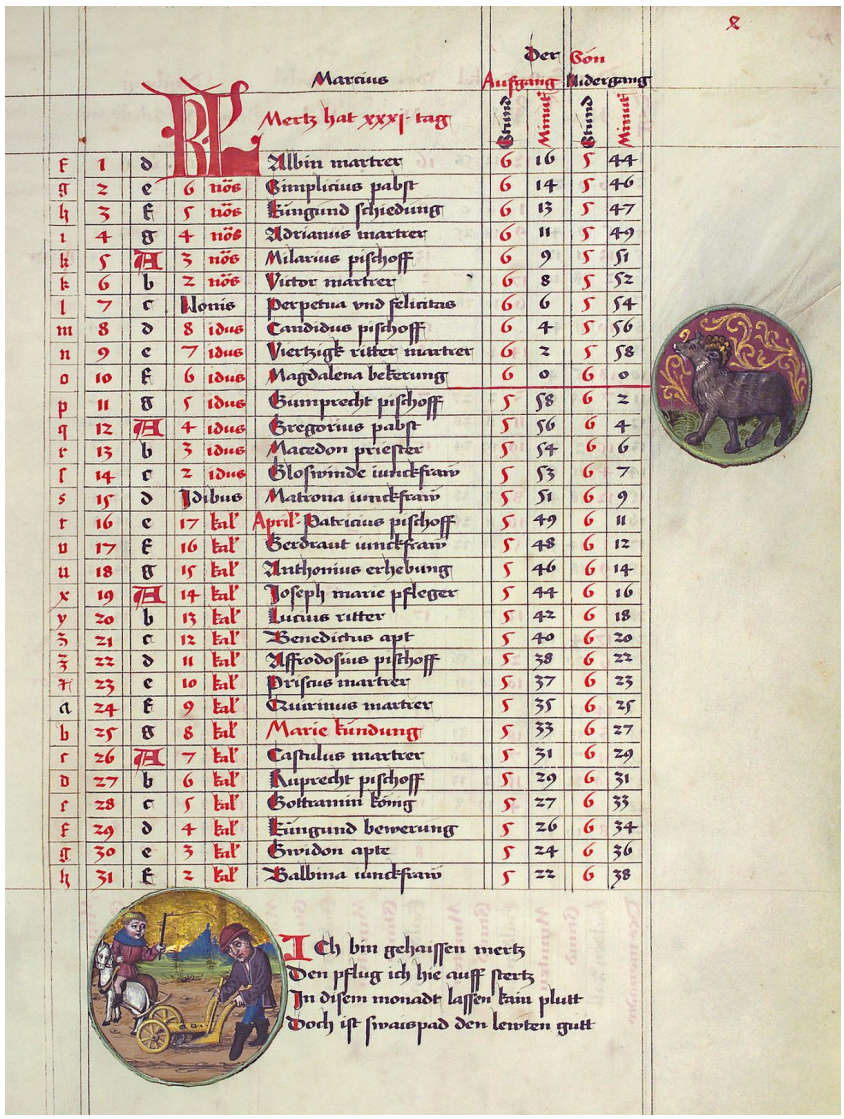
Data quality in Europeana

Designing extensive EDM records :
The Universitätsbibliothek Heidelberg study case



Heidelberger Schicksalsbuch (Regensburg, after 1491), Universitätsbibliothek Heidelberg Cod. Pal. germ. 832, CC BY-SA (source : Europeana)

Europeana Foundation
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Introduction

At Europeana, data quality enhancement is most of the time a matter of subtle changes aligning data to match specific quality standards, or improving it by richer mappings (richer metadata fields to support advanced information needs and discovery features).

The focus of this task is to normalize existing metadata values to match patterns that will enable the Europeana automatic semantic enrichment, and to implement more systematically controlled vocabularies resources available as Linked Open Data. Thanks to this strategy, not only do the records from cultural heritage institutions get enriched with additional and semantically richer metadata, but they are also being connected to a wider network of knowledge and content.

Even if metadata improvements are not always obvious on a result page in the Europeana Collections portal, they nevertheless have a strong impact on search and overall findability. Data quality is critical to support users focused discovery scenarios[1], and strategy to improve it should be considered *de facto* by any cultural institutions, as a leverage to reach a wider audience.

This report, based on the Universitätsbibliothek Heidelberg study case, was therefore designed to highlight such improvements. We focused our work on this specific provider with the hope for improving its collections thanks to IIIF metadata, since it had implemented IIIF features on its side. We based our investigation on METS records, a very rich format in this case. In addition to finding the core elements for implementing IIIF metadata, we eventually discovered an amazing source of information from which improving the overall metadata. We ended up developing extended EDM records, embedded with IIIF compliant resources and refined metadata.

The metadata mapping improvements that have been addressed are :

- Implementation of IIIF specific fields and classes ;
- Normalization of mandatory or important fields (dc:date, dc:type, dc:subject and related skos:Concept) ;
- Implementation of new fields (dc:description, dcterms:spatial) ;
- Normalization of creator and contributor fields (dc:creator/dc:contributor and edm:Agent) ;
- Implementation of hierarchical relationships.

[1] Most of Europeana users rely on the search functionality, and 59% of them use extra filtering options to refine their search. More than half of the users search items based on specific geographical location. *(Source: Europeana Collections Online Survey, April 2016)*

Note

We deliberately excluded screenshots of the METS records, as they could reach an output length of 180 pages for some of our examples. However, we included links to these resources and additional ones in the Appendix section.

Glossary

Raw file	Refers to the data directly received or harvested from an institution. This is the data in its most original and untouched shape.
Transformed file (EDM)	Refers to the data after its conversion to EDM based on an XSLT transformation. At this stage, no enrichment has been applied.
Published record	The record as it is displayed in the Europeana platform. Refers to the final data, resulting from its process through the Europeana Semantic Enrichment and the Hierarchical Object plugin.

IIIF implementation

Study case : /07931/diglit_zantani1548

Highlights

Everything started from the Universitätsbibliothek Heidelberg implementing IIIF visualisation features into their own website. On the other hand, they would expose ESE records lacking of IIIF compliant metadata (e.g. JSON manifest/resources/services URIs), or either no reusable data for retrieving these IIIF components. Indeed, in order to implement it from scratch, one needs **data elements** from which specific **IDs** can be **extracted**. Such data can however be found in the METS records. In this case, these IDs were first used to **reconstruct the URL** of the 1st picture exposed by the IIIF service and map it both as an edm:WebResource and as the mandatory element edm:isShownBy, for each record:

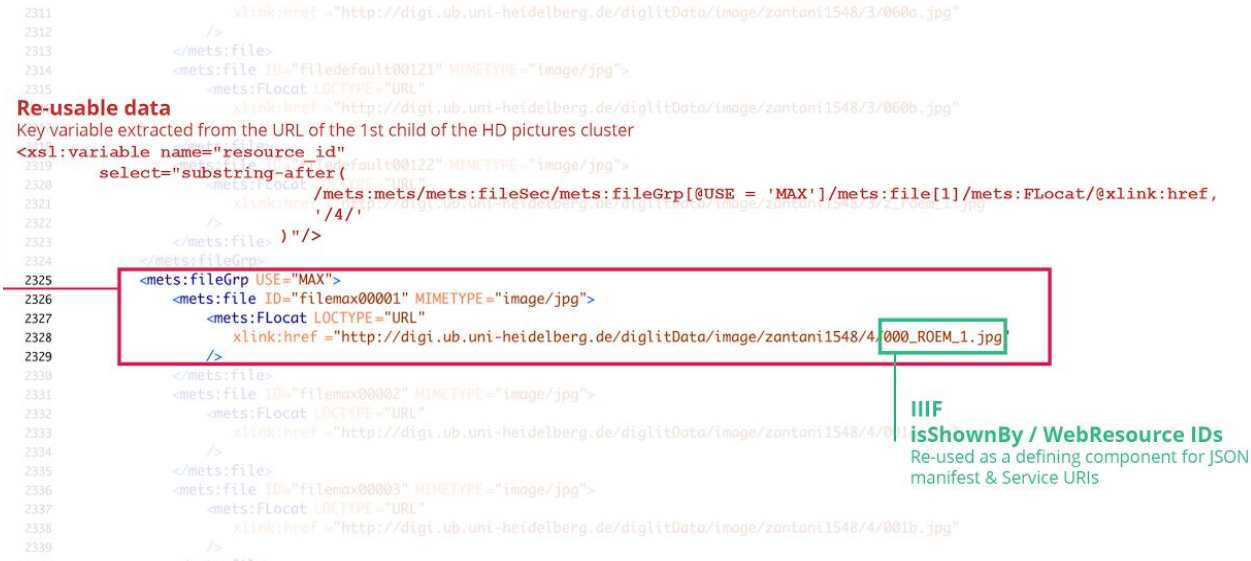


Figure 1 : highlight of the most critical data for implementing IIIF, from the METS record (see Appendix for a link to this file)

And from these IDs and newly reconstructed URLs, it is also possible to add the **connected** WebResource, which will eventually be described with its dependencies to the (both reconstructed) **IIIF JSON manifest and IIIF Service URLs**, the latter being also represented as a separate class.

Once these IIIF elements are embedded in EDM records, the automatic display of the newly retrieved main representation (i.e. edm:isShownBy) triggers the Europeana IIIF Viewer, which itself fetches the next images of the cultural object from the related Service and JSON Manifest.

