of the artifacts. As a result, they all create very heterogenous and often large amounts of research data, including different types of images (UV, x-ray, infrared, etc.), text documents, spreadsheets, scans, and many others. In *Sammlungserschließung* this resulted in an overly complex information environment of over 1,000 categories of metadata.

The review of current collections management software has shown that existing solutions do not take either of these observations into account. Most software is geared towards individual disciplines and does not combine multiple disciplinary viewpoints; and rather than providing interactive platforms of exchange, current software offers mostly static database interfaces with limited means for collaboration. Moreover, existing software is not scalable to manage the complexity and large amounts of heterogenous data that were generated during the interdisciplinary research of *Sammlungserschließung*.
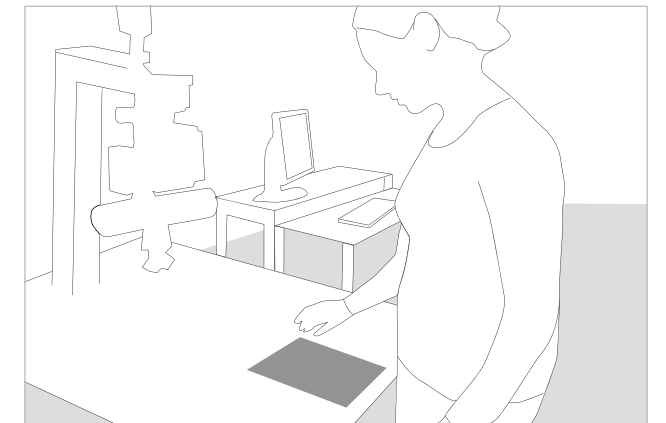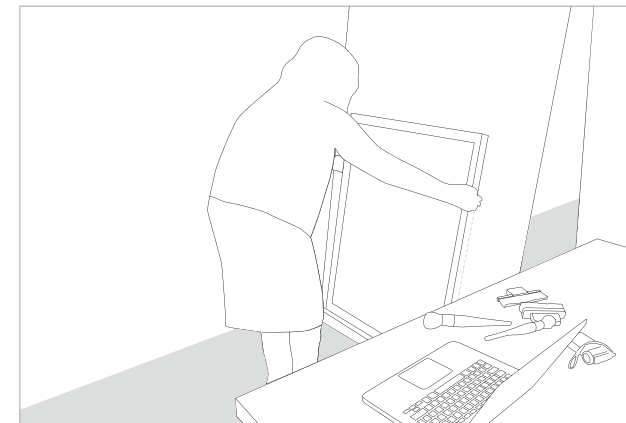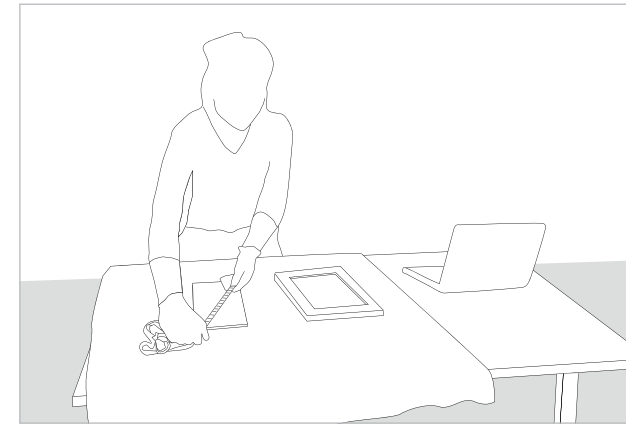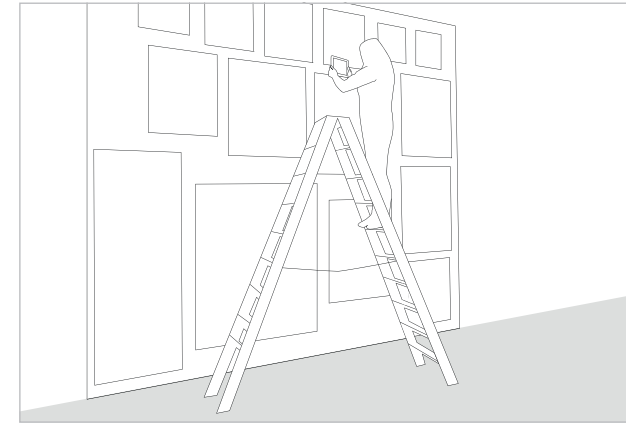
Concept Development

Based on this research, we were able to develop a design concept that incorporates and reflects the needs of individual disciplines while facilitating interdisciplinary exchange. By defining core functions, we designed software interactions and navigation tools and synthesized ideal workflows and exemplary use cases. Several rounds of feedback sessions with the researchers helped to revise and refine the design, which was then tested using low-fidelity wireframe paper prototypes.
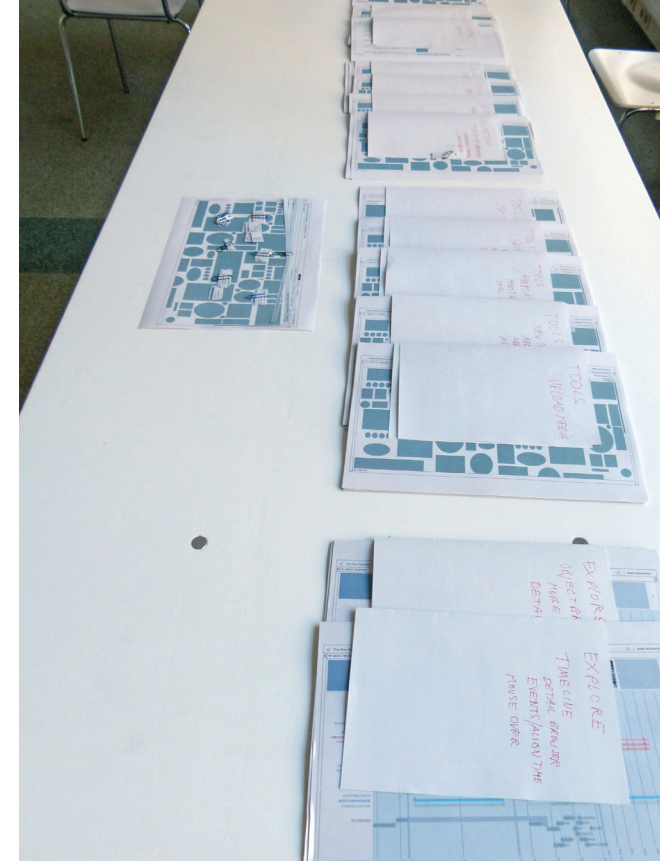
Concept

Model of Collaboration
Layer Model

Model of Collaboration

Based on the observations of the research phase we designed a model of collaboration that serves as the conceptual framework of Culture Collaboratory. The model provides a collaborative workspace that helps streamline research processes, facilitate exchange between disciplines, and make research accessible to the public. To this end, the model accommodates disciplin-specific research methods and workflows, and integrates them onto a shared interface.

Scientific Community

Web Page

Exhibition

Research Group

External

Internal

Disciplines
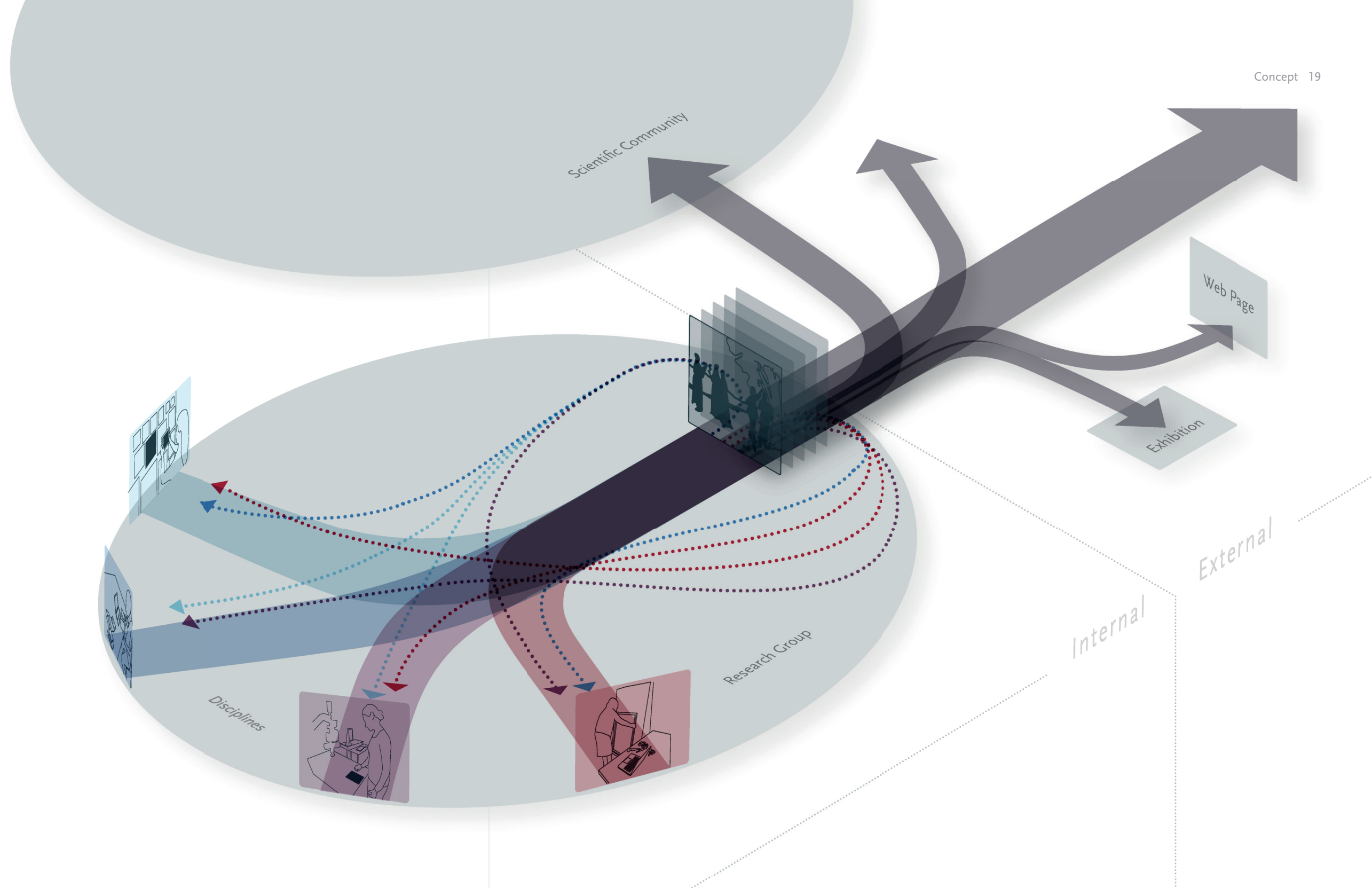
Layer Model

During the research phase, we observed that all researchers chose to explain their results by talking directly in front of the artifact or with a photographic reproduction as visual aid. Culture Collaboratory aims to retain this scenario and transfer it into the virtual workspace. Therefore, the design employs the artifact as a conceptual model for all software interaction.

This so-called layer model is inspired by the physical structure of a painting and is conceptually accessible to all disciplines. Thus, it helps to bridge differences in research methods and terminology.
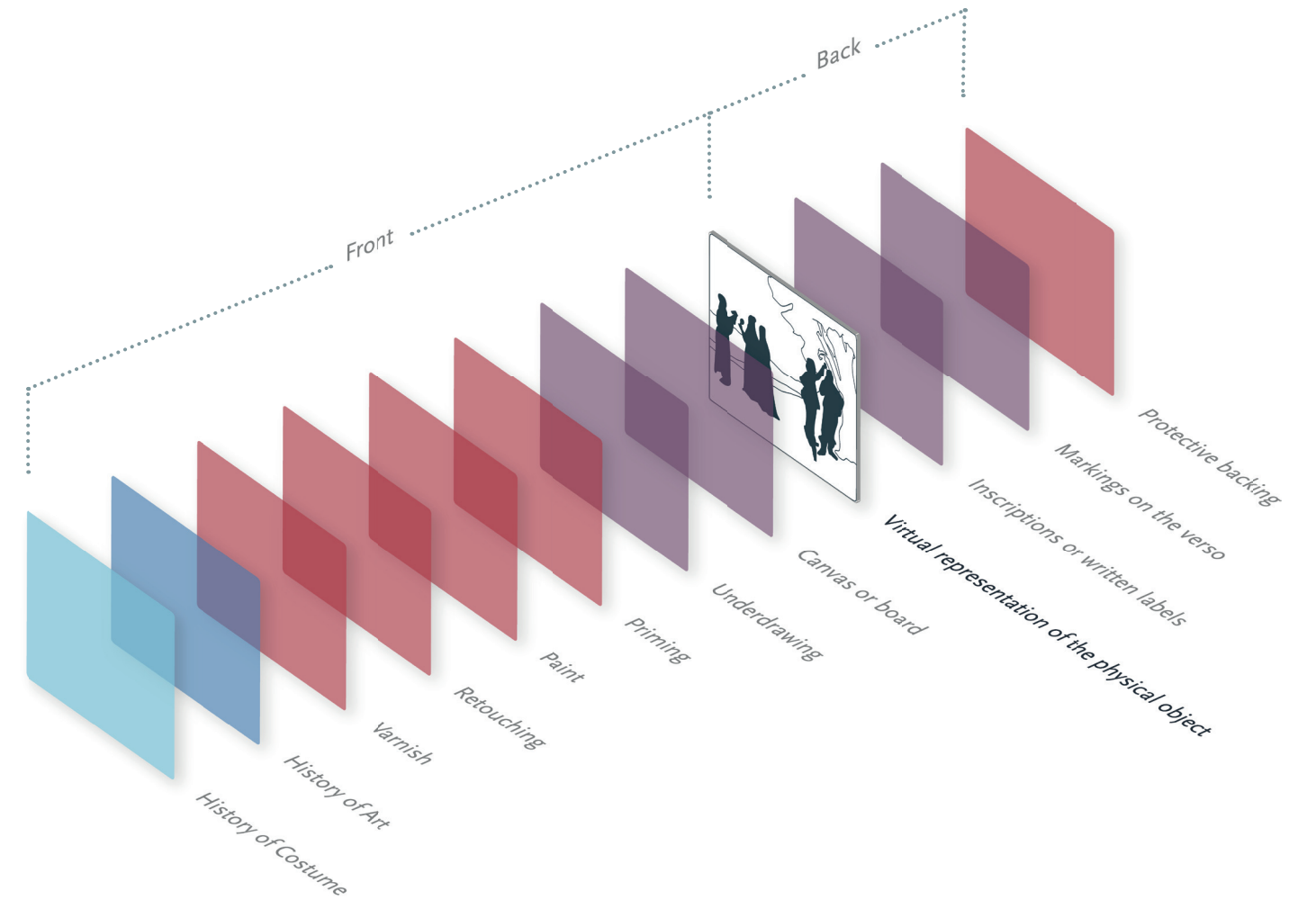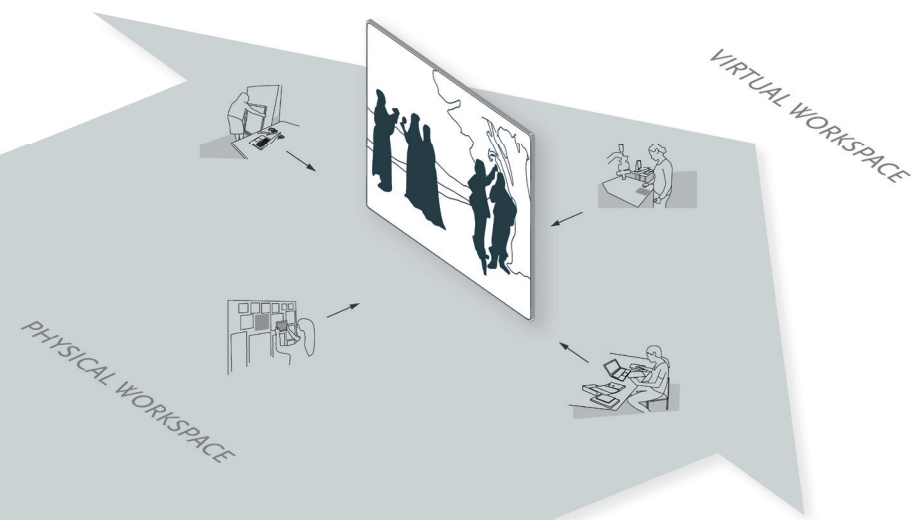
Design