Raw files

ESE (formerly ingested data)

```
<?xml version="1.0" encoding="UTF-8"?>
<OAI-PMH xmlns="http://www.openarchives.org/OAI/2.0/"
    xmlns:xsi ="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation ="http://www.openarchives.org/OAI/2.0/http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd"   >
    <responseDate>2016-12-15T13:28:23Z</responseDate>
    <request identifier="digi.ub.uni-heidelberg.de:1063" verb="GetRecord" metadataPrefix="ese">
      http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi   </request>
    <GetRecord>
        <record>
            <header>
                <identifier>oai:digi.ub.uni-heidelberg.de:1063</identifier>
                <datestamp>2016-06-17T14:38:19Z</datestamp>
            </header>
            <metadata>
                <oai_dc:dc xmlns:dcterms ="http://purl.org/dc/dcterms/"
                   xmlns:europeana ="http://www.europeana.eu/schemas/ese/"
                   xmlns:oai_dc ="http://www.openarchives.org/OAI/2.0/oai_dc/"
                   xmlns:dc ="http://purl.org/dc/elements/1.1/">
                    <dc:creator>Zantani, Antonio; Vico, Enea [Ill.] </dc:creator>
                    <dc:title> Le Imagini Con Tvtti I Riversi Trovati Et Le Vite De Gli Imperatori
                      Tratte Dalle Medaglie Et Dalle Historie De Gli Antichi    </dc:title>
                    <dcterms:alternative> Le imagini con tutti i riversi trovati et le vite de gli
                      imperatori tratte dalle medaglie et dalle historie de gli antichi    </dcterms:alternative>
                    <dc:date>1548 [cicognara Nr. 3055] </dc:date>
                    <dcterms:issued>1548 [cicognara Nr. 3055] </dcterms:issued>
                    <dc:identifier>http://digi.ub.uni-heidelberg.de/diglit/zantani1548   </dc:identifier>
                    <dc:identifier>urn:nbn:de:bsz:16-diglit-10639</dc:identifier>
                    <dc:language>it</dc:language>
                    <dc:type>Monograph</dc:type>
                    <dc:ispartof>Archäologische Literatur </dc:ispartof>
                    <dc:ispartof>Cicognara</dc:ispartof>
                    <dc:ispartof>Druckschriften</dc:ispartof>
                    <dc:ispartof> Heidelberger historische Bestände – digital: Archäologische
                       Literatur  </dc:ispartof>
                    <dc:subject>Archäologie; Porträt; benannte Porträts </dc:subject>
                    <dc:subject>archaeology; portrait; named portraits </dc:subject>
                    <dc:subject> Archäologie; Bildthemen; öffentliches und politisches Leben   </dc:subject>
                    <dc:subject> archaeology; iconographic themes; public and political life   </dc:subject>
                    <dc:subject>Archäologie; Numismatik; römische Münzen </dc:subject>
                    <dc:subject>archaeology; numismatics; Roman coins </dc:subject>
                    <dc:subject> Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate   </dc:subject>
                    <dc:subject> Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate   </dc:subject>
                    <dc:subject>Münze</dc:subject>
                    <dc:subject>Imperator</dc:subject>
                    <dc:subject>Römerzeit</dc:subject>
                    <europeana:object>
                      http://digi.ub.uni-heidelberg.de/diglitData/introimage/zantani1548.jpg    </europeana:object>
                    <europeana:provider>UniversitätsbibliothekHeidelberg </europeana:provider>
                    <europeana:rights>
                      http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html    </europeana:rights>
                    <europeana:type>TEXT</europeana:type>
                    <europeana:isShownAt>http://digi.ub.uni-heidelberg.de/diglit/zantani1548
                    </europeana:isShownAt>
                </oai_dc:dc>
            </metadata>
        </record>
    </GetRecord>
</OAI-PMH>
```

No re-usable data
From these links,
one cannot guess
the useful piece of data
to reconstruct the IIIF components

Figure 2 : commented export of the ESE file related to this record
(see Appendix for a link to this file)

Transformed files (EDM)

From ESE (former Europeana record)

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:dcterms="http://purl.org/dc/terms/" xmlns:svcs="http://rdfs.org/sioc/services#"
    xmlns:ore="http://www.openarchives.org/ore/terms/" xmlns:doap="http://usefulinc.com/ns/doap#"
    xmlns:dc="http://purl.org/dc/elements/1.1/">
    <edm:ProvidedCHO rdf:about="/07927/diglit_zantani1548"/>
    <ore:Aggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zantani1548">
        <edm:aggregatedCHO rdf:resource="/07927/diglit_zantani1548"/>
        <edm:dataProvider>UniversitätsbibliothekHeidelberg </edm:dataProvider>
        <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zantani1548"/>
        <edm:object
            rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/zantani1548.jpg"/>
        <edm:provider>UniversitätsbibliothekHeidelberg </edm:provider>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
    </ore:Aggregation>
    <ore:Proxy rdf:about="/07927/diglit_zantani1548">
        <dc:creator>Zantani, Antonio; Vico, Enea [Ill.] </dc:creator>
        <dc:date>1548 [cicognara Nr. 3055] </dc:date>
        <dc:identifier>urn:nbn:de:bsz:16-diglit-10639</dc:identifier>
        <dc:language>it</dc:language>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <dc:subject>Archäologie; Porträt; benannte Porträts </dc:subject>
        <dc:subject>archaeology; portrait; named portraits </dc:subject>
        <dc:subject>Archäologie; Bildthemen; öffentliches und politisches Leben </dc:subject>
        <dc:subject>archaeology; iconographic themes; public and political life </dc:subject>
        <dc:subject>Archäologie; Numismatik; römische Münzen </dc:subject>
        <dc:subject>archaeology; numismatics; Roman coins </dc:subject>
        <dc:subject>Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate </dc:subject>
        <dc:subject>Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate </dc:subject>
        <dc:subject>Münze</dc:subject>
        <dc:subject>Imperator</dc:subject>
        <dc:subject>Römerzeit</dc:subject>
        <dc:title>Le Imagini Con Tvtti I Riversi Trovati Et Le Vite De Gli Imperatori Tratte Dalle
            Medaglie Et Dalle Historie De Gli Antichi </dc:title>
        <dc:type>Monograph</dc:type>
        <dcterms:alternative>Le imagini con tutti i riversi trovati et le vite de gli imperatori
            tratte dalle medaglie et dalle historie de gli antichi </dcterms:alternative>
        <dcterms:isPartOf>Archäologische Literatur </dcterms:isPartOf>
        <dcterms:isPartOf>Cicognara</dcterms:isPartOf>
        <dcterms:isPartOf>Druckschriften</dcterms:isPartOf>
        <dcterms:isPartOf>Heidelberger historische Bestände – digital: Archäologische
            Literatur </dcterms:isPartOf>
        <dcterms:issued>1548 [cicognara Nr. 3055] </dcterms:issued>
        <edm:type>TEXT</edm:type>
    </ore:Proxy>
    <edm:EuropeanaAggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zantani1548">
        <edm:aggregatedCHO rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zantani1548"/>
        <edm:country>Germany</edm:country>
        <edm:language>de</edm:language>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
    </edm:EuropeanaAggregation>
</rdf:RDF>
```

EDM record lacking of IIIF Components
The original record is basically transformed into EDM, without any implementation of IIIF components (compliant resources, services or JSON manifest)

Figure 3 : commented export of the transformed file (ESE to EDM) related to this record (see Appendix for a link to this file)

From METS (current Europeana record)

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:dcterms="http://purl.org/dc/terms/"
    xmlns:svcs="http://rdfs.org/sioc/services#" xmlns:ore="http://www.openarchives.org/ore/terms/"
    xmlns:doap="http://usefulinc.com/ns/doap#" xmlns:rdaGr2="http://rdvocab.info/ElementsGr2/"
    xmlns:skos="http://www.w3.org/2004/02/skos/core#">
    <edm:ProvidedCHO rdf:about="/07931/diglit_zantani1548"/>
    <edm:WebResource
        rdf:about="http://diglit.ub.uni-heidelberg.de/image/zantani1548/000_ROEM_1.jpg/full/full/0/default.jpg">
        <dc:format>image/jpg</dc:format>
        <dcterms:isReferencedBy>http://digi.ub.uni-heidelberg.de/diglit/iiif/zantani1548/manifest.json</dcterms:isReferencedBy>
        <svcs:has_service
            rdf:resource="http://diglit.ub.uni-heidelberg.de/image/zantani1548/000_ROEM_1.jpg"/>
    </edm:WebResource>
    <edm:Agent rdf:about="http://d-nb.info/gnd/133724603">
        <rdaGr2:professionOrOccupation>Author</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/119099950">
        <rdaGr2:professionOrOccupation>Illustrator</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <skos:Concept rdf:about="http://d-nb.info/gnd/4040629-5">
        <skos:prefLabel xml:lang="de">Münze</skos:prefLabel>
    </skos:Concept>
    <skos:Concept rdf:about="http://d-nb.info/gnd/4435136-7">
        <skos:prefLabel xml:lang="de">Imperator</skos:prefLabel>
    </skos:Concept>
    <skos:Concept rdf:about="http://d-nb.info/gnd/4076769-3">
        <skos:prefLabel xml:lang="de">Römerzeit</skos:prefLabel>
    </skos:Concept>
    <ore:Aggregation rdf:about="zantani1548_Aggregation">
        <edm:aggregatedCHO rdf:resource="/07931/diglit_zantani1548"/>
        <edm:dataProvider>UniversitätsbibliothekHeidelberg </edm:dataProvider>
        <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zantani1548"/>
        <edm:isShownBy
            rdf:resource="http://diglit.ub.uni-heidelberg.de/image/zantani1548/000_ROEM_1.jpg/full/full/0/default.jpg"/>
        <edm:object
            rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/zantani1548.jpg"/>
        <edm:provider>UniversitätsbibliothekHeidelberg </edm:provider>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
    </ore:Aggregation>
    <ore:Proxy rdf:about="/07931/diglit_zantani1548">
        <dc:creator rdf:resource="http://d-nb.info/gnd/133724603"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/119099950"/>
        <dc:description>Shelfmark: Universitätsbibliothek Heidelberg, 85 A 5675 RES </dc:description>
        <dc:description xml:lang="de">Antonio Zantanis (1509-1567) Ausgabe römischen Kaiserbildnisse
          enthält für jeden der 12 Kaiser eine kurze Biographie sowie daran anschließend mehrere
          Seiten mit Darstellungen der Münzreverse. Zantani unterteilte die Medaillen nach ihrem
          Material: Gold, Silber und Bronze. Die auf einigen Seiten vorhandenen leeren
          Medaillenrahmen sollte der Dokumentation neu aufgefundener Medaillien dienen. Die
          Zeichnungen stammen von Enea Vico (1523-1567).  </dc:description>
        <dc:identifier>urn:nbn:de:bsz:16-diglit-10639</dc:identifier>
        <dc:identifier>cicognara Nr. 3055 </dc:identifier>
        <dc:identifier>oai:digi.ub.uni-heidelberg.de:1063</dc:identifier>
        <dc:language>it</dc:language>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <dc:source>UniversitätsbibliothekHeidelberg </dc:source>
        <dc:subject rdf:resource="http://d-nb.info/gnd/4040629-5"/>
        <dc:subject rdf:resource="http://d-nb.info/gnd/4435136-7"/>
        <dc:subject rdf:resource="http://d-nb.info/gnd/4076769-3"/>
        <dc:subject xml:lang="en">archaeology</dc:subject>
        <dc:subject xml:lang="en">portrait</dc:subject>
        <dc:subject xml:lang="en">named portraits </dc:subject>
        <dc:subject xml:lang="de">Archäologie</dc:subject>
        <dc:subject xml:lang="de">Porträt</dc:subject>
        <dc:subject xml:lang="de">benannte Porträts </dc:subject>
        <dc:title xml:lang="it">Le Imagini Con Tvtti I Riversi Trovati Et Le Vite De Gli Imperatori
          Tratte Dalle Medaglie Et Dalle Historie De Gli Antichi  </dc:title>
        <dc:type xml:lang="de">Urkunde</dc:type>
        <dcterms:isPartOf xml:lang="de">Cicognara</dcterms:isPartOf>
        <dcterms:isPartOf xml:lang="de">Druckschriften</dcterms:isPartOf>
        <dcterms:isPartOf xml:lang="de">Heidelberger historische Bestände – digital: Archäologische
          Literatur </dcterms:isPartOf>
        <dcterms:isPartOf xml:lang="de">Sammlung16 - Archäologie </dcterms:isPartOf>
        <dcterms:created>1548</dcterms:created>
        <dcterms:spatial>[Venedig]</dcterms:spatial>
        <edm:type>TEXT</edm:type>
    </ore:Proxy>
    <edm:EuropeanaAggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zantani1548">
        <edm:aggregatedCHO rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zantani1548"/>
        <edm:country>Germany</edm:country>
        <edm:language>de</edm:language>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
    </edm:EuropeanaAggregation>
    <svcs:Service rdf:about="http://diglit.ub.uni-heidelberg.de/image/zantani1548/000_ROEM_1.jpg">
        <dcterms:conformsTo rdf:resource="http://iiif.io/api/image"/>
        <doap:implements rdf:resource="http://iiif.io/api/image/2/level2.json"/>
    </svcs:Service>
</rdf:RDF>
```

IIIF
Connected WebResource
- fetching the related **JSON manifest**
- fetching the related **Service**

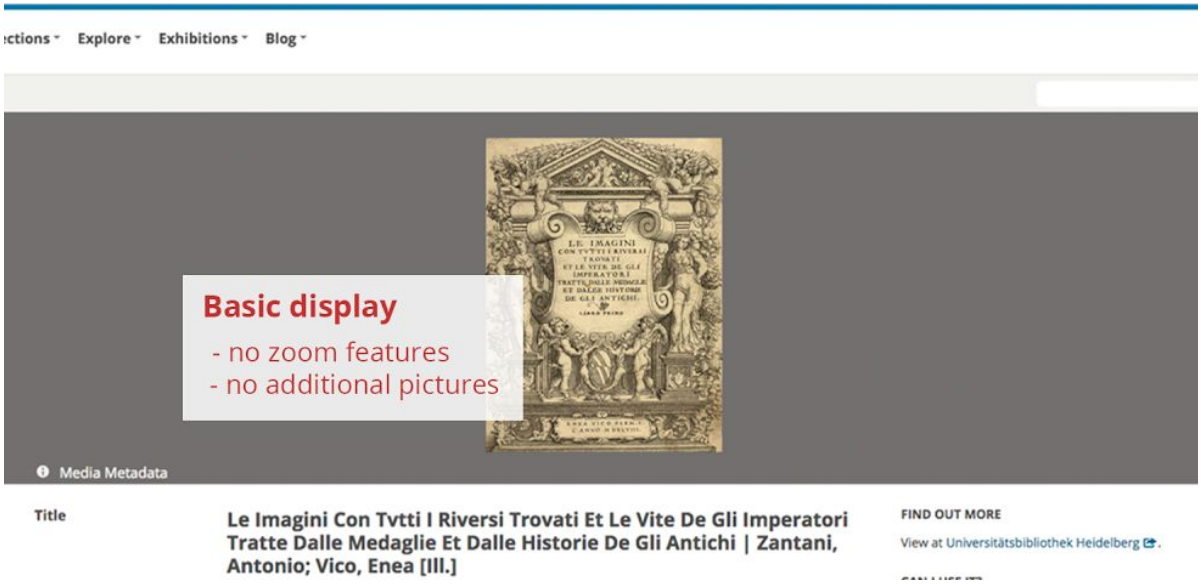
IIIF
Compliant edm:isShownBy

IIIF
Connected Service

Figure 4 : commented export of the transformed file (METS to EDM) related to this record (see Appendix for a link to this file)

Published records

From ESE (former Europeana record)



From METS (current Europeana record)

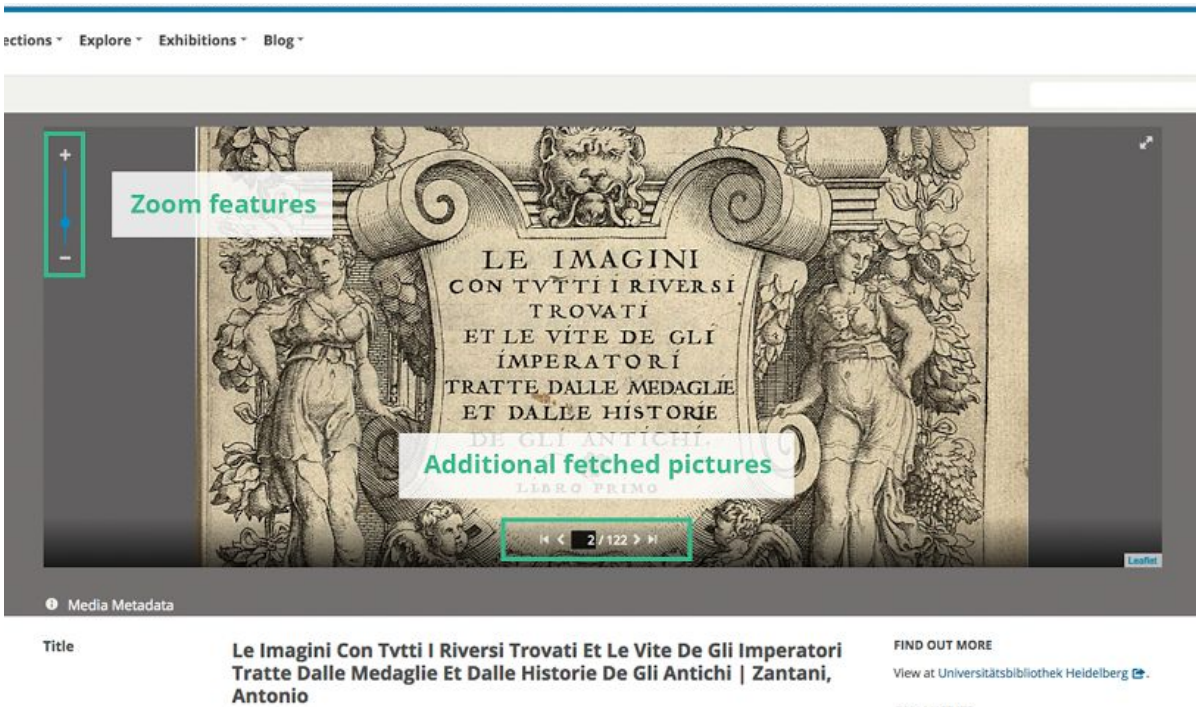


Figure 5 & 6: commented screenshots of the related pages in Europeana (see Appendix for a link to the latter resource, the former being now unavailable/updated with the data improvement)

General normalization & additional fields

Study case : /07931/diglit_zantani1548

Highlights

For this section, most of the work was based on mapping clear and separate instances for important or mandatory fields such as **dcterms:created, dc:type, dc:subject (and related skos:Concept)**, and to implement new fields such as **dc:description and dcterms:spatial**.

Mapping dc:subject with separate instances

For this specific field, we previously received metadata records in which multiple values for a given field were mapped in only one instance of this field, such as :

```
<dc:subject>Archäologie; Porträt; benannte Porträts </dc:subject>
<dc:subject>archaeology; portrait; named portraits </dc:subject>
<dc:subject> Archäologie; Bildthemen; öffentliches und politisches Leben  </dc:subject>
<dc:subject> archaeology; iconographic themes; public and political life  </dc:subject>
<dc:subject>Archäologie; Numismatik; römische Münzen </dc:subject>
<dc:subject>archaeology; numismatics; Roman coins </dc:subject>
<dc:subject> Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate  </dc:subject>
<dc:subject> Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate  </dc:subject>
```

Figure 7 : screenshot of an export of the ESE file related to this record (see Appendix for a link to this file)

Having single strings introduced in a single metadata field with separators prevents the Europeana automatic semantic enrichment from detecting the appropriate string and enriching the record based on the matching string.