Software Structure

COLLECTION ◀ ▶ INDIVIDUAL ARTIFACT

**Culture Collaboratory
offers two levels of interaction:
the entire collection and
individual artifacts.**

The light table provides a
clipboard to move, arrange,
and compare artifacts, and
make connections visible.

The collection browser
provides an overview
of the collection.

The object browser contains
a virtual representation
of individual artifacts.

The workbench contains
a detail editor (edit mode) or
detail explorer (explore mode).
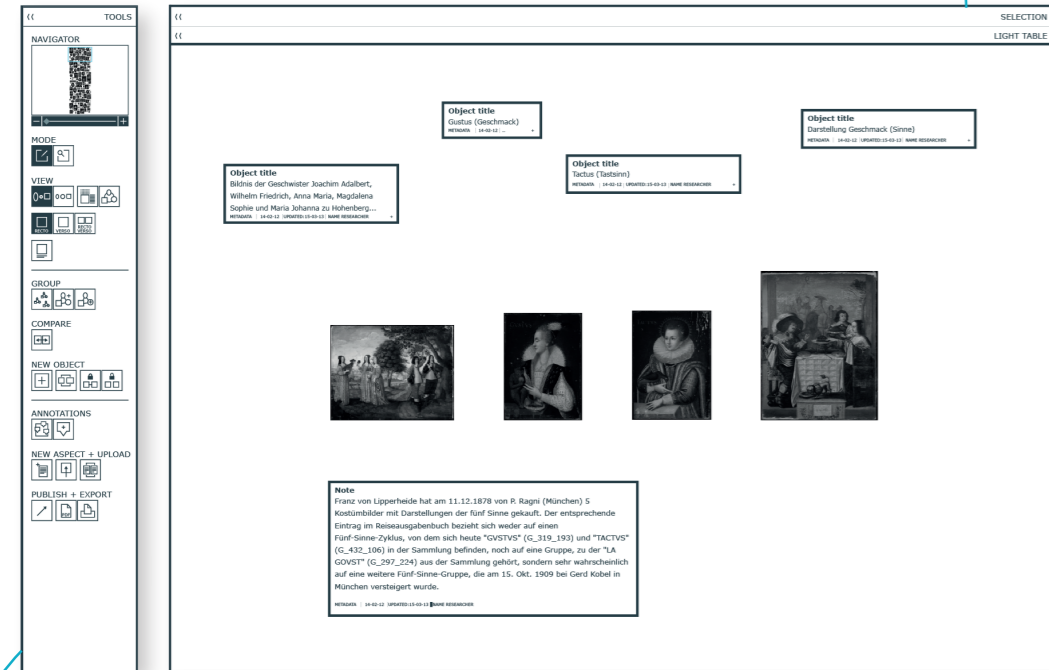
A tool bar provides specialized
tools to navigate the collection and
individual artifacts and to switch
between edit and explore mode.

The media browser
contains all files related
to the collection and
individual artifacts respectively.

The timeline provides a
chronological view of all data
pertaining to the collection and
individual artifacts respectively.

The provenance browser
maps all locations associated
with the entire collection or
individual artifacts.

My work contains all
entries by individual
researchers.

Group work allows to
share entries and findings
among colleagues.

Public data shows
published entries and
is accessible online to
external users.

Collection Overview

The navigator helps to orientate oneself while exploring the collection.

Different sort and view options help to explore the collection as a whole and the relation of individual artifacts to each other.

Create groups, compare individual artifacts, add annotations, and export data.

Lipperheide Painting Collection | Art Library | Berlin

FILTER BY ▾ | SEARCH IN ▾ | LOGIN ▾

TOOLS

SORT BY : RANDOM

NAVIGATOR

VIEW

RECTO VERSO RECTO VERSO

GROUP

COMPARE

ANNOTATIONS

EXPORT
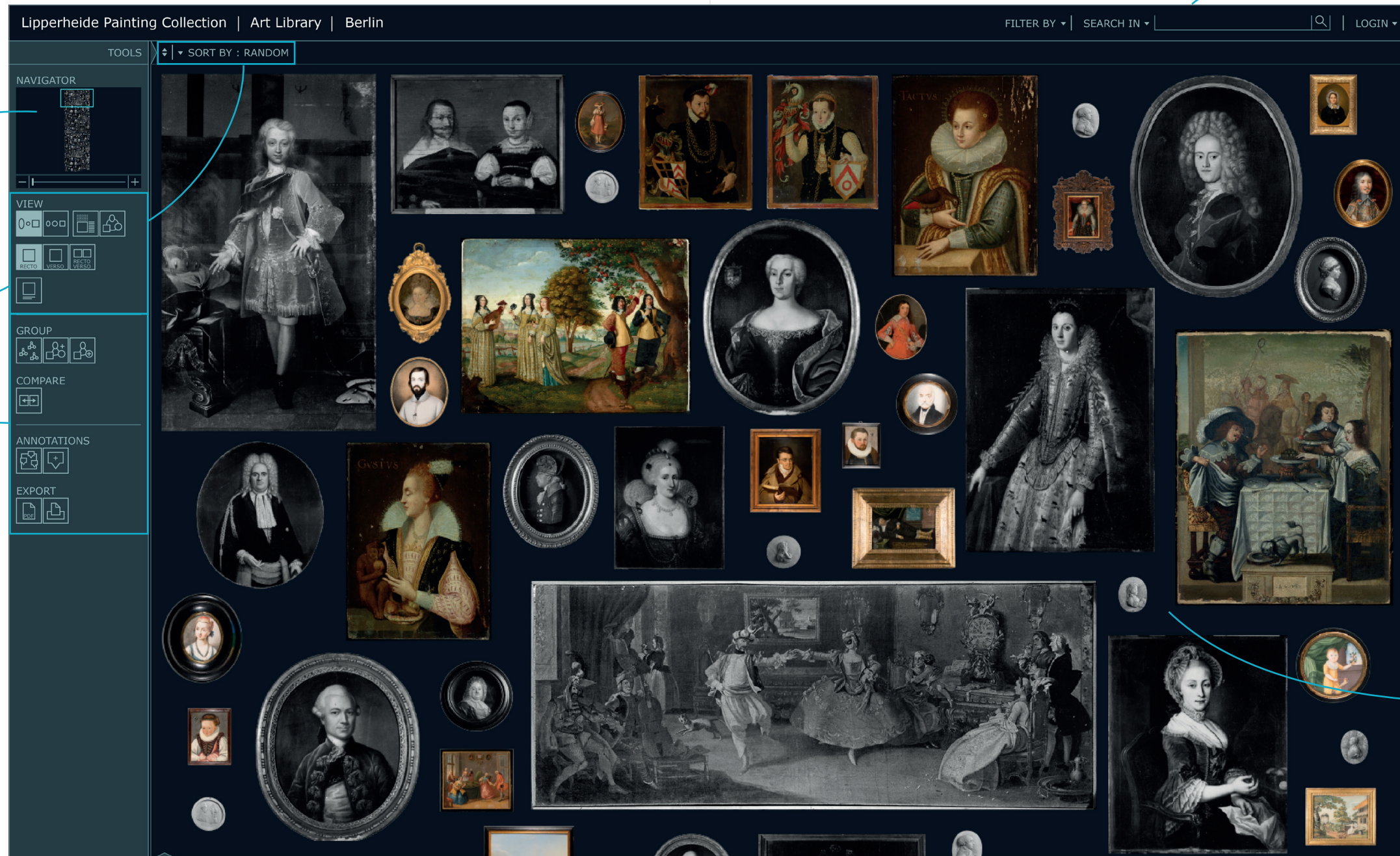
Detailed filter and search options help navigate and explore large collections according to chosen parameters.

The landing page displays an overview of the entire collection. A mouseover shows basic information about individual artifacts.

View Options

Proportionate view shows the relational size of multiple artifacts.