Normalizing dc:date into dcterms:created ; Optimizing dc:type

We restructured the temporal data by using the more specific field dcterms:created, and we populated it from more relevant and consistent data. Same approach was followed for dc:type, which took benefit from stricter mapping conditions.
Expanding metadata in both quality and range brought us to perform specific refinements such as :

- **Normalization of existing field values**
  - Fetching more standardized temporal fields and mapping them to dcterms:created instead of dc:date ;
  - Mapping dc:type with more specific conditions (e.g. rejecting 'Monograph', an over broad term) ;
  - Mapping dc:subject with separate instances, either with :
    - If GND entities URIs[2] are available in the original records, resources populated with these URIs (and creating the related skos:Concept instances, connected to one another by their respective attributes @rdf:resource and @rdf:about) ;

[2] The **Integrated Authority File** (German: *Gemeinsame Normdatei*, also known as: *Universal Authority File*) or **GND** is an international authority file for the organisation of personal names, subject headings and corporate bodies from catalogues. The GND is managed by the German National Library in cooperation with various regional library networks in German-speaking Europe and other partners (source: Wikipedia).

- If no GND entities URIs are available, literals with related @lang attributes ;

- **Creating new field values**
  - Including a new dc:description field with related @lang attribute ;
  - Creating a 2nd *ad-hoc* dc:description, populated with a concatenated string made out of physical location information ;
  - Including a new dcterms:spatial field.

The idea behind this extension of the metadata records is to have either **normalised literals that can be automatically enriched by Europeana, or URIs from a controlled vocabulary.** These improvements[3] increase the degree of multilinguality of these records and their findability in Europeana Collections by removing a level of ambiguity.

[3] For further details, see http://pro.europeana.eu/page/europeana-semantic-enrichment

Raw files

ESE (old data)

```
<?xml version="1.0" encoding="UTF-8"?>
<OAI-PMH xmlns="http://www.openarchives.org/OAI/2.0/"
    xmlns:xsi ="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation ="http://www.openarchives.org/OAI/2.0/ http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd"  >
    <responseDate>2016-12-15T13:28:23Z</responseDate>
    <request identifier ="digi.ub.uni-heidelberg.de:1063" verb="GetRecord" metadataPrefix ="ese">
      http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi  </request>
    <GetRecord>
        <record>
            <header>
                <identifier>oai:digi.ub.uni-heidelberg.de:1063</identifier>
                <datestamp>2016-06-17T14:38:19Z</datestamp>
            </header>
            <metadata>
                <oai_dc:dc xmlns:dcterms ="http://purl.org/dc/dcterms/"
                   xmlns:europeana ="http://www.europeana.eu/schemas/ese/"
                   xmlns:oai_dc ="http://www.openarchives.org/OAI/2.0/oai_dc/"
                   xmlns:dc ="http://purl.org/dc/elements/1.1/">
                    <dc:creator>Zantani, Antonio; Vico, Enea [Ill.] </dc:creator>
                    <dc:title> Le Imagini Con Tvtti I Riversi Trovati Et Le Vite De Gli Imperatori
                      Tratte Dalle Medaglie Et Dalle Historie De Gli Antichi  </dc:title>
                    <dcterms:alternative> Le imagini con tutti i riversi trovati et le vite de gli
                      imperatori tratte dalle medaglie et dalle historie de gli antichi  </dcterms:alternative>
                    <dc:date>1548 [cicognara Nr. 3055] </dc:date>
                    <dcterms:issued>1548 [cicognara Nr. 3055] </dcterms:issued>
                    <dc:identifier>http://digi.ub.uni-heidelberg.de/diglit/zantani1548  </dc:identifier>
                    <dc:identifier>urn:nbn:de:bsz:16-diglit-10639</dc:identifier>
                    <dc:language>it</dc:language>
                    <dc:type>Monograph</dc:type>
                    <dc:ispartof>Archäologische Literatur </dc:ispartof>
                    <dc:ispartof>Cicognara</dc:ispartof>
                    <dc:ispartof>Druckschriften</dc:ispartof>
                    <dc:ispartof> Heidelberger historische Bestände – digital: Archäologische
                      Literatur  </dc:ispartof>
                    <dc:subject>Archäologie; Porträt; benannte Porträts </dc:subject>
                    <dc:subject>archaeology; portrait; named portraits </dc:subject>
                    <dc:subject> Archäologie; Bildthemen; öffentliches und politisches Leben  </dc:subject>
                    <dc:subject> archaeology; iconographic themes; public and political life  </dc:subject>
                    <dc:subject>Archäologie; Numismatik; römische Münzen </dc:subject>
                    <dc:subject>archaeology; numismatics; Roman coins </dc:subject>
                    <dc:subject> Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate  </dc:subject>
                    <dc:subject> Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate  </dc:subject>
                    <dc:subject>Münze</dc:subject>
                    <dc:subject>Imperator</dc:subject>
                    <dc:subject>Römerzeit</dc:subject>
                    <europeana:object>
                      http://digi.ub.uni-heidelberg.de/diglitData/introimage/zantani1548.jpg  </europeana:object>
                    <europeana:provider>UniversitätsbibliothekHeidelberg </europeana:provider>
                    <europeana:rights>
                      http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html  </europeana:rights>
                    <europeana:type>TEXT</europeana:type>
                    <europeana:isShownAt>http://digi.ub.uni-heidelberg.de/diglit/zantani1548
                    </europeana:isShownAt>
                </oai_dc:dc>
            </metadata>
        </record>
    </GetRecord>
</OAI-PMH>
```

Date Issues
Non-standard values

Type Issues
- no lang attributes
- missing values

Subjects Issues
- several instances concatenated in the same field
- no lang attributes (English & German)

Figure 8 : commented export of the ESE file related to this record
(see Appendix for a link to this file)

Transformed files (EDM)

From ESE (former Europeana record)