Proportionate view shown with captions.
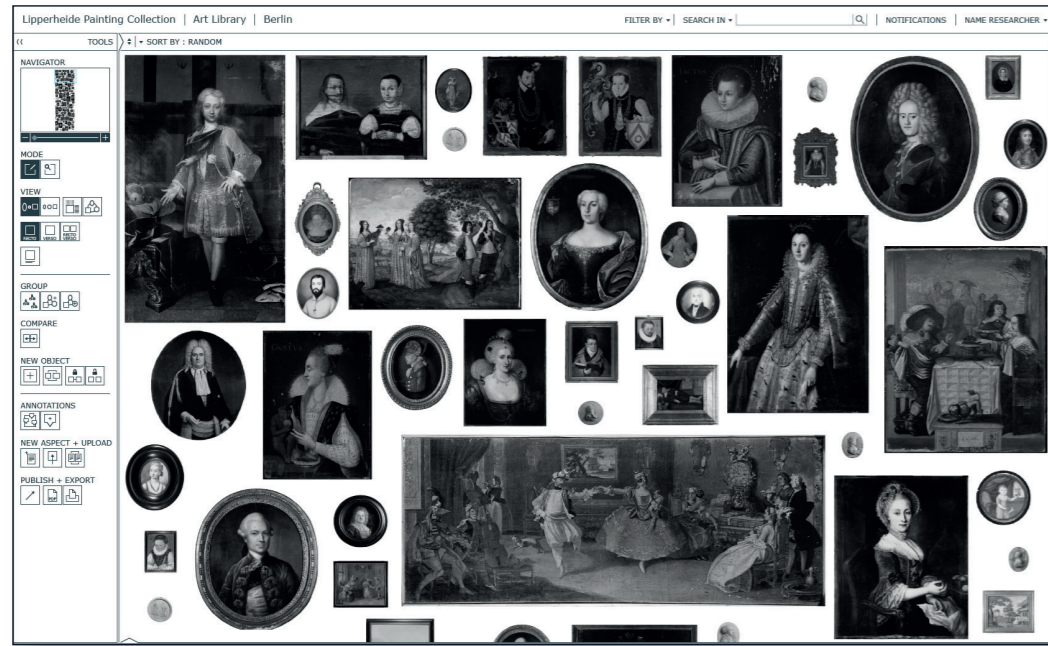
View as same size allows to ignore proportionate size and focus on visual content instead.
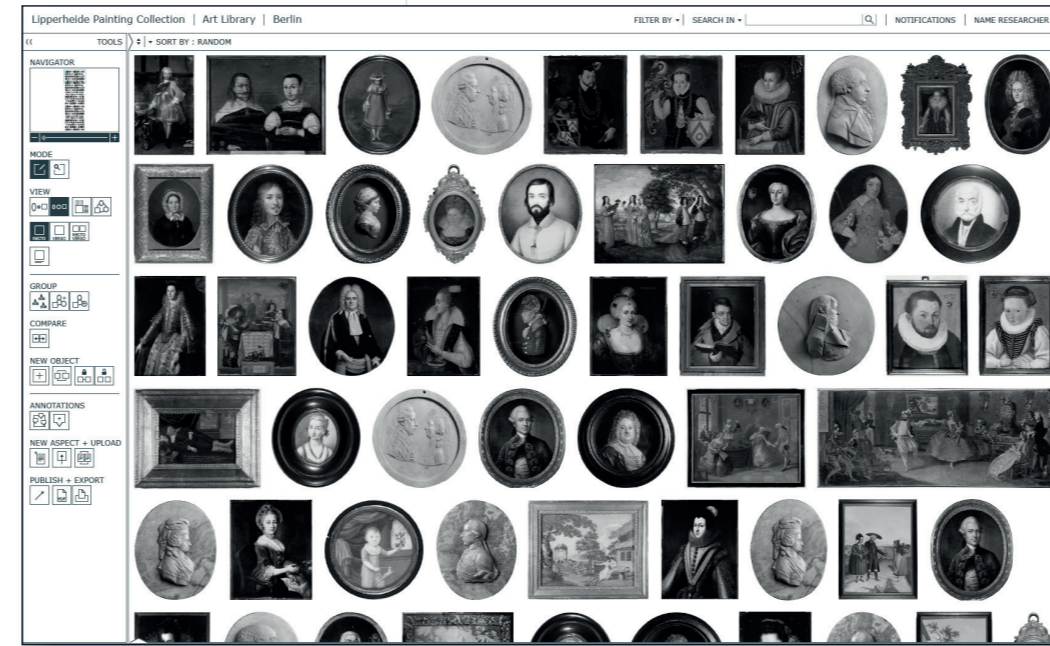
View as same size shown with captions plus recto and verso.
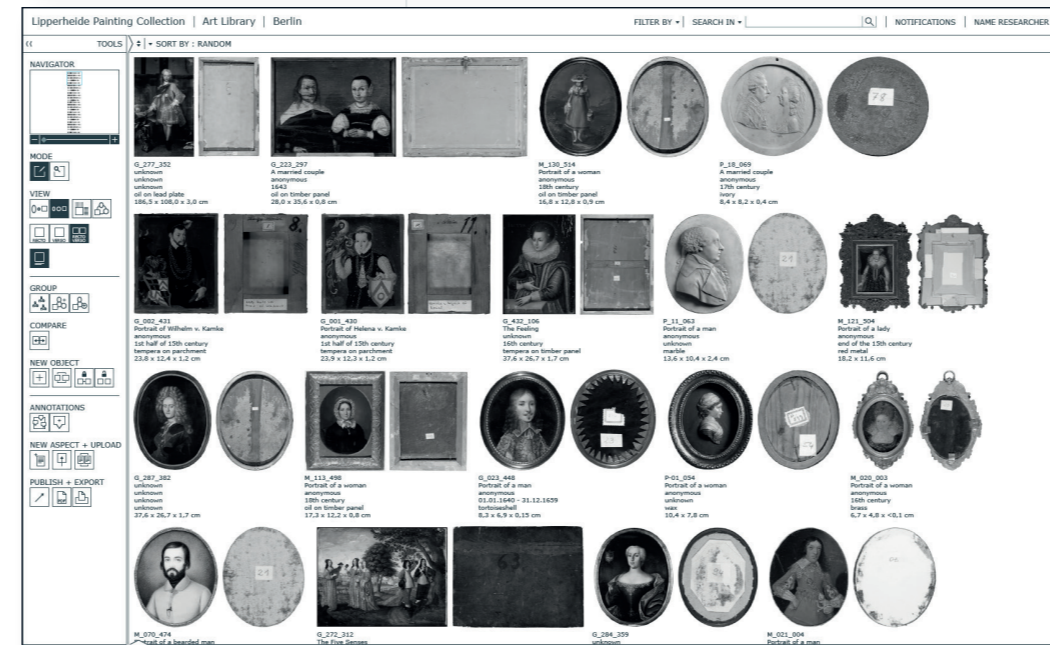
View relations highlights relations between objects as generated by automated matches in metadata fields or by defining groups or connections.
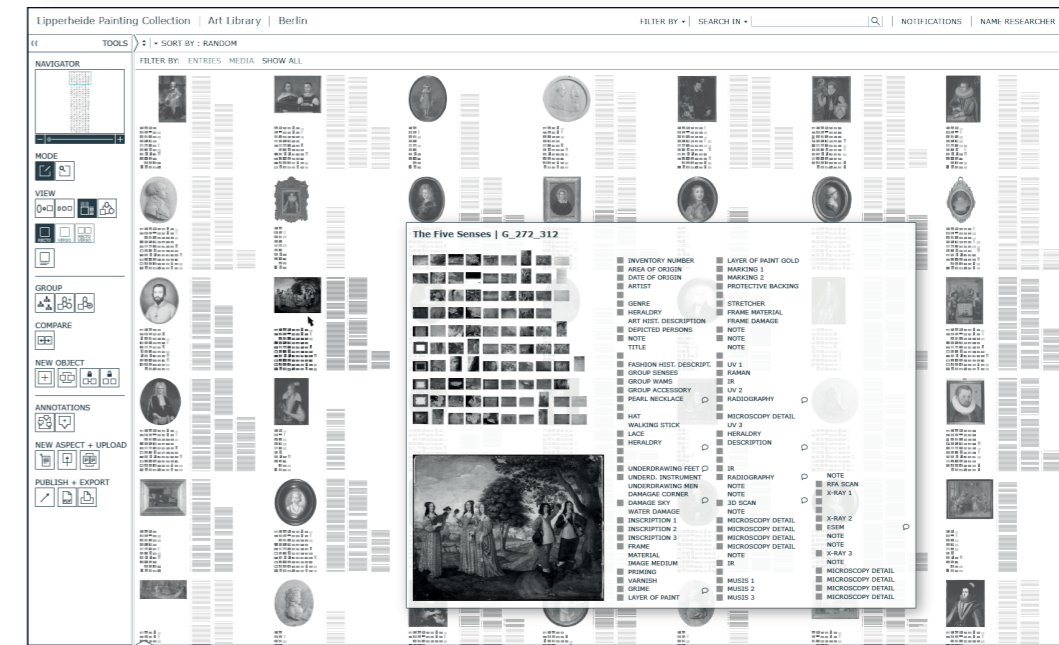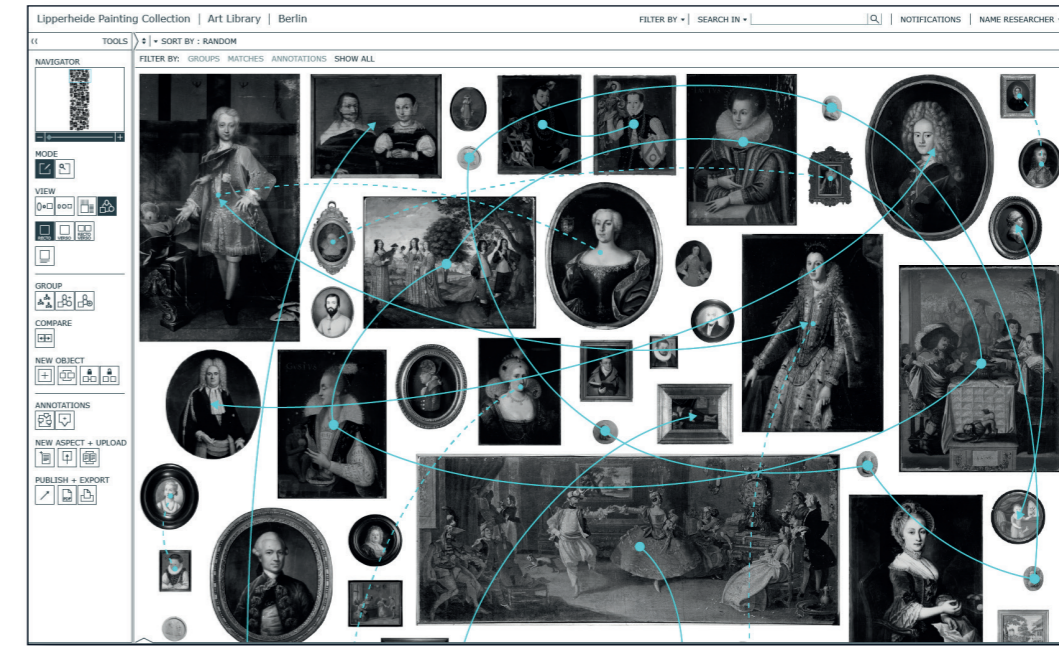
View state of research gives an overview of the information attached to each object using thumbnails for media and lines for entries.

Layer Object and Layer Interactions

The layer object is a virtual 3D representation of the physical artifact using high resolution 2D photography. Information layers recreate the physical structure of an artwork and are arranged around the object. The layer object contains material information about support, priming, or underdrawing on its inner layers and semantic information about the subject matter on the outermost layer. Information can be mapped onto matching layers using the annotation tool. Moreover, the information layers are interactively synchronized with the detail explorer.

Layer object

The context browser consists of a provenance browser, media browser, and a timeline with the metadata thumbnail.

Data can be accessed through the detail explorer, which provides a list view of all research data sorted according to categories of metadata.
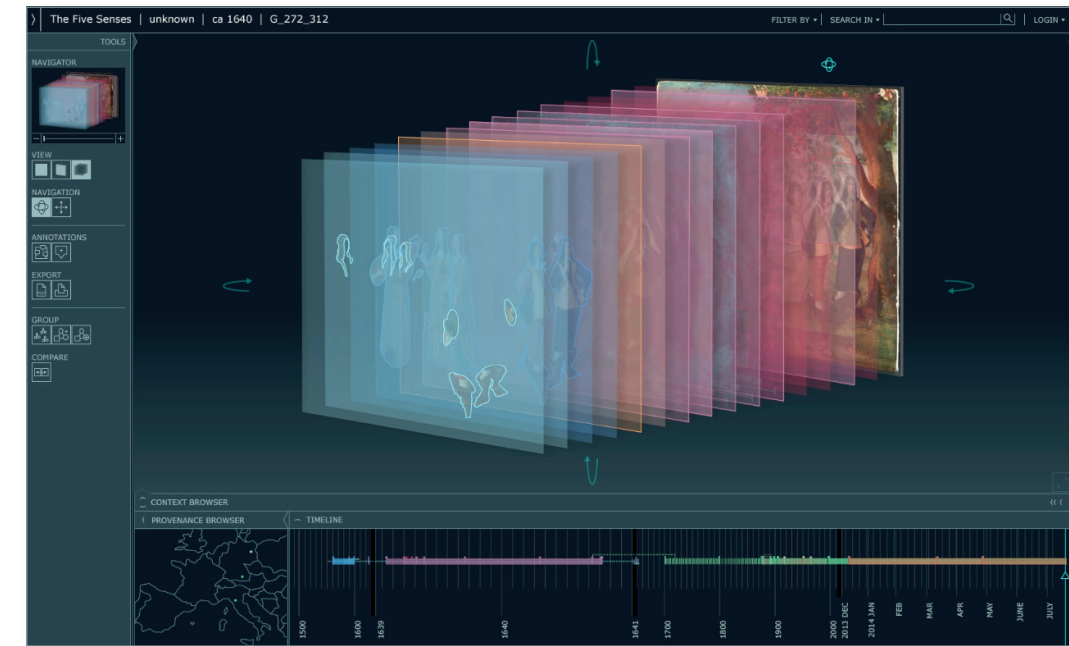

The Five Senses | unknown | ca 1640 | G_272_312

FILTER BY ▾ | SEARCH IN ▾ | LOGIN ▾

TOOLS

NAVIGATOR

VIEW

NAVIGATION

ANNOTATIONS

EXPORT

GROUP

COMPARE

⟨ DETAIL EXPLORER   FILTER BY ▾ | SORT BY ▾ ⟩

OBJECT

TITLE   The five Senses
ARTIST   Unknown
DATE   around 1640
MATERIAL   Oil on lead plate
SIZE   ca.31,9 cm x 43,3 cm
ASSOCIATED FRAME wood, brown stained, shellac (?), inner side poliment gilded
SIZE   54,5 cm x 66,5 cm x 5,5 cm

HISTORICAL CONTEXT
TIME OF ORIGIN
PHYSICAL STRUCTURE
SKETCHES + UNDERDRAWINGS
CONSERVATION + TREATMENT
MEASURES + ACTIONS
CONDITION + DAMAGES
VISUAL CONTEXT
VISUAL INSPIRATION
VISUAL CITATIONS
ICONOGRAPHY
FASHION HISTORY
PROVENANCE
OWNERSHIP
LOCATIONS

CONTEXT BROWSER

⟨ PROVENANCE BROWSER   ⌄ TIMELINE

1500   1600 1639   1640   1641 1700 1800 1900 2000 2013 DEC 2014 JAN FEB MAR APR MAY JUNE JULY

A navigator helps to orientate oneself while exploring the layer object.
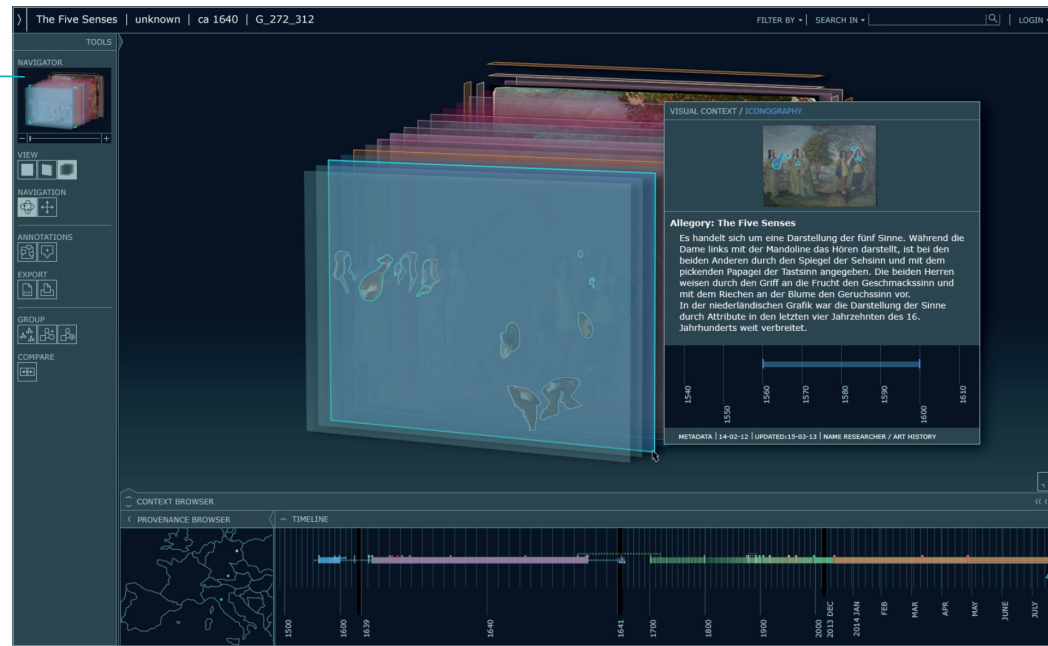
A mouseover summarizes information on the individual layers.

Rotate the *layer object* and its information layers.

Select a side of the *layer object* to explore relevant information.
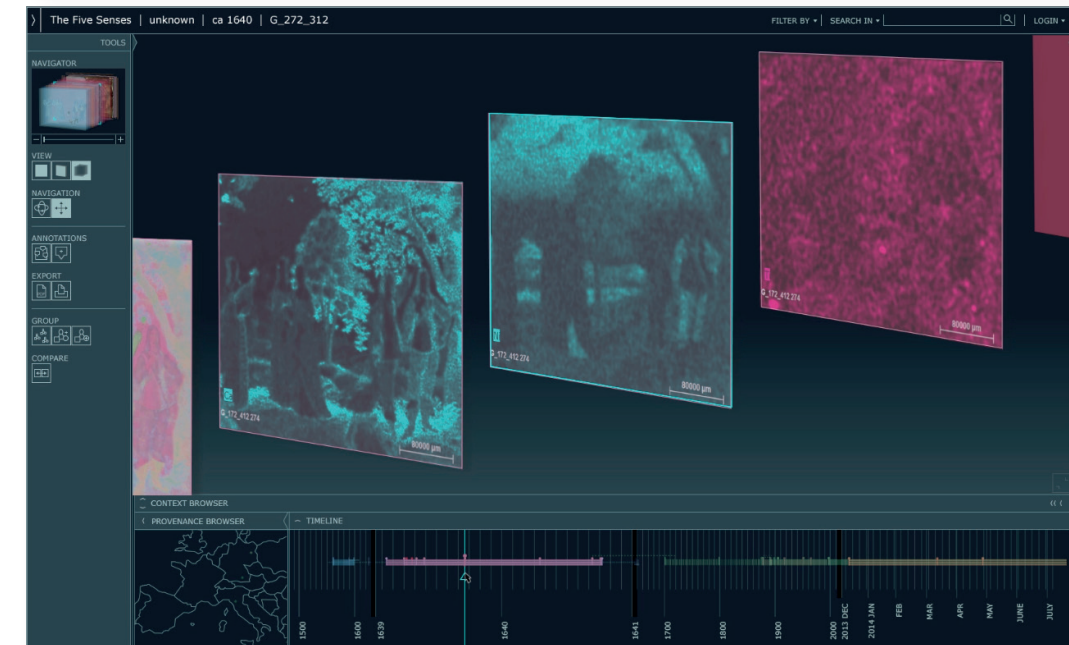
Access all research in the exploded view by panning the *layer object* directly or scrolling through the layer object on the *cultural genome*.

Timeline

The provenance browser maps historical and current locations of the artifact.

The timeline is split into categories of metadata and disciplines. It represents all research data and links them to events in the history of the artifact.

Switch from proportional to disproportional time to review all events at a glance.
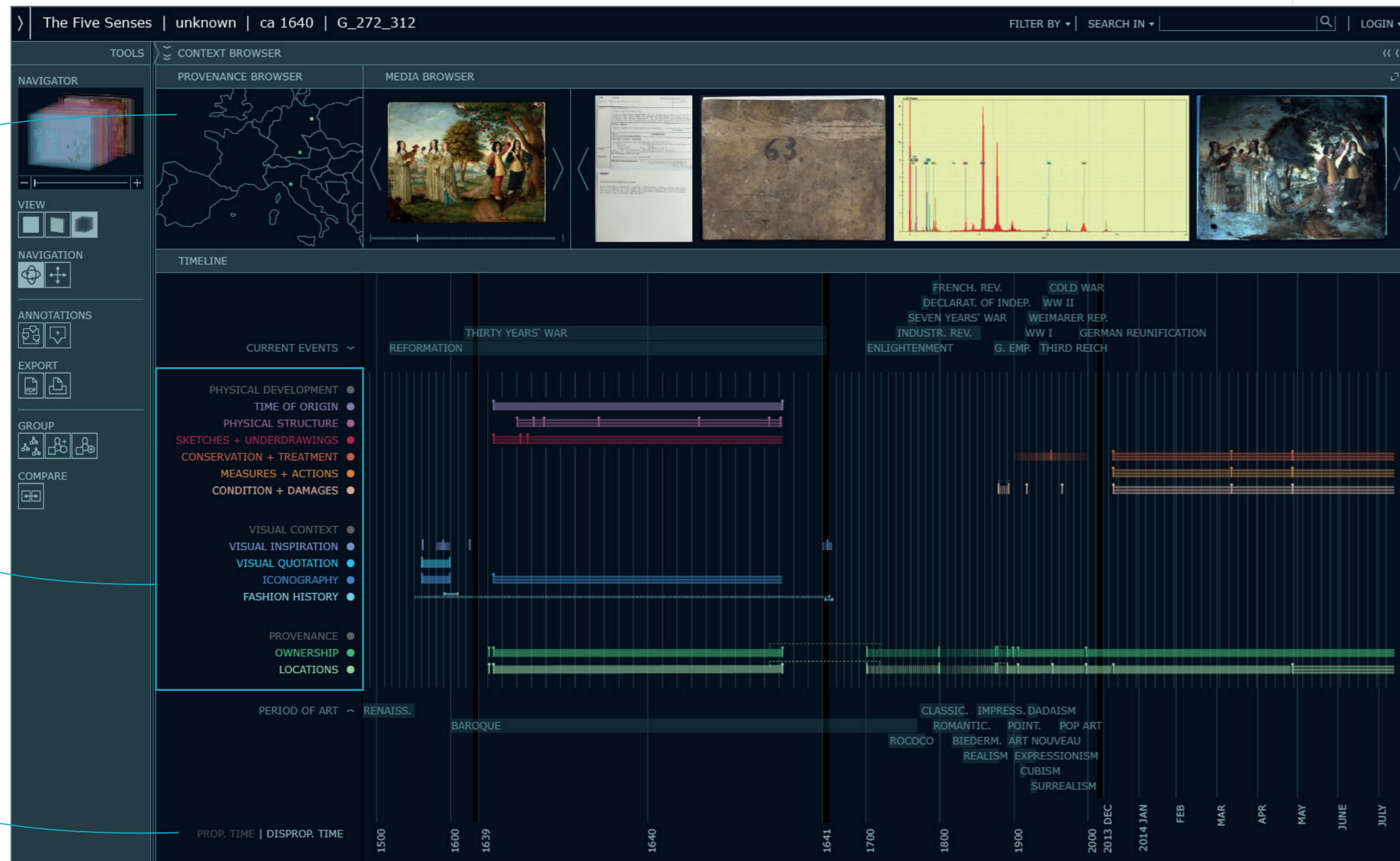
The media browser contains all media associated with specific events in the history of the artifact.
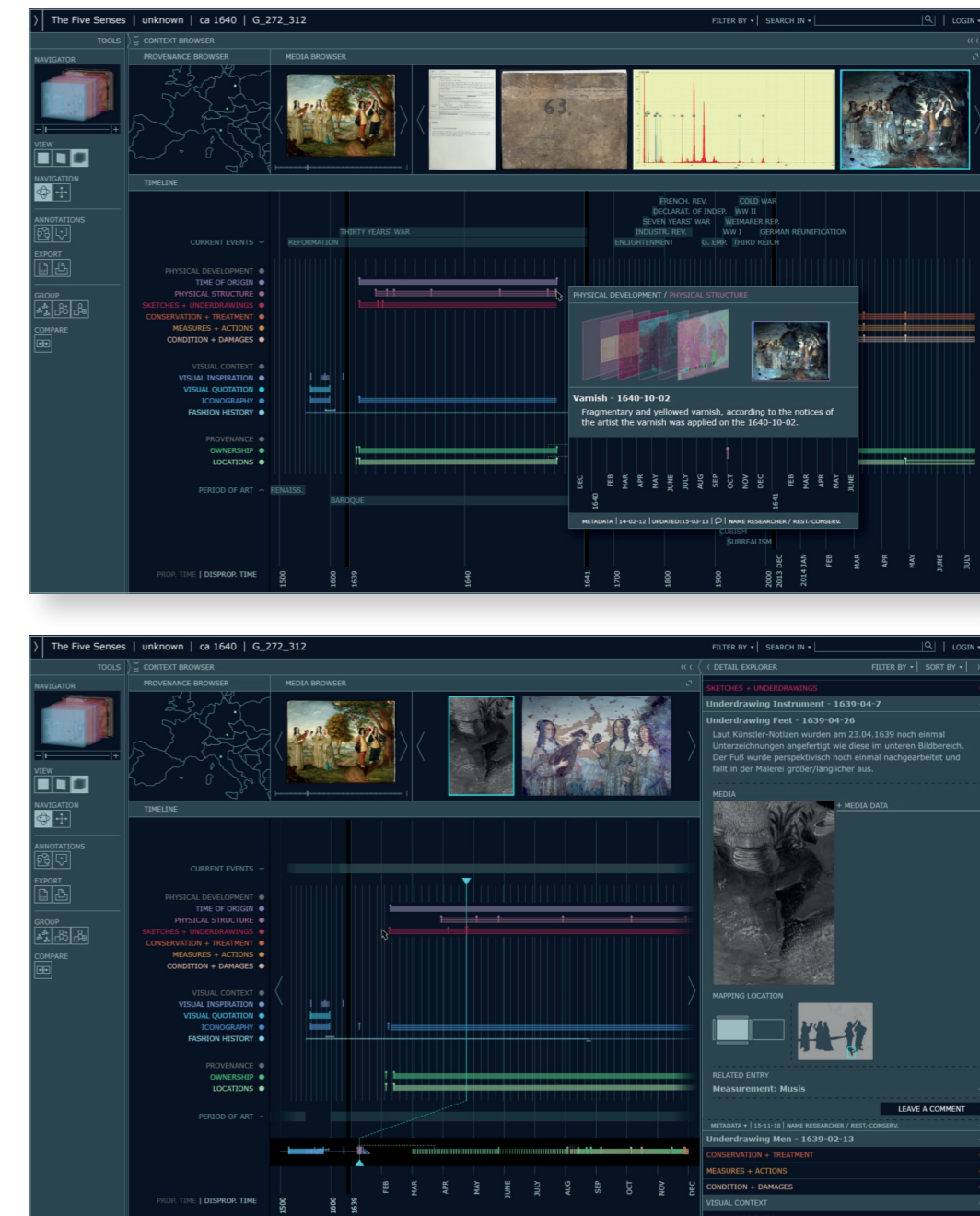
A mouseover shows brief information about the event. Associated media are shown in the *media browser* and are linked to the events.

Click on an event and review detailed information and media in the *detail explorer*.

The Five Senses | unknown | ca 1640 | G_272_312

TOOLS   CONTEXT BROWSER

NAVIGATOR

PROVENANCE BROWSER   MEDIA BROWSER

VIEW

NAVIGATION

ANNOTATIONS

EXPORT

GROUP

COMPARE

TIMELINE

CURRENT EVENTS

FRENCH. REV.   COLD WAR
DECLARAT. OF INDEP.   WW II
SEVEN YEARS' WAR   WEIMARER REP.
INDUSTR. REV.   WW I   GERMAN REUNIFICATION
ENLIGHTENMENT   G. EMP.   THIRD REICH

THIRTY YEARS' WAR
REFORMATION

PHYSICAL DEVELOPMENT
TIME OF ORIGIN
PHYSICAL STRUCTURE
SKETCHES + UNDERDRAWINGS
CONSERVATION + TREATMENT
MEASURES + ACTIONS
CONDITION + DAMAGES

VISUAL CONTEXT
VISUAL INSPIRATION
VISUAL QUOTATION
ICONOGRAPHY
FASHION HISTORY

PROVENANCE
OWNERSHIP
LOCATIONS

PERIOD OF ART   RENAISS.
BAROQUE
ROCOCO   BIEDERM.   ART NOUVEAU
REALISM   EXPRESSIONISM
CUBISM
SURREALISM

CLASSIC.   IMPRESS. DADAISM
ROMANTIC.   POINT.   POP ART

PROP. TIME | DISPROP. TIME

1500   1600   1639   1640   1641   1700   1800   1900   2000   2013 DEC   2014 JAN   FEB   MAR   APR   MAY   JUNE   JULY

Time Designations

While language is able to designate different qualities of time, existing software requires clear specifications. With strictly defined dates, however, subtle differentiations can get lost. The visual code of different qualities of time allows for more variance and accurately reflects the uncertainty of dating cultural artifacts.

unambigous time designations

Dates

- e.g.: 1.1.1639

- e.g.: 1640

Periods

- e.g.: 1.1.1641 - 12.31.1650

- e.g.: 1641 - 1650

vague time designations

- 19th century, 1st half of the 19th century

- define designation starting from a specific date

conflicting time designations

- date (of production, of purchase)

Culture Genome

The culture genome is a visual notation system that allows to analyze and compare metadata of cultural artifacts. It is generated by overlaying the timelines of the various metadata categories that appear spread out in full view mode. As a thumbnail of all research data associated with one object, the culture genome helps to assess the state of research of individual or multiple objects in one glance.
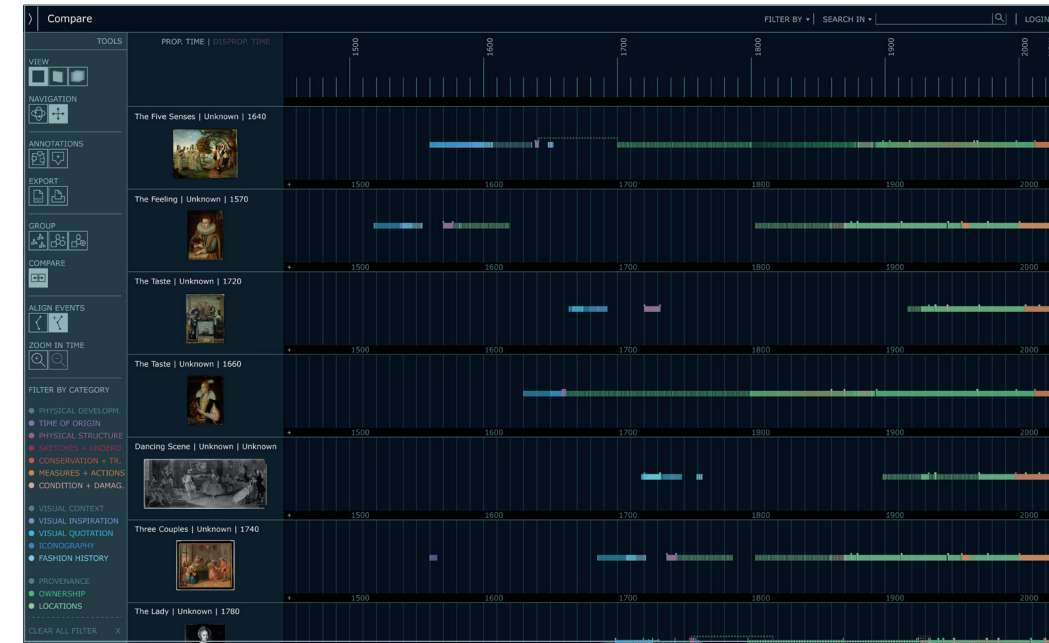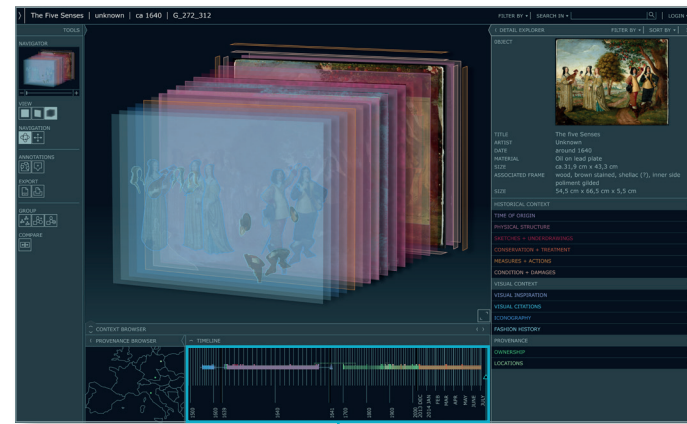
Compare multiple artifacts in one glance.
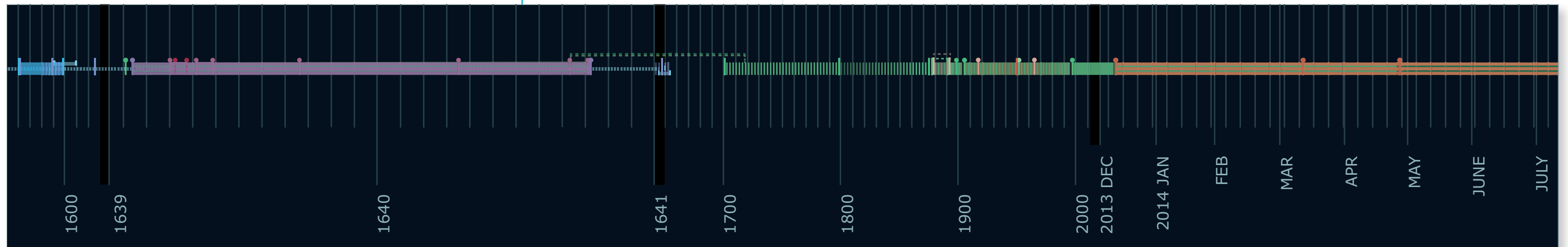
Use Cases

Use Cases

Culture Collaboratory can be used in a multitude of settings: by teams creating exhibitions or researchers in academic institutions who need to manage and interpret large sets of data. Smaller museums with limited resources benefit from a software that helps them manage, research, and publish their collections.