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:dcterms="http://purl.org/dc/terms/" xmlns:svcs="http://rdfs.org/sioc/services#"
    xmlns:ore="http://www.openarchives.org/ore/terms/" xmlns:doap="http://usefulinc.com/ns/doap#"
    xmlns:dc="http://purl.org/dc/elements/1.1/">
    <edm:ProvidedCHO rdf:about="/07927/diglit_zantani1548"/>
    <ore:Aggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zantani1548">
        <edm:aggregatedCHO rdf:resource="/07927/diglit_zantani1548"/>
        <edm:dataProvider>UniversitätsbibliothekHeidelberg </edm:dataProvider>
        <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zantani1548"/>
        <edm:object
            rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/zantani1548.jpg"/>
        <edm:provider>UniversitätsbibliothekHeidelberg </edm:provider>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
    </ore:Aggregation>
    <ore:Proxy rdf:about="/07927/diglit_zantani1548">
        <dc:creator>Zantani, Antonio; Vico, Enea [Ill.] </dc:creator>
        <dc:date>1548 [cicognara Nr. 3055] </dc:date>
        <dc:identifier>urn:nbn:de:bsz:16-diglit-10639</dc:identifier>
        <dc:language>it</dc:language>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <dc:subject>Archäologie; Porträt; benannte Porträts </dc:subject>
        <dc:subject>archaeology; portrait; named portraits </dc:subject>
        <dc:subject>Archäologie; Bildthemen; öffentliches und politisches Leben </dc:subject>
        <dc:subject>archaeology; iconographic themes; public and political life </dc:subject>
        <dc:subject>Archäologie; Numismatik; römische Münzen </dc:subject>
        <dc:subject>archaeology; numismatics; Roman coins </dc:subject>
        <dc:subject>Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate </dc:subject>
        <dc:subject>Cicognara; Parte Seconda; Numismatica, e Pietre Intagliate </dc:subject>
        <dc:subject>Münze</dc:subject>
        <dc:subject>Imperator</dc:subject>
        <dc:subject>Römerzeit</dc:subject>
        <dc:title>Le Imagini Con Tvtti I Riversi Trovati Et Le Vite De Gli Imperatori Tratte Dalle
            Medaglie Et Dalle Historie De Gli Antichi </dc:title>
        <dc:type>Monograph</dc:type>
        <dcterms:alternative>Le imagini con tutti i riversi trovati et le vite de gli imperatori
            tratte dalle medaglie et dalle historie de gli antichi </dcterms:alternative>
        <dcterms:isPartOf>Archäologische Literatur </dcterms:isPartOf>
        <dcterms:isPartOf>Cicognara</dcterms:isPartOf>
        <dcterms:isPartOf>Druckschriften</dcterms:isPartOf>
        <dcterms:isPartOf>Heidelberger historische Bestände – digital: Archäologische
            Literatur </dcterms:isPartOf>
        <dcterms:issued>1548 [cicognara Nr. 3055] </dcterms:issued>
        <edm:type>TEXT</edm:type>
    </ore:Proxy>
    <edm:EuropeanaAggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zantani1548">
        <edm:aggregatedCHO rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zantani1548"/>
        <edm:country>Germany</edm:country>
        <edm:language>de</edm:language>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
    </edm:EuropeanaAggregation>
</rdf:RDF>
```

Remaining Date Issues

Remaining Subjects Issues

Remaining Type Issues

Figure 9 : commented export of the transformed file (ESE to EDM) related to this record (see Appendix for a link to this file)

From METS (current Europeana record)

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:dcterms="http://purl.org/dc/terms/"
    xmlns:svcs="http://rdfs.org/sioc/services#" xmlns:ore="http://www.openarchives.org/ore/terms/"
    xmlns:doap="http://usefulinc.com/ns/doap#" xmlns:rdaGr2="http://rdvocab.info/ElementsGr2/"
    xmlns:skos="http://www.w3.org/2004/02/skos/core#">
    <edm:ProvidedCHO rdf:about="/07931/diglit_zantani1548"/>
    <edm:WebResource
        rdf:about="http://diglit.ub.uni-heidelberg.de/image/zantani1548/000_ROEM_1.jpg/full/full/0/default.jpg">
        <dc:format>image/jpg</dc:format>
        <dcterms:isReferencedBy>http://digi.ub.uni-heidelberg.de/diglit/iiif/zantani1548/manifest.json</dcterms:isReferencedBy>
        <svcs:has_service
            rdf:resource="http://diglit.ub.uni-heidelberg.de/image/zantani1548/000_ROEM_1.jpg"/>
    </edm:WebResource>
    <edm:Agent rdf:about="http://d-nb.info/gnd/133724603">
        <rdaGr2:professionOrOccupation>Author</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/119099950">
        <rdaGr2:professionOrOccupation>Illustrator</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <skos:Concept rdf:about="http://d-nb.info/gnd/4040629-5">
        <skos:prefLabel xml:lang="de">Münze</skos:prefLabel>
    </skos:Concept>
    <skos:Concept rdf:about="http://d-nb.info/gnd/4435136-7">
        <skos:prefLabel xml:lang="de">Imperator</skos:prefLabel>
    </skos:Concept>
    <skos:Concept rdf:about="http://d-nb.info/gnd/4076769-3">
        <skos:prefLabel xml:lang="de">Römerzeit</skos:prefLabel>
    </skos:Concept>
    <ore:Aggregation rdf:about="zantani1548_Aggregation">
        <edm:aggregatedCHO rdf:resource="/07931/diglit_zantani1548"/>
        <edm:dataProvider>UniversitätsbibliothekHeidelberg </edm:dataProvider>
        <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zantani1548"/>
        <edm:isShownBy
            rdf:resource="http://diglit.ub.uni-heidelberg.de/image/zantani1548/000_ROEM_1.jpg/full/full/0/default.jpg"/>
        <edm:object
            rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/zantani1548.jpg"/>
        <edm:provider>UniversitätsbibliothekHeidelberg </edm:provider>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
    </ore:Aggregation>
    <ore:Proxy rdf:about="/07931/diglit_zantani1548">
        <dc:creator rdf:resource="http://d-nb.info/gnd/133724603"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/119099950"/>
        <dc:description>Shelfmark: Universitätsbibliothek Heidelberg, 85 A 5675 RES </dc:description>
        <dc:description xml:lang="de">Antonio Zantanis (1509-1567) Ausgabe römischen Kaiserbildnisse
            enthält für jeden der 12 Kaiser eine kurze Biographie sowie daran anschließend mehrere
            Seiten mit Darstellungen der Münzreverse. Zantani unterteilte die Medaillen nach ihrem
            Material: Gold, Silber und Bronze. Die auf einigen Seiten vorhandenen leeren
            Medaillenrahmen sollte der Dokumentation neu aufgefundener Medaillien dienen. Die
            Zeichnungen stammen von Enea Vico (1523-1567). </dc:description>
        <dc:identifier>urn:nbn:de:bsz:16-diglit-10639</dc:identifier>
        <dc:identifier>cicognara Nr. 3055 </dc:identifier>
        <dc:identifier>oai:digi.ub.uni-heidelberg.de:1063</dc:identifier>
        <dc:language>it</dc:language>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <dc:source>UniversitätsbibliothekHeidelberg </dc:source>
        <dc:subject rdf:resource="http://d-nb.info/gnd/4040629-5"/>
        <dc:subject rdf:resource="http://d-nb.info/gnd/4435136-7"/>
        <dc:subject rdf:resource="http://d-nb.info/gnd/4076769-3"/>
        <dc:subject xml:lang="en">archaeology</dc:subject>
        <dc:subject xml:lang="en">portrait</dc:subject>
        <dc:subject xml:lang="en">named portraits </dc:subject>
        <dc:subject xml:lang="de">Archäologie</dc:subject>
        <dc:subject xml:lang="de">Porträt</dc:subject>
        <dc:subject xml:lang="de">benannte Porträts </dc:subject>
        <dc:title xml:lang="it">Le Imagini Con Tvtti I Riversi Trovati Et Le Vite De Gli Imperatori
            Tratte Dalle Medaglie Et Dalle Historie De Gli Antichi </dc:title>
        <dc:type xml:lang="de">Druckschriften</dc:type>
        <dcterms:isPartOf xml:lang="de">Cicognara</dcterms:isPartOf>
        <dcterms:isPartOf xml:lang="de">Druckschriften</dcterms:isPartOf>
        <dcterms:isPartOf xml:lang="de">Heidelberger historische Bestände – digital: Archäologische
            Literatur </dcterms:isPartOf>
        <dcterms:isPartOf xml:lang="de">Sammlung16 - Archäologie </dcterms:isPartOf>
        <dcterms:created>1548</dcterms:created>
        <dcterms:spatial>[Venedig]</dcterms:spatial>
        <edm:type>TEXT</edm:type>
    </ore:Proxy>
    <edm:EuropeanaAggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zantani1548">
        <edm:aggregatedCHO rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zantani1548"/>
        <edm:country>Germany</edm:country>
        <edm:language>de</edm:language>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
    </edm:EuropeanaAggregation>
    <svcs:Service rdf:about="http://diglit.ub.uni-heidelberg.de/image/zantani1548/000_ROEM_1.jpg">
        <dcterms:conformsTo rdf:resource="http://iiif.io/api/image"/>
        <doap:implements rdf:resource="http://iiif.io/api/image/2/level2.json"/>
    </svcs:Service>
</rdf:RDF>
```

Connected Skos Concepts

New Description fields
- **systematic "Shelfmark" field**, fetching the related institution (dataProvider) and the location of the document (shelfLocator)
- **record related description**, with the relevant lang attribute

Improved Subjects
- **aligned literals**, with lang attributes (English & German)
- fetched **DNB resources**, with the connected Skos:Concept (s)

Improved Types
- more **specific values** (e.g. 'urkunde' means 'charter' in German)
- **lang attributes** (English & German)

Aligned Dates (See #1 recommendation)
New Spatial field

Figure 10 : commented export of the transformed file (METS to EDM) related to this record (see Appendix for a link to this file)

Published records

From ESE (former Europeana record)

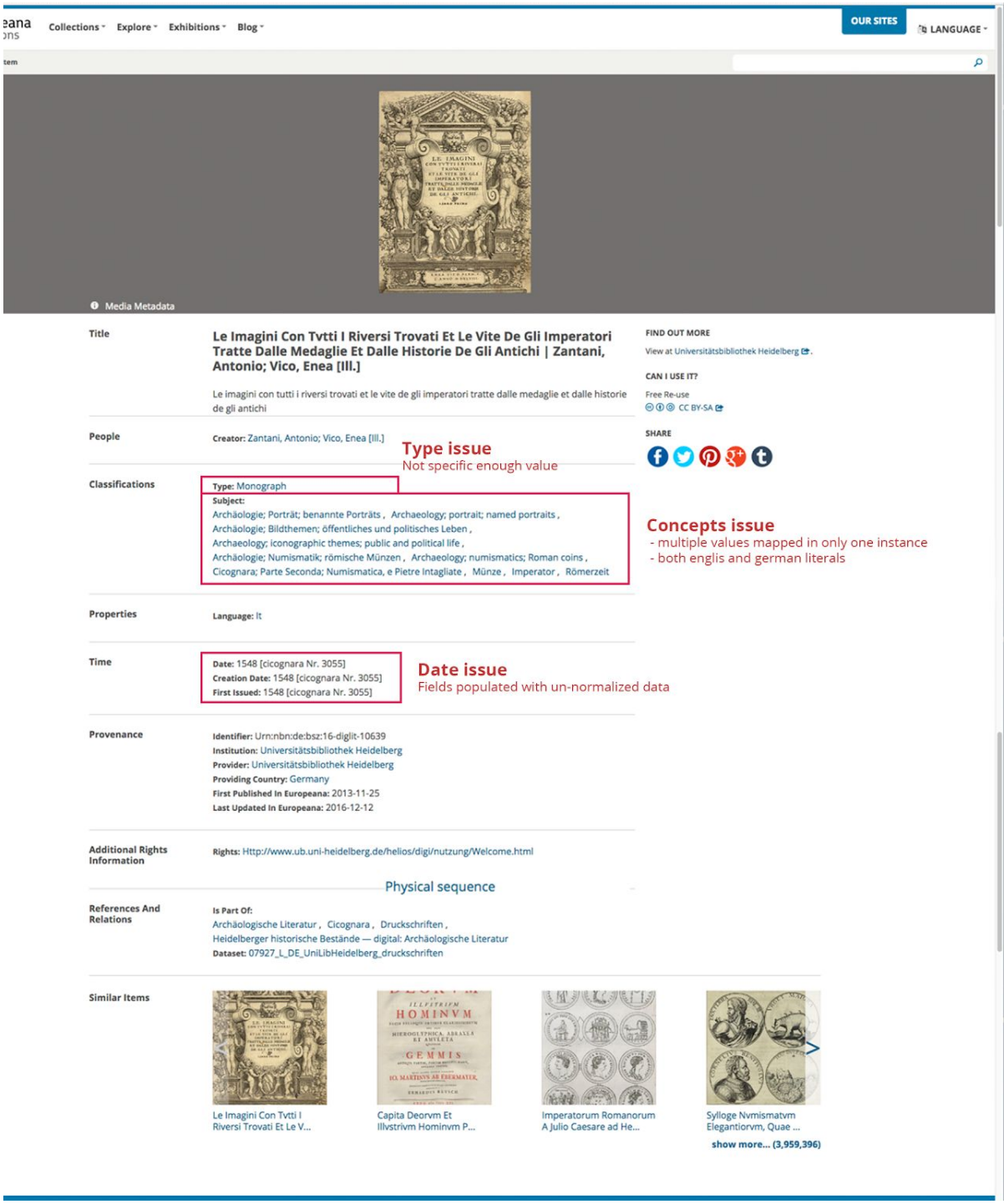


Figure 11 : commented screenshot of the related page in Europeana (now unavailable, as the page was updated with the data improvement)

From METS (current Europeana record)