The following use cases show various tasks routinely performed in museums and other research institutions. They highlight the interdisciplinary scope of the design and present different user groups, such as internal and external users.
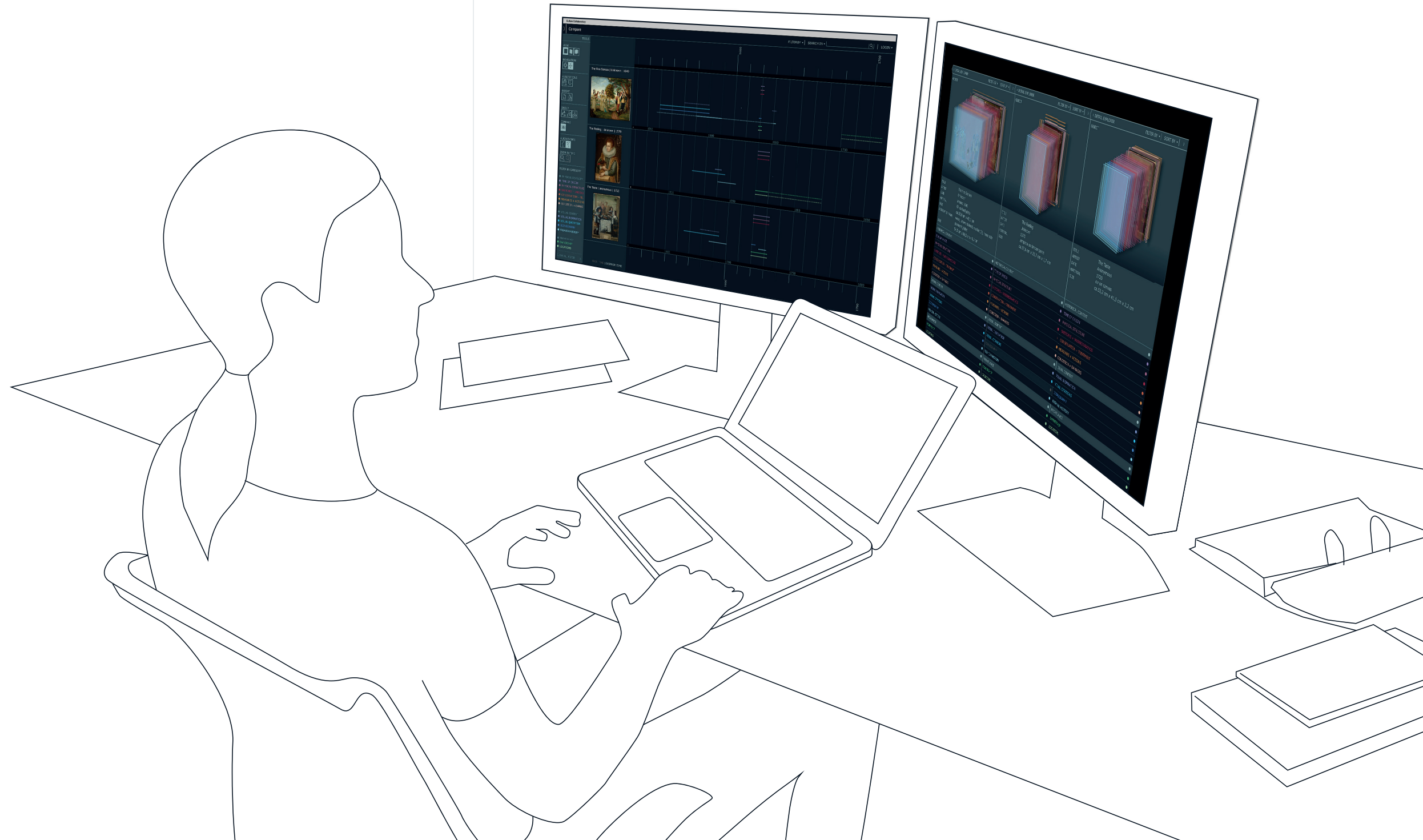
Adding Information about an Artist

Adding information about an artist and keeping it up to date is easy with linked open data. For Culture Collaboratory, we chose to use the German National Library's integrated authority file for persons and corporate bodies (GND).

Select *artist* and enter the name and relevant information manually or copy-paste the corresponding GND link.

Choose new aspect in the *tool bar*.
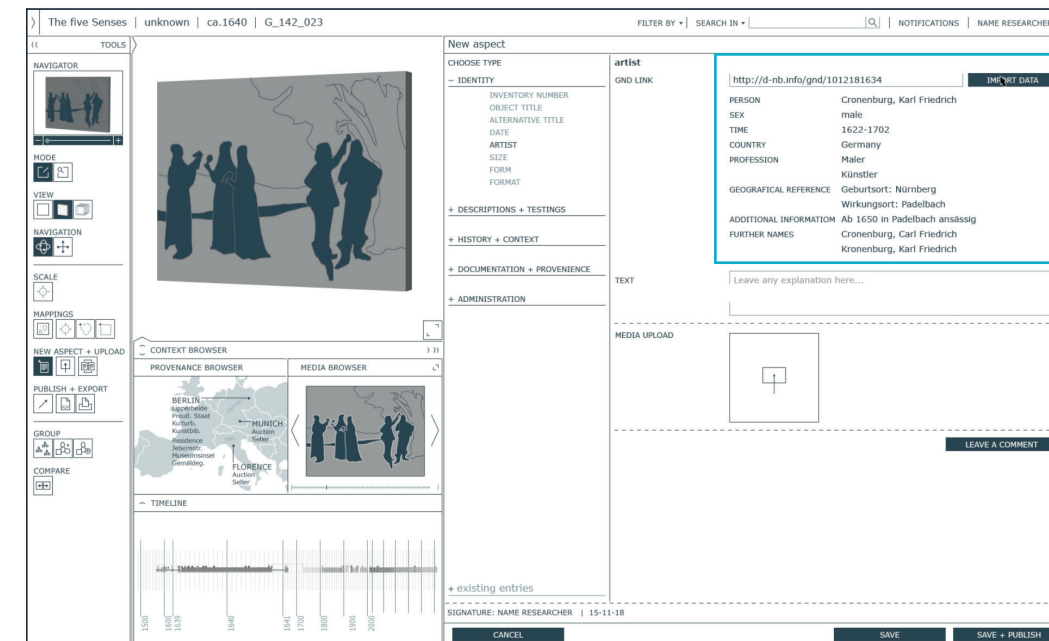
The link will automatically import all data from the biographic files provided by the German National Library. Saving will create an entry in *my work*.

Measuring Artifacts

Existing databases do not allow for much variance in recording the dimensions of an object. Maximum height x width x depth is most commonly used. However, most artifacts are not geometrically even. In order to reflect these inconsistencies and to be able to describe objects accurately, Culture Collaboratory uses object- and context-centered interactions.

Select the side of the artifact you want to measure.
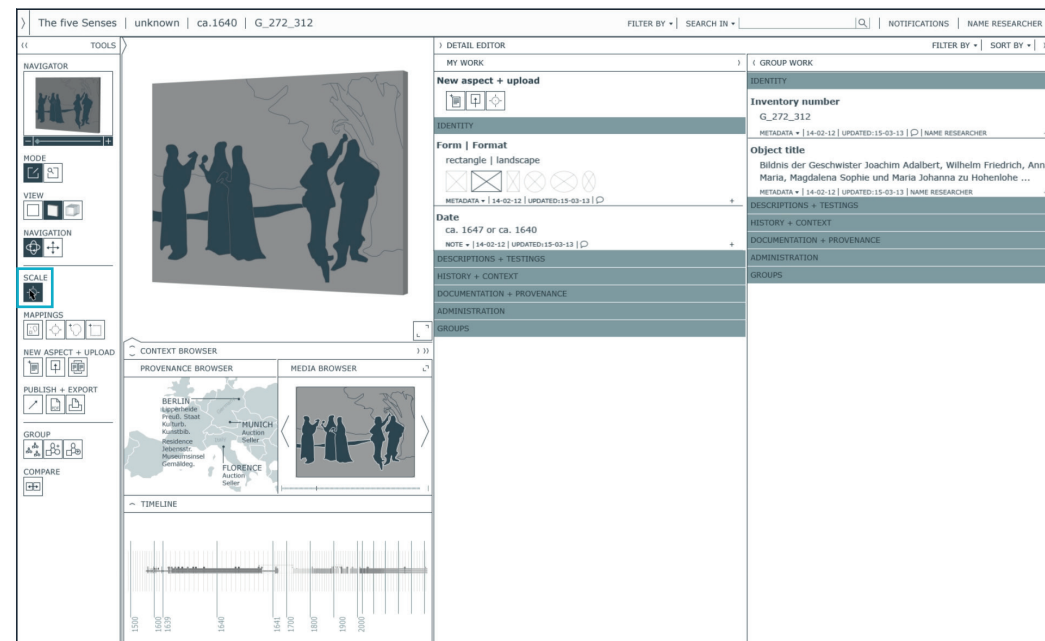
Choose scale from the *tool bar*.

A *smart zoom* will zoom in on the reference point as closely as the resolution of the digital image allows to ensure the exact replication of the measurement.

Move the cursor vertically, horizontal, or diagonally and select the end point of the measurement.

... click *save after adding all measurements.*
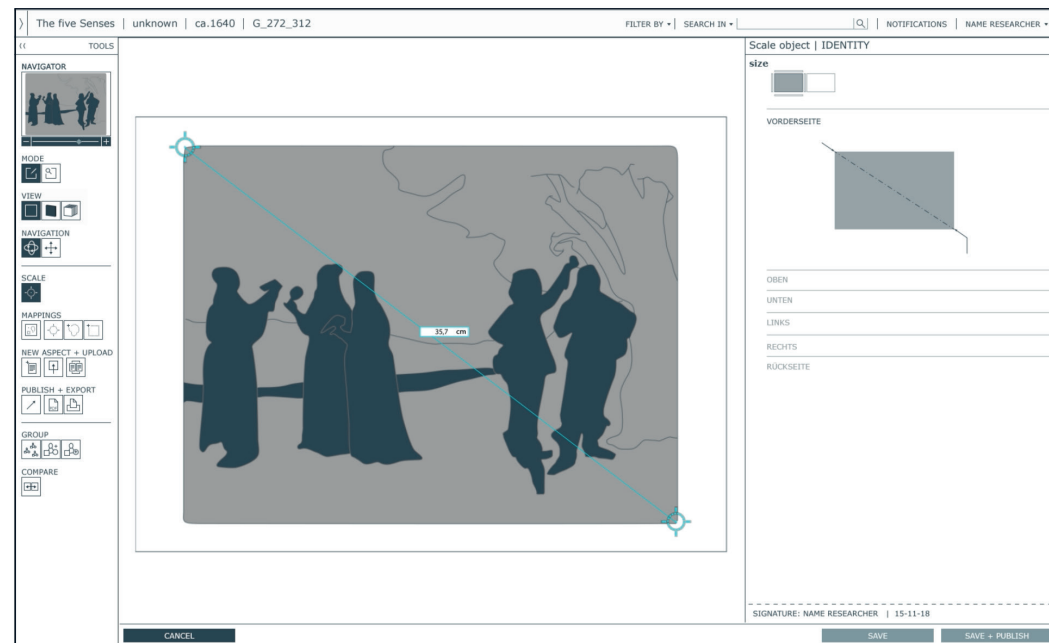
Enter the dimensions ...

Review all dimensions in *my work.*

Documenting Testings

Documenting testings and results are key to transparent and replicable research. In order to maintain the relationship between research data and the artifact, all results can be mapped directly onto the layer object.

Select one of six sides of the artifact …

Choose a mapping tool from the *tool bar*.
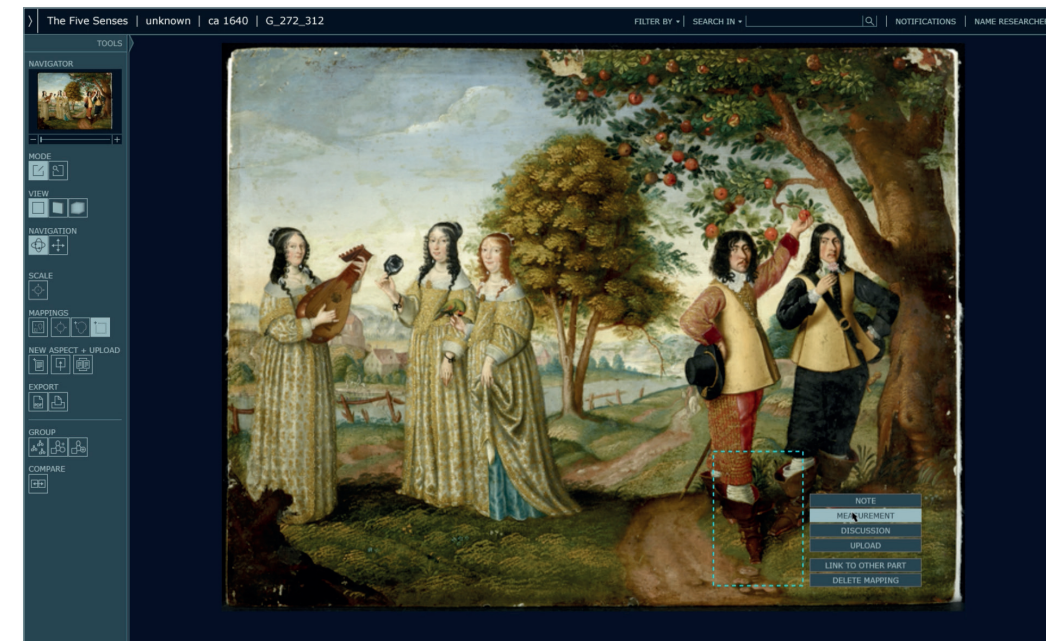
… tag the relevant area and choose *measurement*.
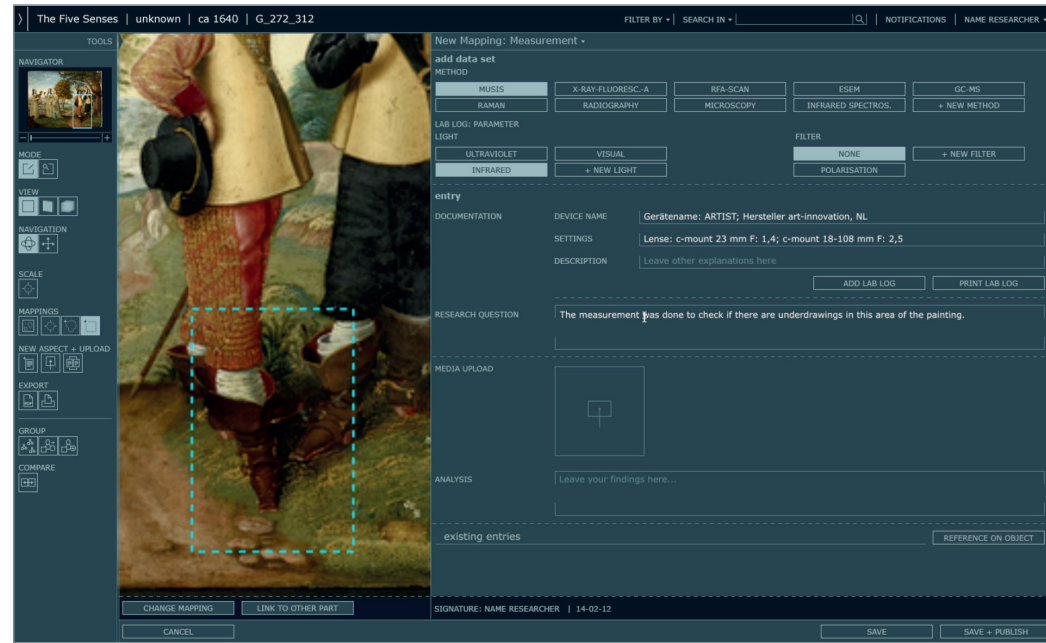
Select a measuring method
and enter all parameters,
instrument settings, and
research questions.
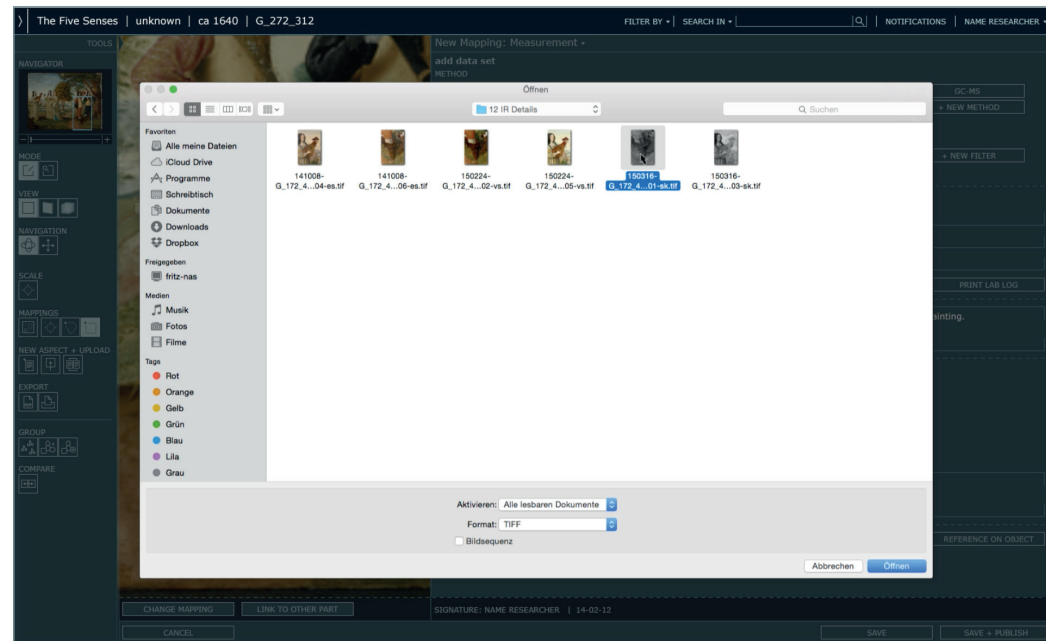
Save ...

Upload related images
to document the testing
or measurement.
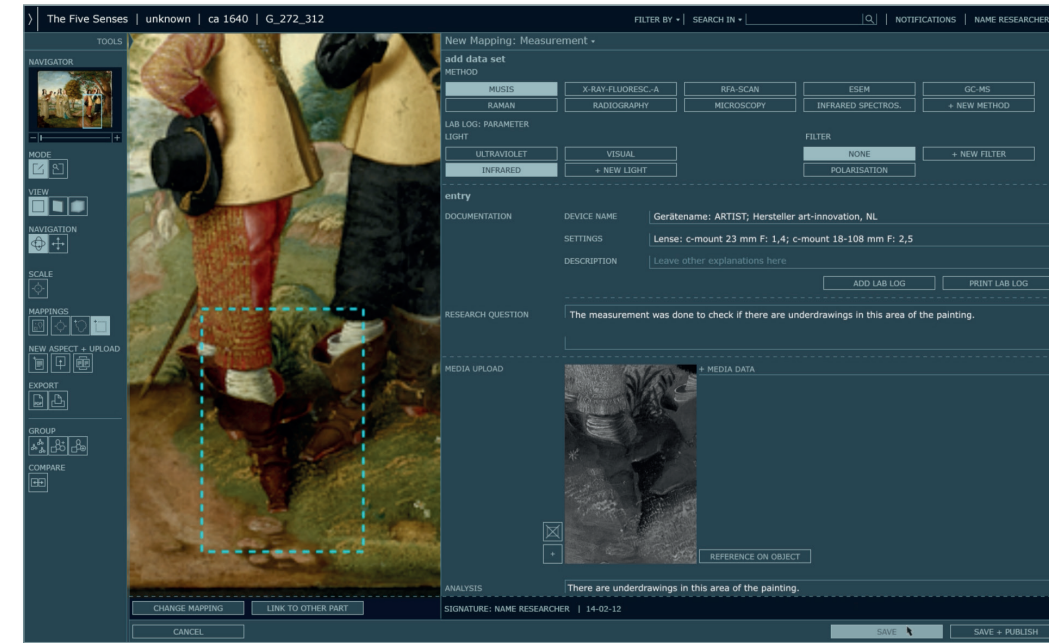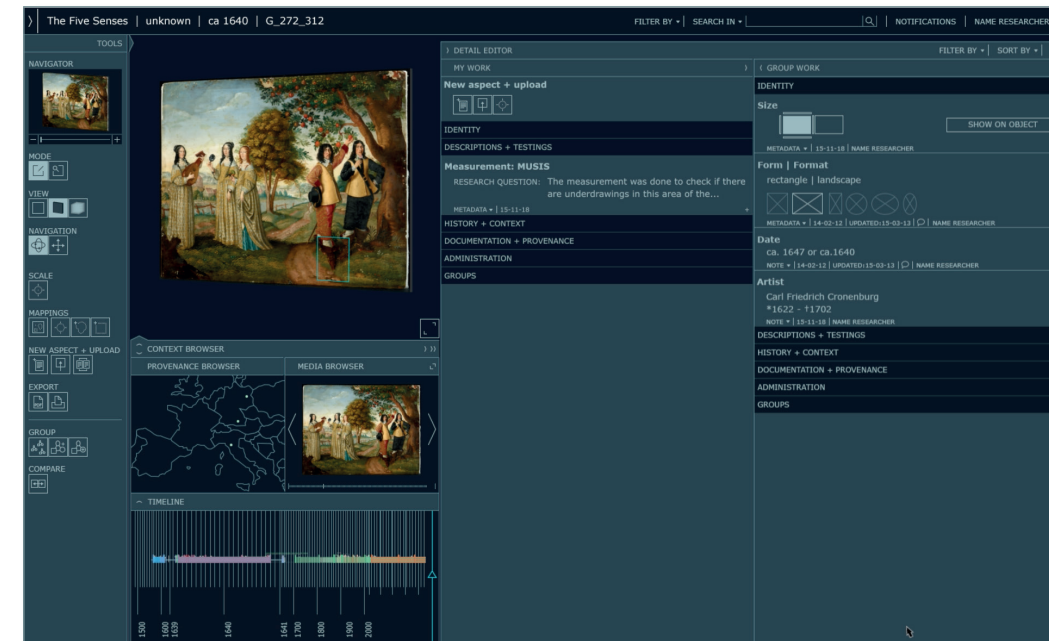
... and review in *my work*.

Interdisciplinary Exchange

Existing collections management systems often function as digital yet static archives of information. Culture Collaboratory, in contrast, is designed to foster exchange and interdisciplinary collaboration. The design allows to review colleagues' research, leave comments, and ask questions.
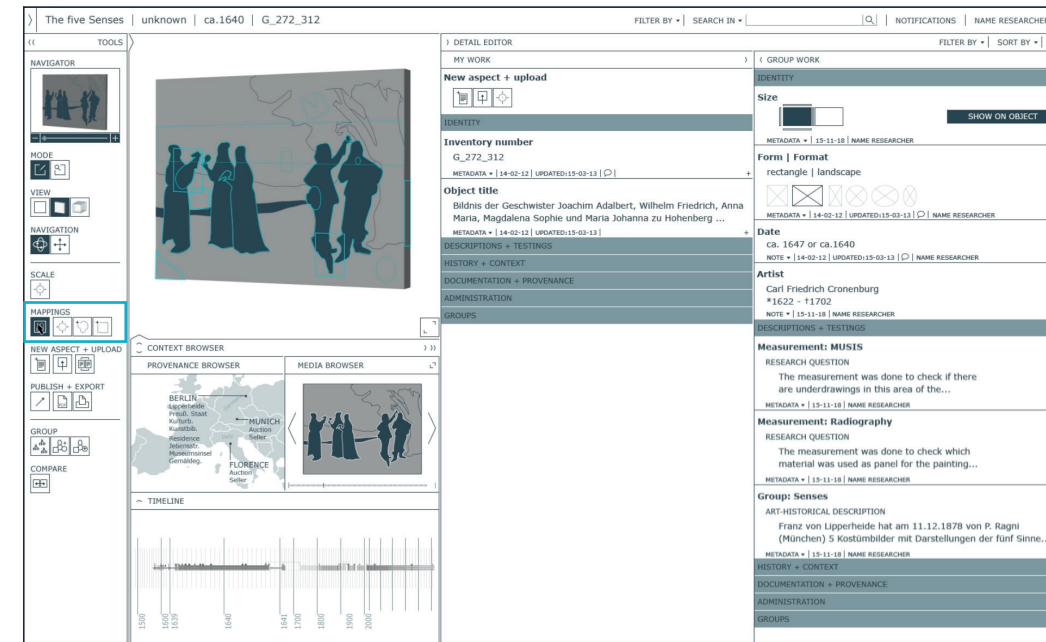
Choose show mappings from the *tool bar* to highlight all mappings on an artifact. Individual mappings can be selected and viewed in detail.
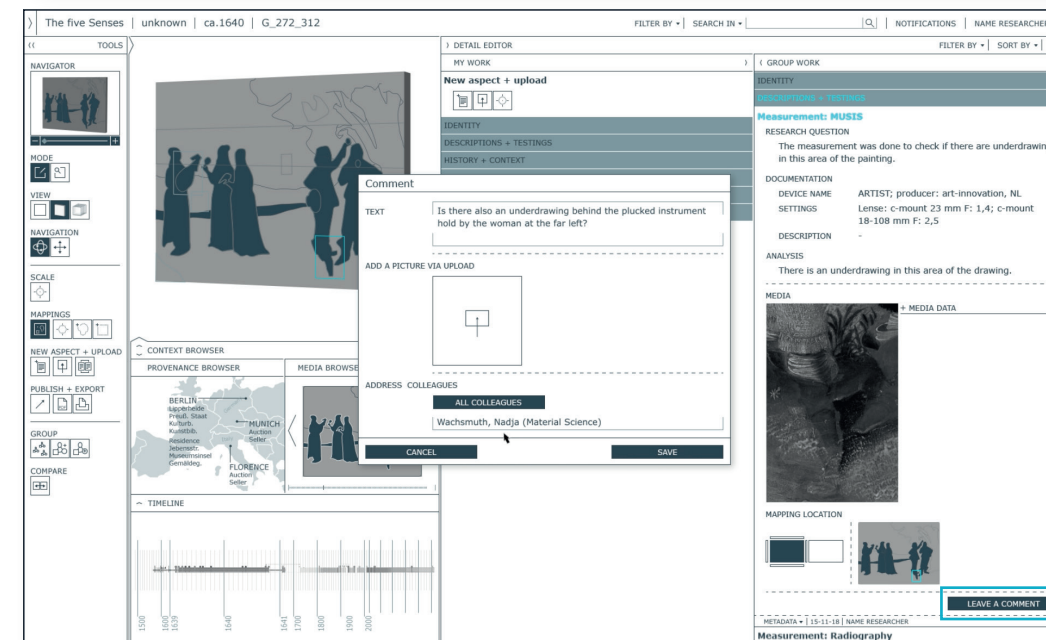
Leave a comment or questions to start a discussion.