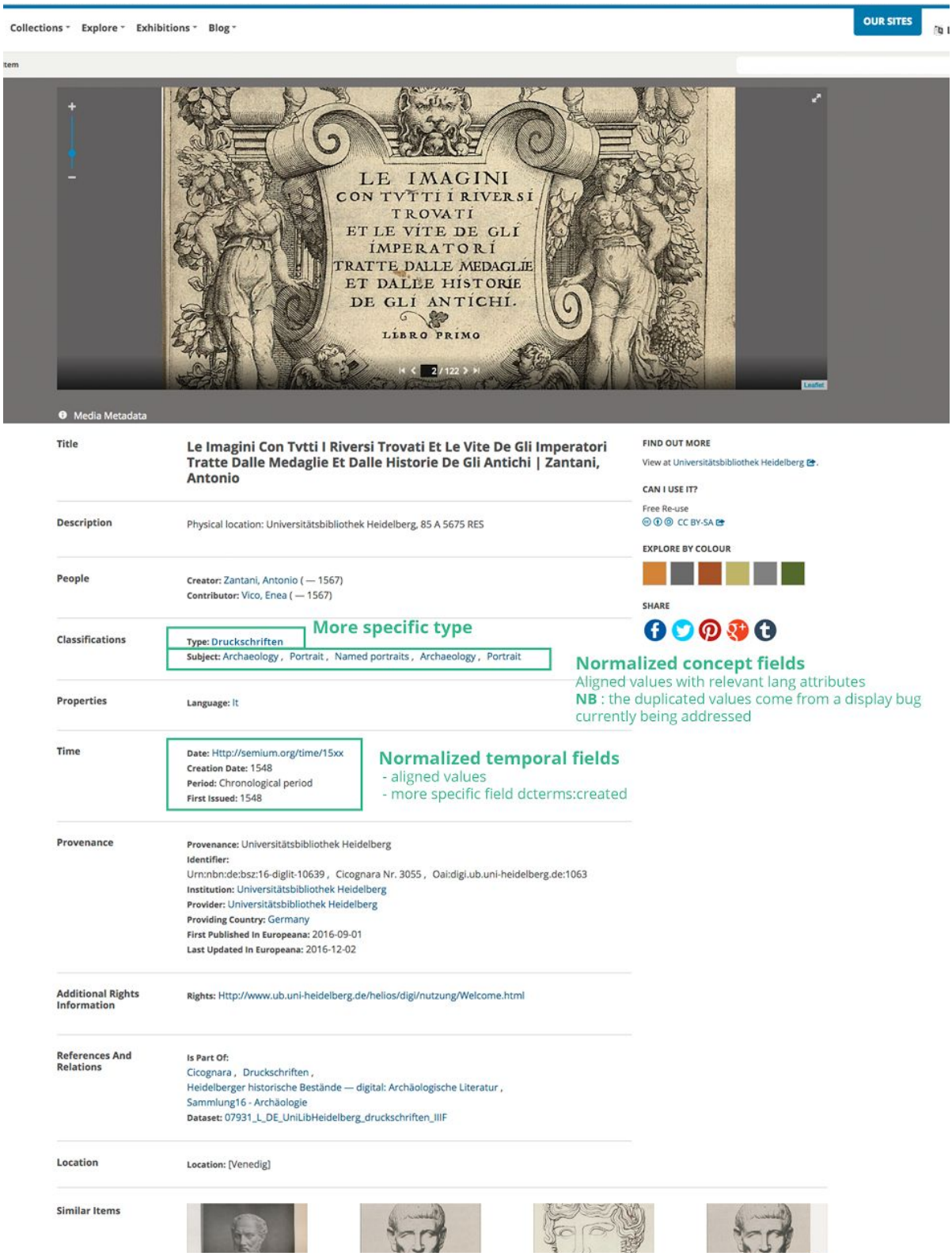


Figure 12 : commented screenshot of the related page in Europeana (see Appendix for a link to this resource)

Creators and contributors normalization

Study case : /07931/diglit_kieser1664

Highlights

Value normalisation and sharper mapping

This section is rather similar to the section General normalization & additional fields, as the described work mainly consisted here in mapping clear and separate instances for the agent related fields **dc:creator and dc:contributor.** Indeed, for these specific fields, we previously received metadata in which multiple values for a given field were mapped altogether in only one instance:

```
<dc:creator> Wölfflin, Christoph; Kieser, Johann Theodor [Hrsg.]; Schertlin,
  Peter [Hrsg.]; Schabhard, David [Hrsg.]; Vischer, Philipp Christoph [Hrsg.];
  Scholl, Johann Andreas [Hrsg.]; Gross, Christoph [Hrsg.]; Roschüz, Matthäus
  [Hrsg.]; Odor, Janos [Hrsg.]; Häberlin, Georg Heinrich [Hrsg.]    </dc:creator>
```

Figure 13 : screenshot of an export of the ESE file related to this record (see Appendix for a link to this file)

Comparing these values with what was available in the MODS files, we noticed that not only individual instances (e.g. agents) were **merged together in one unique field** (with `[Hrsg.]` trails), but the **distinction between creators and contributors was also lost** in the process :

Figure 14 : commented screenshot of an export of the METS file related to this record (see Appendix for a link to this file)

An intermediary **fixed value mapping** based on http://loc.gov/marc/relators/relacode.html was therefore performed to normalize these **Marc Relator codes to their literal value**. These codes were also used as **filtering conditions** to differentiate creators (code = 'aut', for 'author') from other contributors (e.g. above data, where code = 'edt', for 'editor').

```
<xsl:variable name="map_marcRelator">
    <map value="Abridger">abr</map>
    <map value="Art copyist">acp</map>
    <map value="Actor">act</map>
    <map value="Art director">adi</map>
    <map value="Adapter">adp</map>
    <map value="Author of afterword, colophon, etc.">aft</map>
    <map value="Analyst">anl</map>
    <map value="Animator">anm</map>
    <map value="Annotator">ann</map>
    <map value="Bibliographic antecedent">ant</map>
    <map value="Appellee">ape</map>
    <map value="Appellant">apl</map>
    <map value="Applicant">app</map>
    <map value="Author in quotations or text abstracts">aqt</map>
    <map value="Architect">arc</map>
    <map value="Artistic director">ard</map>
    <map value="Arranger">arr</map>
    <map value="Artist">art</map>
    <map value="Assignee">asg</map>
    <map value="Associated name">asn</map>
    <map value="Autographer">ato</map>
    <map value="Attributed name">att</map>
    <map value="Auctioneer">auc</map>
    <map value="Author of dialog">aud</map>
    <map value="Author of introduction, etc.">aui</map>
    <map value="Screenwriter">aus</map>
    <map value="Author">aut</map>
    <map value="Binding designer">bdd</map>
    <map value="Bookjacket designer">bjd</map>
    <map value="Book designer">bkd</map>
    <map value="Book producer">bkp</map>
    <map value="Blurb writer">blw</map>
    <map value="Binder">bnd</map>
```

Normalizing role code with related label
Example here with the string 'aut' being replaced by 'Author'

Figure 15 : commented screenshot of an export of the fixed value mapping implemented in the XSLT used to transform the METS files to EDM

Raw files

ESE (old data)

```
<?xml version="1.0" encoding="UTF-8"?>
<OAI-PMH xmlns="http://www.openarchives.org/OAI/2.0/"
    xmlns:xsi ="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation ="http://www.openarchives.org/OAI/2.0/ http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd"  >
    <responseDate>2016-12-15T13:28:23Z</responseDate>
    <request identifier="digi.ub.uni-heidelberg.de:1063" verb="GetRecord" metadataPrefix="ese">
      http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi  </request>
    <GetRecord>
        <record>
            <header>
                <identifier>oai:digi.ub.uni-heidelberg.de:1063</identifier>
                <datestamp>2016-06-17T14:38:19Z</datestamp>
            </header>
            <metadata>
                <oai_dc:dc xmlns:dcterms ="http://purl.org/dc/dcterms/"
                   xmlns:europeana ="http://www.europeana.eu/schemas/ese/"
                   xmlns:oai_dc ="http://www.openarchives.org/OAI/2.0/oai_dc/"
                   xmlns:dc ="http://purl.org/dc/elements/1.1/">
                    <dc:creator> Wölfflin, Christoph; Kieser, Johann Theodor [Hrsg.]; Schertlin,
                      Peter [Hrsg.]; Schabhard, David [Hrsg.]; Vischer, Philipp Christoph [Hrsg.];
                      Scholl, Johann Andreas [Hrsg.]; Gross, Christoph [Hrsg.]; Roschüz, Matthäus
                      [Hrsg.]; Odor, Janos [Hrsg.]; Häberlin, Georg Heinrich [Hrsg.]  </dc:creator>
                    <dc:title> Heptas Exercitationum Sacrarum De Obligatione Credendi In Christum:
                      Ex Quo Post Immensos Cruciatus Emensos, Et Triduanam Requiem Declinatam, Leo
                       De Tribu Juda ... Jesus Christus, Mortem  &amp;amp; Martem Stygium in Triumpho
                      ducens ...[P. P. ipsis Vigiliis Paschalibus, A. O. R. M DC LXXX.]  </dc:title>
                    <dc:date>1664 [VD17 16:727354P] </dc:date>
                    <dcterms:issued>1664 [VD17 16:727354P] </dcterms:issued>
                    <dc:identifier>http://digi.ub.uni-heidelberg.de/diglit/kieser1664</dc:identifier>
                    <dc:identifier>urn:nbn:de:bsz:16-diglit-194773</dc:identifier>
                    <dc:language>la</dc:language>
                    <dc:type>Monograph</dc:type>
                    <dc:ispartof>Theologische Literatur </dc:ispartof>
                    <dc:ispartof>Druckschriften</dc:ispartof>
                    <dc:ispartof> Digitalisierung wertvoller Bestände baden-württembergischer
                       Bibliotheken  </dc:ispartof>
                    <dc:ispartof> Verzeichnis der im deutschen Sprachbereich erschienenen Drucke des
                       17. Jahrhunderts  </dc:ispartof>
                    <dc:ispartof> Heidelberger historische Bestände – digital: Theologische
                       Literatur  </dc:ispartof>
                    <europeana:object>
                      http://digi.ub.uni-heidelberg.de/diglitData/introimage/kieser1664.jpg  </europeana:object>
                    <europeana:provider>UniversitätsbibliothekHeidelberg </europeana:provider>
                    <europeana:rights>
                      http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html  </europeana:rights>
                    <europeana:type>TEXT</europeana:type>
                    <europeana:isShownAt>http://digi.ub.uni-heidelberg.de/diglit/kieser1664</europeana:isShownAt>
                </oai_dc:dc>
            </metadata>
        </record>
    </GetRecord>
</OAI-PMH>