Creating Groups

Creating groups of artifacts is a central tool for collections research and helps to identify connections and make them visible. In curatorial work, groups are an easy way of keeping a central checklist, which can be accessed by all members of the team.

... and select artifacts from the *collection overview*.

Choose the grouping tool ...
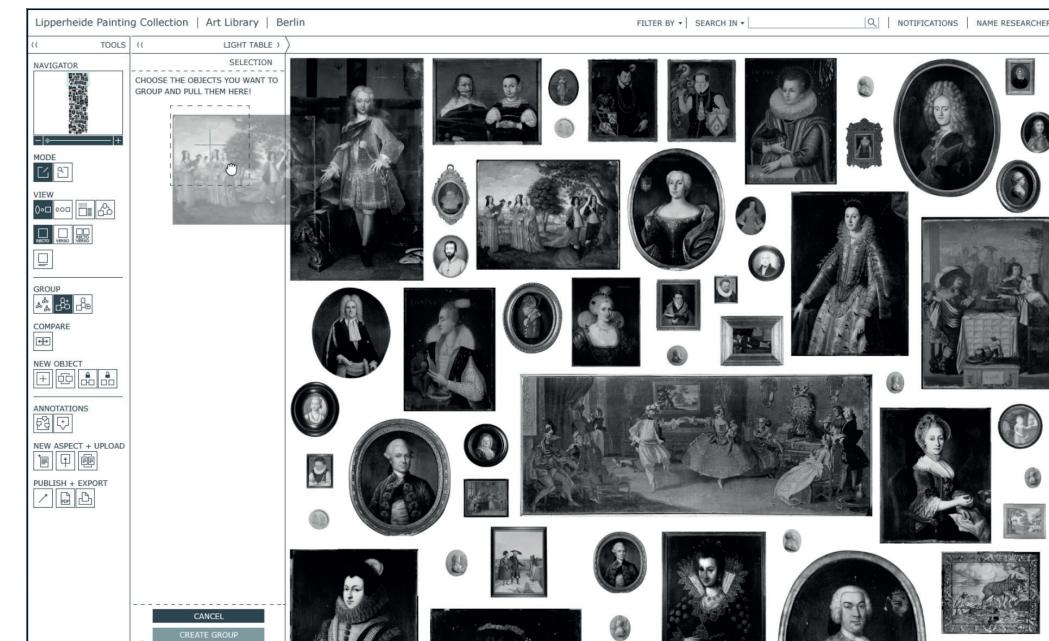
Move them per drag-and-drop to the *light table* for further research.

Click *create group* ...

... and click *save and show*.
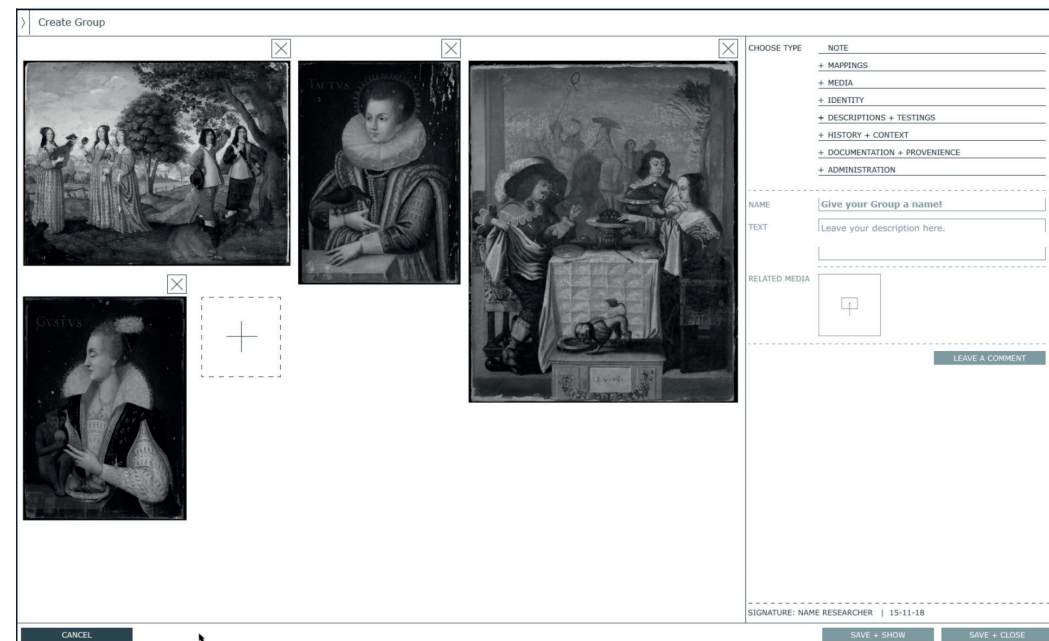
... add notes about the selection ...
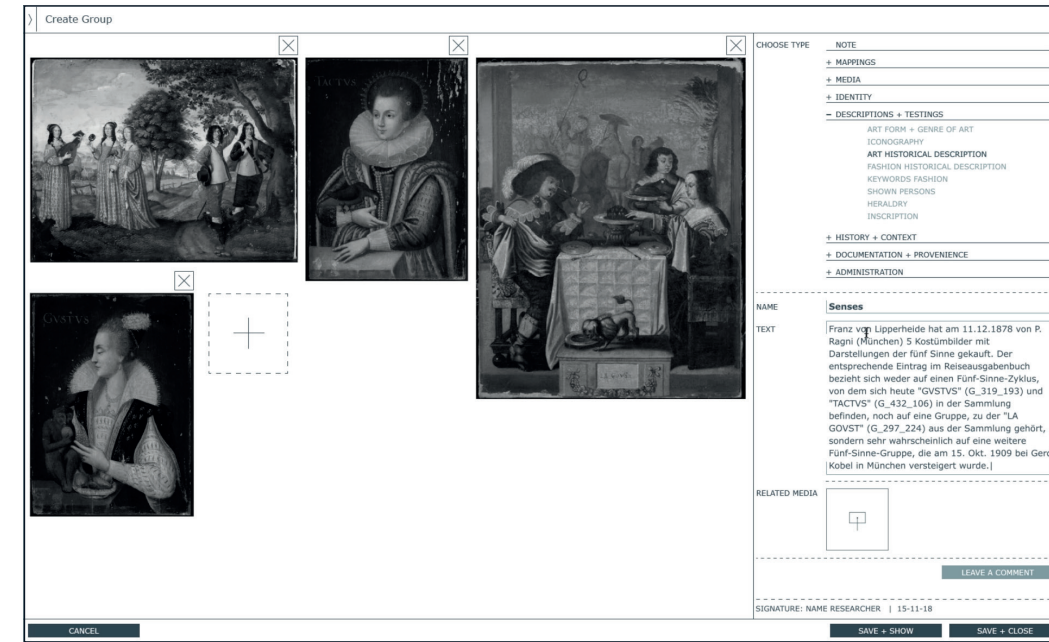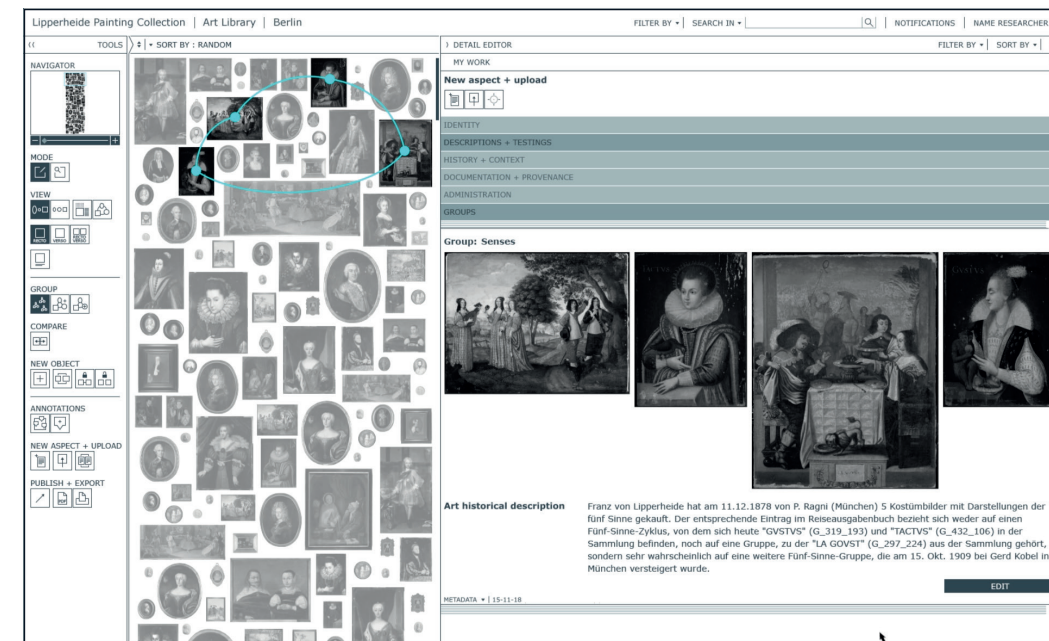
The selection will be shown in relation to the *collection overview*.

Comparing Artifacts

Multiple artifacts can be selected to compare their individual timelines. The metadata thumbnail helps to identify similarities and differences at a glance. Different tools support the exploration of the artifacts, such as the zoom-and-align tool, which can be used to view events in relation to each other.

Select artifacts from the *collection overview* …
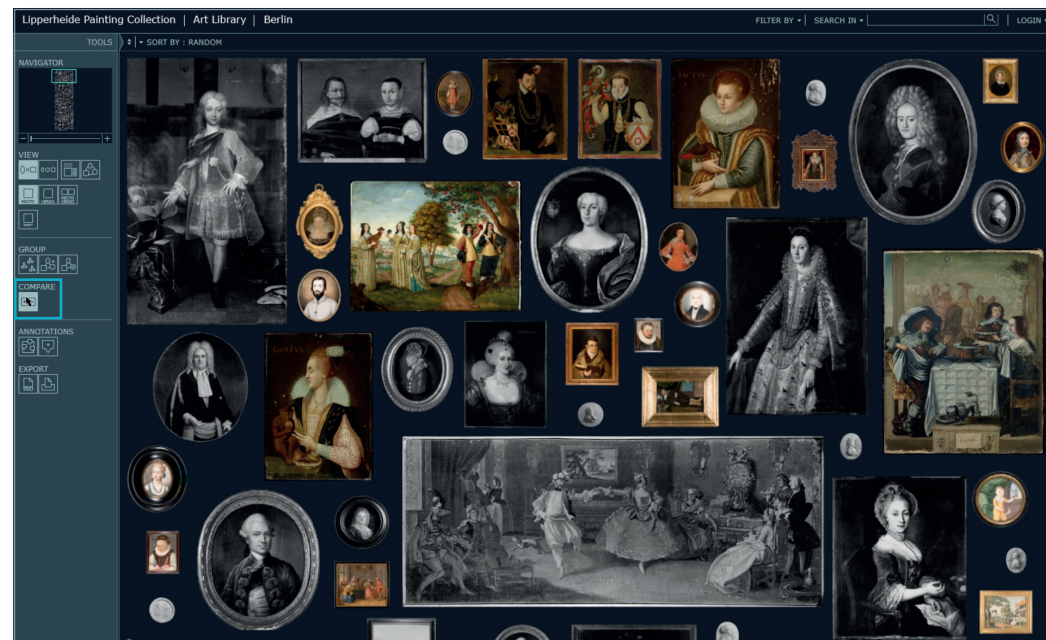
Choose compare from the *tool bar*.
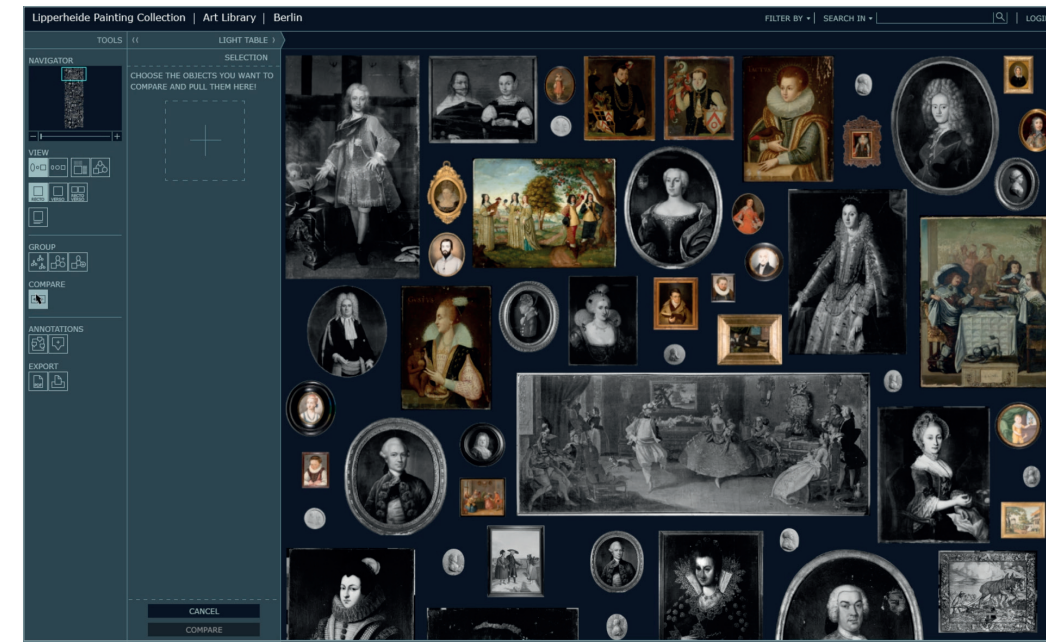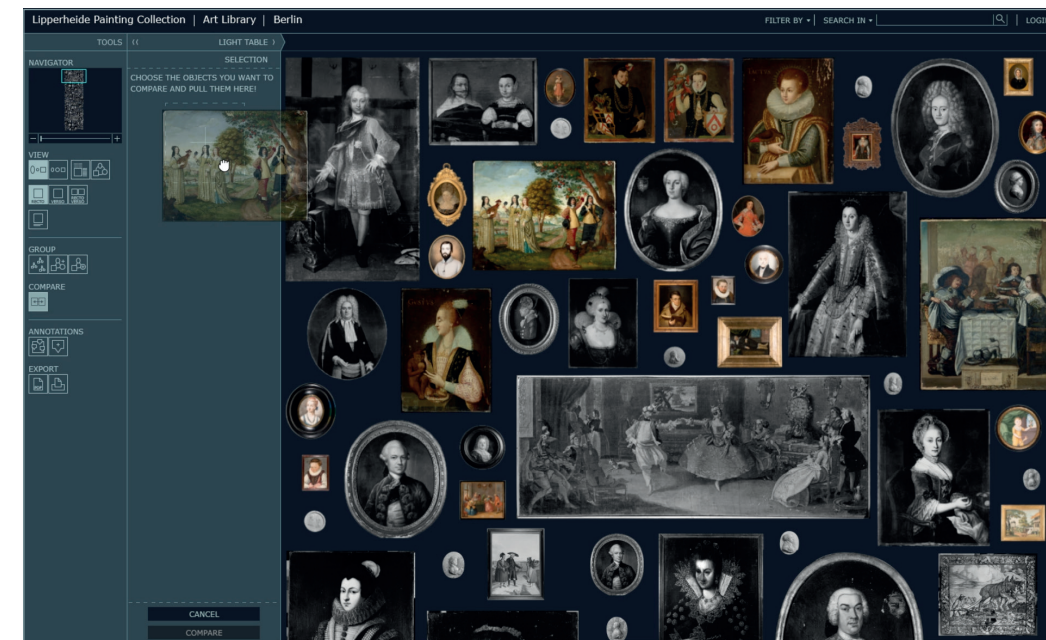
… and move them per drag-and-drop to the *light table*.

Click *compare* ...

Choose zoom-and-align
from the *tool bar* ...
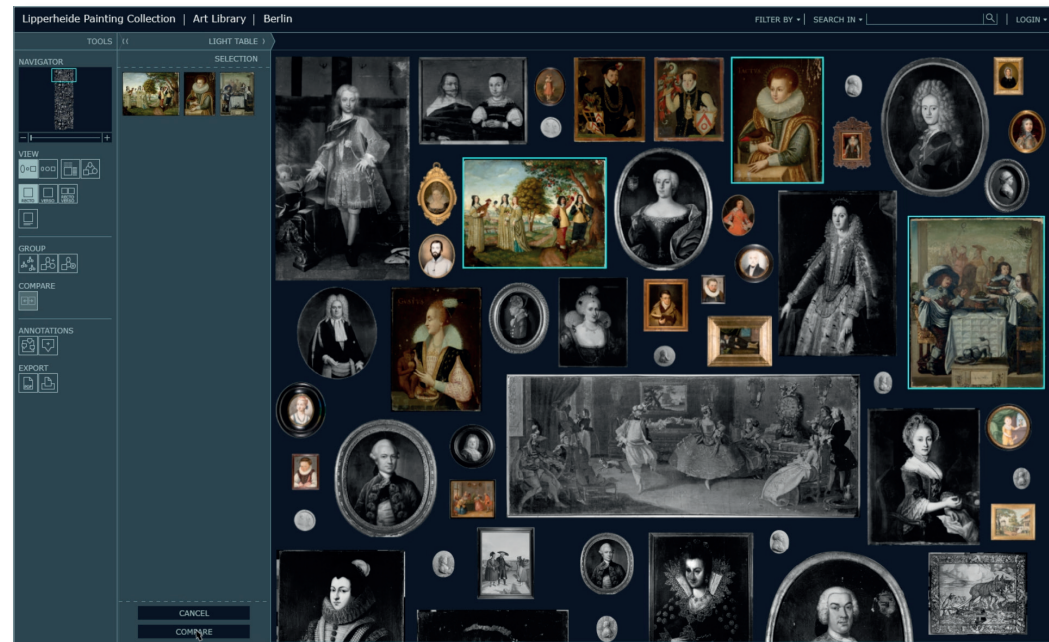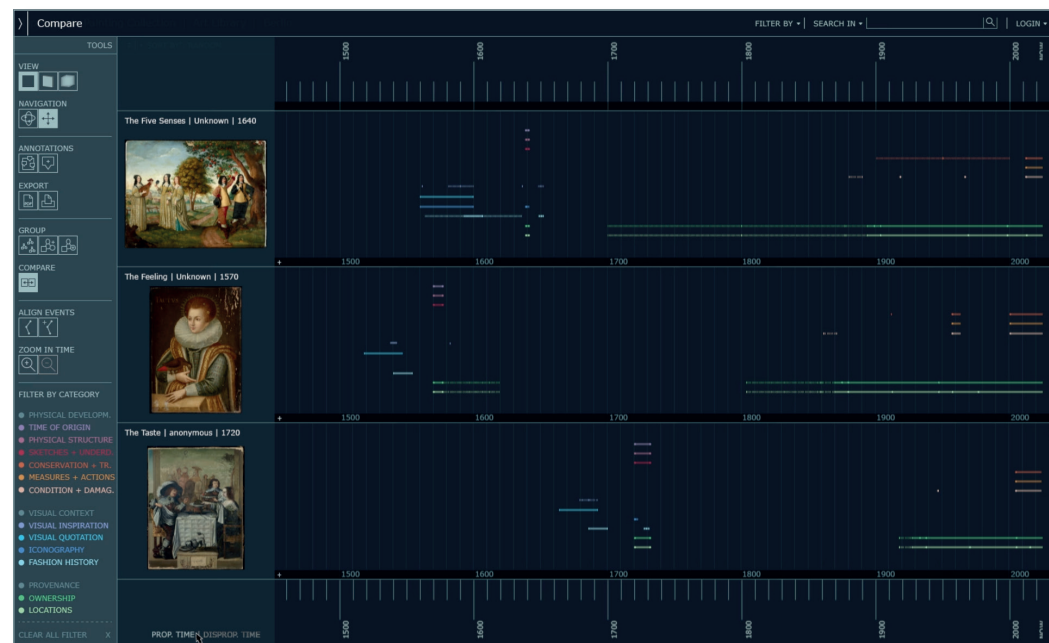
... and compare artifacts
by reviewing their metadata
thumbnails. Switch between
proportional or *dispropor-
tional time*.
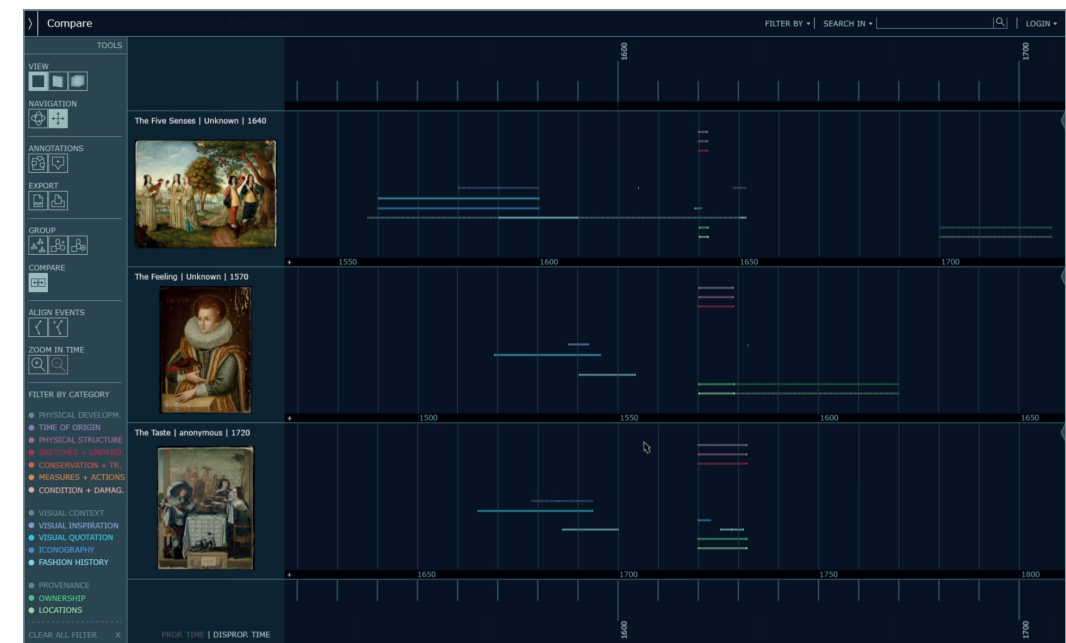
... to view selected events
in relation to each other.

Innovation

Innovation

The advantages of Culture Collaboratory over existing software are manifold. Using a design-driven and user-centered approach led us to develop an innovative design that allows for collaboration, interdisciplinary exchange, and interactive exploration of complex research data.

The object-centered approach helps researchers to understand and assess complex information in interdisciplinary settings more quickly and easily. The visualization of the layer object renders even highly specialized information understandable for diverse disciplines and audiences; cultural artifacts and research results can be accessed remotely when researchers cannot examine them in person; and data remain accessible and understandable for future generations and sustainable re-use.

Unlike static database systems, Culture Collaboratory is not merely a digital archive of information. Instead it supports interdisciplinary research processes by providing an interactive platform of collaboration and exchange. Following the philosophy of open access to science and culture, an integrated publishing tool makes it easy to share knowledge with the research community and the general public.

Finally, Culture Collaboratory offers a fundamentally new way of exploring research and interacting with cultural artifacts in the digital world.
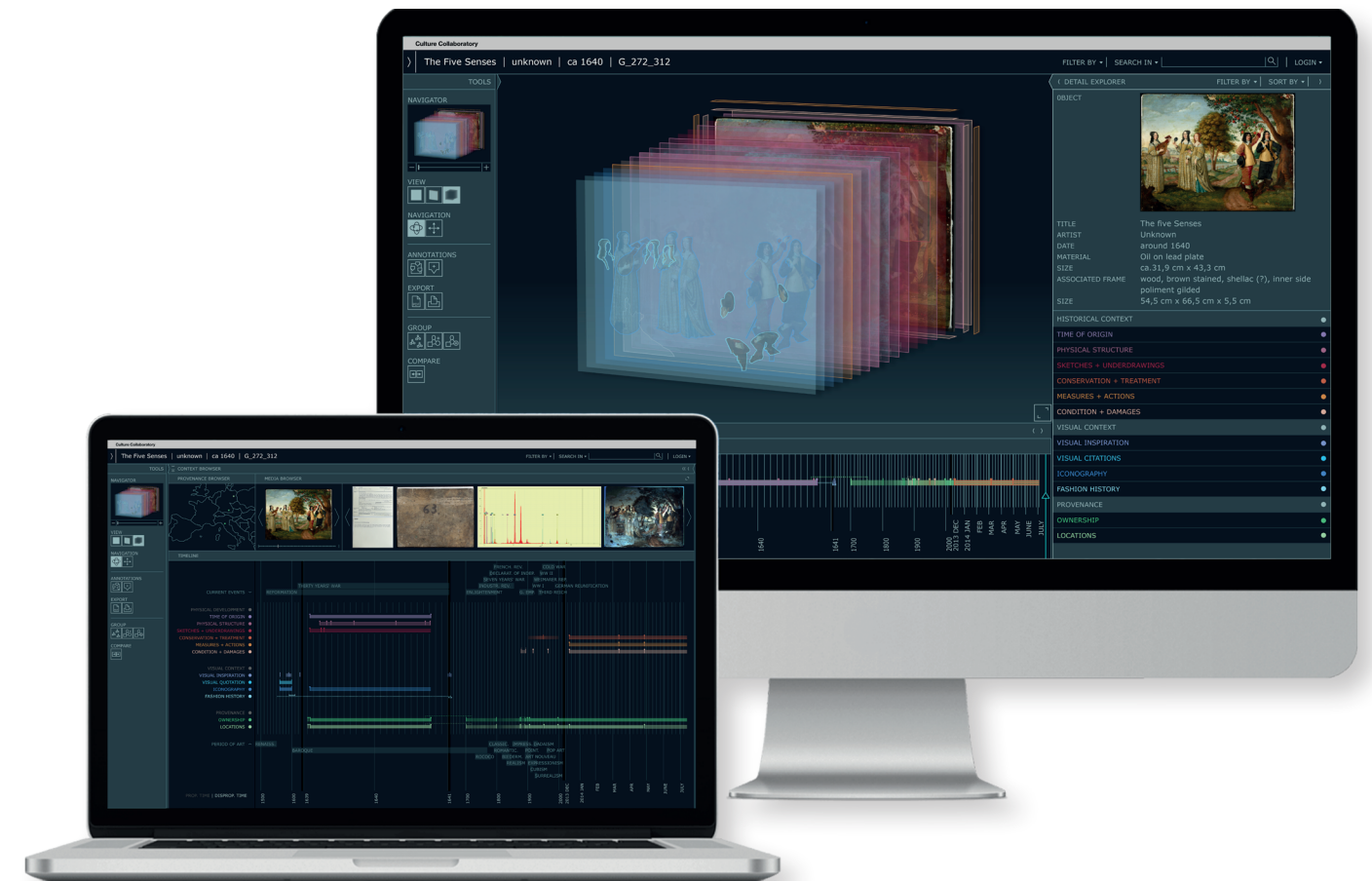
About

About

The software design for Culture Collaboratory was developed by Rebekka Lauer, Lisa Dannebaum, and Carola Zwick and grew out of the interdisciplinary research project *Sammlungserschließung*, which ran from December 2012 until January 2016 at the *Interdisciplinary Laboratory Image Knowledge Gestaltung* at Humboldt-Universität zu Berlin. The project was generously supported by the German Research Foundation and was established in collaboration with *Weißensee School of Art Berlin*, the *German Federal Institute of Materials Research and Testing (BAM)*, and the *Art Library of the State Museums Berlin.*

The interdisciplinary research team of *Sammlungserschließung* included experts in art history, fashion history, conservation and material science, computer science, and interaction design. The aim of the project was to explore how these diverse disciplines approach individual artifacts as well as entire collections, and to understand both disciplinary research processes and interdisciplinary exchange. Ultimately, the goal was to develop a digital tool to better organize and support these processes and thereby improve interdisciplinary research.

The sample collection used for this project consisted of around 550 oil paintings, miniatures, and bas-reliefs, of which a sample of 20 oil paintings was studied and researched in detail. The collection is a part of the *Lipperheide Costume Library*, the world's largest library on the history of fashion and dress housed at the *Art Library of the State Museums Berlin.*

For further information on the project *Sammlungserschließung* please see the website:
https://www.interdisciplinary-laboratory.hu-berlin.de/en/content/sammlungserschliessung/
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Credits

Imprint

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Virtual Workspace for Interdisciplinary Collections Research and Management

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