```

Agent Issues
- several instances concatenated in the same field
- acronyms for the role of the contributors

Figure 16 : commented export of the ESE file related to this record
(see Appendix for a link to this file)

Transformed files (EDM)

From ESE (former Europeana record)

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:dcterms="http://purl.org/dc/terms/" xmlns:svcs="http://rdfs.org/sioc/services#"
    xmlns:ore="http://www.openarchives.org/ore/terms/" xmlns:doap="http://usefulinc.com/ns/doap#"
    xmlns:dc="http://purl.org/dc/elements/1.1/">
    <edm:ProvidedCHO rdf:about="/07927/diglit_kieser1664"/>
    <ore:Aggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/kieser1664">
        <edm:aggregatedCHO rdf:resource="/07927/diglit_kieser1664"/>
        <edm:dataProvider>UniversitätsbibliothekHeidelberg </edm:dataProvider>
        <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/kieser1664"/>
        <edm:object
            rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/kieser1664.jpg"/>
        <edm:provider>UniversitätsbibliothekHeidelberg </edm:provider>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
    </ore:Aggregation>
    <ore:Proxy rdf:about="/07927/diglit_kieser1664">
        <dc:creator>Wölfflin, Christoph; Kieser, Johann Theodor [Hrsg.]; Schertlin, Peter [Hrsg.];
          Schabhard, David [Hrsg.]; Vischer, Philipp Christoph [Hrsg.]; Scholl, Johann Andreas
          [Hrsg.]; Gross, Christoph [Hrsg.]; Roschüz, Matthäus [Hrsg.]; Odor, Janos [Hrsg.];
          Häberlin, Georg Heinrich [Hrsg.] </dc:creator>
        <dc:date>1664 [VD17 16:727354P] </dc:date>
        <dc:identifier>urn:nbn:de:bsz:16-diglit-194773</dc:identifier>
        <dc:language>la</dc:language>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <dc:title>Heptas Exercitationum Sacrarum De Obligatione Credendi In Christum: Ex Quo Post
          Immensos Cruciatus Emensos, Et Triduanam Requiem Declinatam, Leo De Tribu Juda ... Jesus
          Christus, Mortem  &amp;amp; Martem Stygium in Triumpho ducens ...[P. P. ipsis Vigiliis
          Paschalibus, A. O. R. M DC LXXX.] </dc:title>
        <dc:type>Monograph</dc:type>
        <dcterms:isPartOf>Theologische Literatur </dcterms:isPartOf>
        <dcterms:isPartOf>Druckschriften</dcterms:isPartOf>
        <dcterms:isPartOf>Digitalisierung wertvoller Bestände baden-württembergischer
          Bibliotheken </dcterms:isPartOf>
        <dcterms:isPartOf>Verzeichnis der im deutschen Sprachbereich erschienenen Drucke des 17.
          Jahrhunderts </dcterms:isPartOf>
        <dcterms:isPartOf>Heidelberger historische Bestände – digital: Theologische
          Literatur </dcterms:isPartOf>
        <dcterms:issued>1664 [VD17 16:727354P] </dcterms:issued>
        <edm:type>TEXT</edm:type>
    </ore:Proxy>
    <edm:EuropeanaAggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/kieser1664">
        <edm:aggregatedCHO rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/kieser1664"/>
        <edm:country>Germany</edm:country>
        <edm:language>de</edm:language>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
    </edm:EuropeanaAggregation>
</rdf:RDF>

```

Remaining Issues with Creators /Contributors

Figure 17 : commented export of the transformed file (ESE to EDM) related to this record (see Appendix for a link to this file)

From METS (current Europeana record)

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:dcterms="http://purl.org/dc/terms/" xmlns:svcs="http://rdfs.org/sioc/services#"
    xmlns:ore="http://www.openarchives.org/ore/terms/" xmlns:doap="http://usefulinc.com/ns/doap#"
    xmlns:rdaGr2="http://rdvocab.info/ElementsGr2/" xmlns:dc="http://purl.org/dc/elements/1.1/">
    <edm:ProvidedCHO rdf:about="/07931/diglit_kieser1664"/>
    <edm:WebResource
        rdf:about="http://diglit.ub.uni-heidelberg.de/image/kieser1664/000a.jpg/full/full/0/default.jpg">
        <dc:format>image/jpg</dc:format>

<dcterms:isReferencedBy>http://digi.ub.uni-heidelberg.de/diglit/iiif/kieser1664/manifest.json</dcterms:isReferencedBy>
        <svcs:has_service
            rdf:resource="http://diglit.ub.uni-heidelberg.de/image/kieser1664/000a.jpg"/>
    </edm:WebResource>
    <edm:Agent rdf:about="http://d-nb.info/gnd/117453455">
        <rdaGr2:professionOrOccupation>Author</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/1036692027">
        <rdaGr2:professionOrOccupation>Editor</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/1036692124">
        <rdaGr2:professionOrOccupation>Editor</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/1036692191">
        <rdaGr2:professionOrOccupation>Editor</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/103030247">
        <rdaGr2:professionOrOccupation>Editor</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/121387208">
        <rdaGr2:professionOrOccupation>Editor</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/1036692264">
        <rdaGr2:professionOrOccupation>Editor</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/1036692353">
        <rdaGr2:professionOrOccupation>Editor</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/1036692493">
        <rdaGr2:professionOrOccupation>Editor</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <edm:Agent rdf:about="http://d-nb.info/gnd/104224045">
        <rdaGr2:professionOrOccupation>Editor</rdaGr2:professionOrOccupation>
    </edm:Agent>
    <ore:Aggregation rdf:about="kieser1664_Aggregation">
        <edm:aggregatedCHO rdf:resource="/07931/diglit_kieser1664"/>
        <edm:dataProvider>UniversitätsbibliothekHeidelberg </edm:dataProvider>
        <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/kieser1664"/>
        <edm:isShownBy
            rdf:resource="http://diglit.ub.uni-heidelberg.de/image/kieser1664/000a.jpg/full/full/0/default.jpg"/>
        <edm:object
            rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/kieser1664.jpg"/>
        <edm:provider>UniversitätsbibliothekHeidelberg </edm:provider>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
    </ore:Aggregation>
    <ore:Proxy rdf:about="/07931/diglit_kieser1664">
        <dc:creator rdf:resource="http://d-nb.info/gnd/117453455"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/1036692027"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/1036692124"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/1036692191"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/103030247"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/121387208"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/1036692264"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/1036692353"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/1036692493"/>
        <dc:contributor rdf:resource="http://d-nb.info/gnd/104224045"/>
        <dc:description>Physical location: Universitätsbibliothek Heidelberg, 1,7127
            RES </dc:description>
        <dc:description xml:lang="de">Tübingen, Univ., Diss., 1664 </dc:description>
        <dc:identifier>urn:nbn:de:bsz:16-diglit-194773</dc:identifier>
        <dc:identifier>VD17 16:727354P </dc:identifier>
        <dc:identifier>oai:digi.ub.uni-heidelberg.de:19477</dc:identifier>
        <dc:language>la</dc:language>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <dc:source>UniversitätsbibliothekHeidelberg </dc:source>
        <dc:title xml:lang="la">Heptas Exercitationum Sacrarum De Obligatione Credendi In Christum:
          Ex Quo Post Immensos Cruciatus Emensos, Et Triduanam Requiem Declinatam, Leo De Tribu
          Juda ... Jesus Christus, Mortem  &amp;amp; Mortem Stygium in Triumpho ducens ...[P. P. ipsis
          Vigiliis Paschalibus, A. O. R. M DC LXXX.] </dc:title>
        <dc:type xml:lang="en">Monograph</dc:type>
        <dc:type xml:lang="en">Physical sequence </dc:type>
        <dcterms:isPartOf xml:lang="de">Druckschriften</dcterms:isPartOf>
        <dcterms:isPartOf xml:lang="de">Digitalisierung wertvoller Bestände baden-württembergischer
            Bibliotheken </dcterms:isPartOf>
```

Connected Edm:Agent
- good enrichment potential, thanks to the **DNB resources**
- profession field populated with **values aligned from the MARC21 Code List for Relators**

Improved Creators/Contributors
Fetched **DNB resources**, with the connected **edm:Agent(s)**

```
        <dcterms:isPartOf xml:lang="de">Verzeichnis der im deutschen Sprachbereich erschienenen
           Drucke des 17. Jahrhunderts </dcterms:isPartOf>
        <dcterms:isPartOf xml:lang="de">Heidelberger historische Bestände – digital: Theologische
           Literatur </dcterms:isPartOf>
        <dcterms:isPartOf xml:lang="de">Sammlung33 - Theologische Literatur </dcterms:isPartOf>
        <dcterms:issued>1664</dcterms:issued>
        <dcterms:created>1664</dcterms:created>
        <dcterms:spatial>Tubingae</dcterms:spatial>
        <edm:type>TEXT</edm:type>
    </ore:Proxy>
    <edm:EuropeanaAggregation rdf:about="kieser1664_EuropeanaAggregation">
        <edm:aggregatedCHO rdf:resource="diglit_kieser1664"/>
        <edm:country>Germany</edm:country>
        <edm:language>de</edm:language>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
    </edm:EuropeanaAggregation>
    <svcs:Service rdf:about="http://diglit.ub.uni-heidelberg.de/image/kieser1664/000a.jpg">
        <dcterms:conformsTo rdf:resource="http://iiif.io/api/image"/>
        <doap:implements rdf:resource="http://iiif.io/api/image/2/level2.json"/>
    </svcs:Service>
</rdf:RDF>
```

Figure 18 : commented export of the transformed file (METS to EDM) related to this record (see Appendix for a link to this file)

Published records

From ESE (former Europeana record)

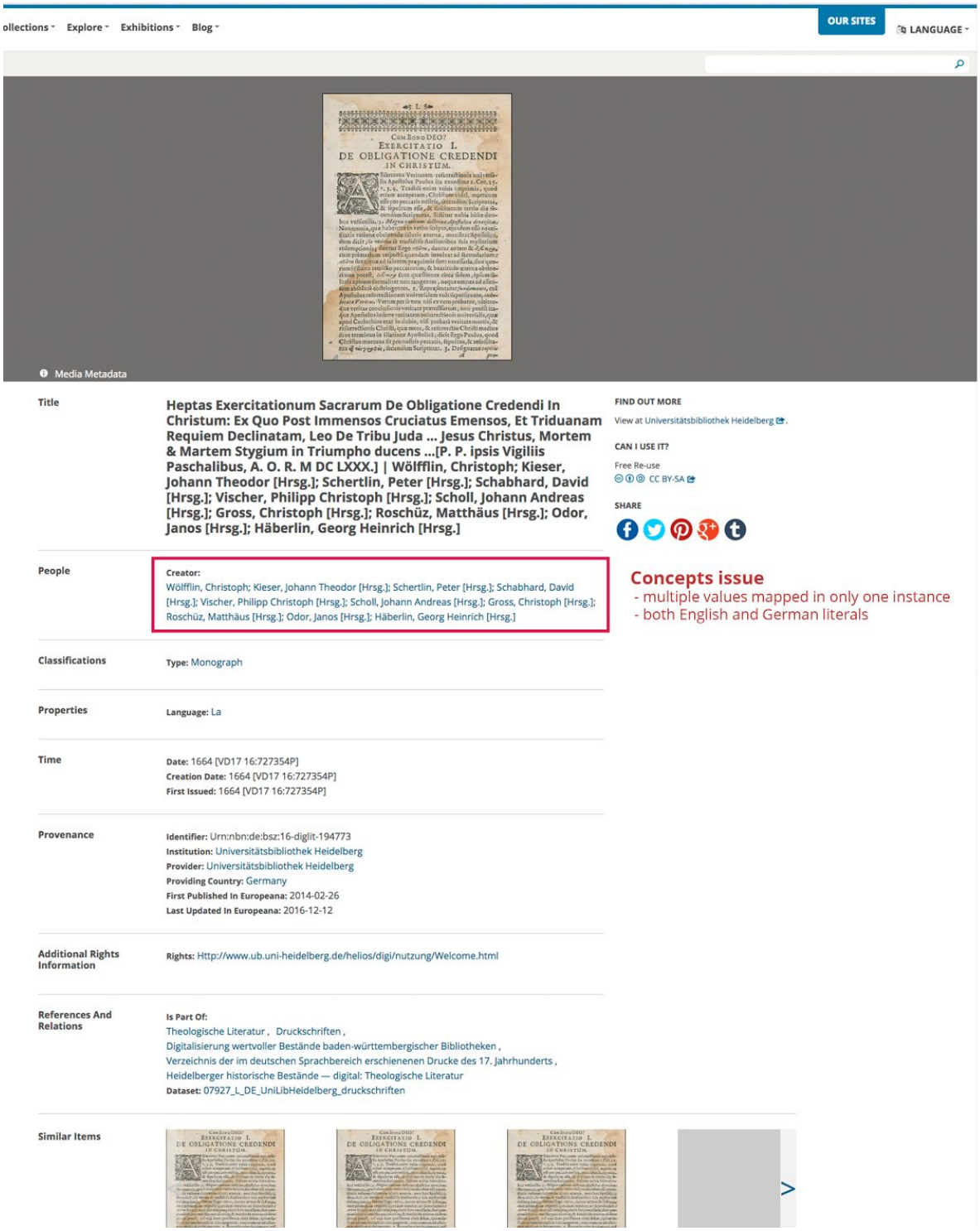


Figure 19 : commented screenshot of the related page in Europeana (now unavailable, as the page was updated with the data improvement)

From METS (current Europeana record)

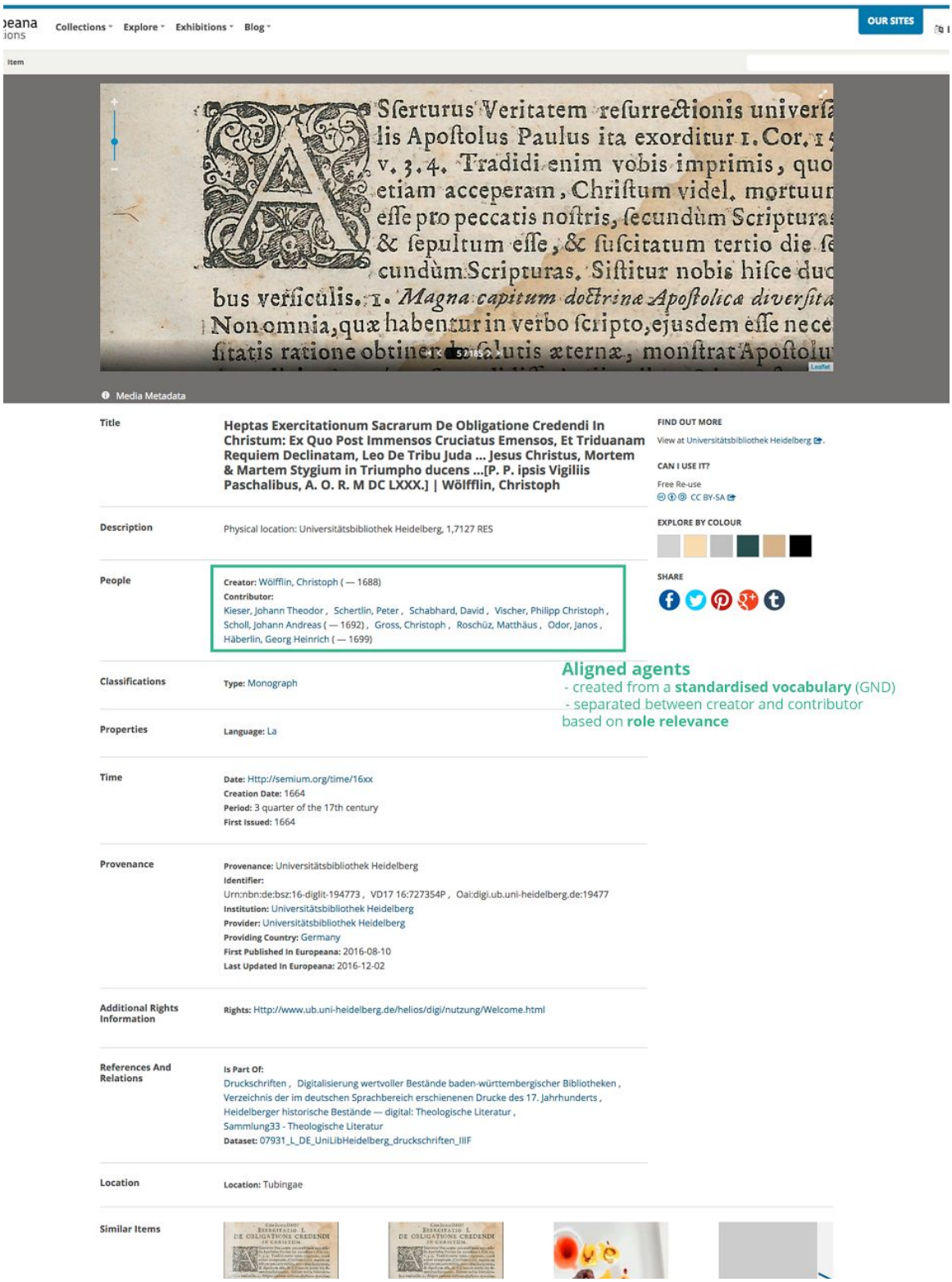


Figure 20 : commented screenshot of the related page in Europeana (see Appendix for a link to this resource)

Hierarchies implementation

Retrieval of hierarchical structure, disambiguation of children objects

Study case : /07931/diglit_zaak (parent record)
/07931/diglit_zaak1913 (child record)

Highlights

Through sampling combined with the explanations provided by Barth Jochen from the Universitätsbibliothek Heidelberg, we performed a complete rework of the hierarchical data previously sent, for all the records defined as part of volumes of journals.

Classic normalization

Original hierarchical references were represented with literals (simple strings). By definition, these values are not compatible with Europeana's **Hierarchical Object plugin,** which only benefits from proper RDF resources i.e. links to other records in the Europeana triplestore. Therefore, these fields will be left somehow untouched by the plugin and will be displayed only as searchable literals on the record page. We refined the mapping of the originally included hierarchical fields (dcterms:hasPart, dcterms:isPartOf) in order to include more specific references and related lang attributes.

Retrieving the relevant hierarchical data

The hierarchical connections between records are present within the METS records, and can be fetched depending of the presence and order of specific fields within the data. It is indeed possible to infer if the considered record is included as a sub-element within a bigger ensemble (e.g. a “journal” record can be part of a “volume of journals”), or if it is itself composed of several children record. Once these conditions are proven, the relevant resources were then mapped as rdf:resource attributes within **dcterms:isPartOf** (bottom-up relations) or **dcterms:hasPart fields** (top-down relations).

Relying on this new data, the Hierarchical Object plugin can implement these hierarchical relationships in the Europeana’s database. These relationships can then be displayed in a **dedicated widget on each record page**, empowering users with another mean of browsing Europeana’s collections.

Disambiguating records thanks to refined titles

For this subcategory of volumes of journals, record titles would be basically identical between parent and children record. In order to avoid such duplications, we simply concatenated (only for the affected children record) a separating string `', '` and the corresponding year.

From a user perspective, this simple trick automatically disambiguates the record within Europeana search results, by giving each one of them a unique title.

Finally, we refined this title field a little further, without any record distinction, by implementing a lang attribute populated with a specific language value from the same record.

Raw files

ESE (old data, Parent record)

```
<?xml version="1.0" encoding="UTF-8"?>
<OAI-PMH xmlns="http://www.openarchives.org/OAI/2.0/"
    xmlns:xsi ="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation ="http://www.openarchives.org/OAI/2.0/http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd"  >
    <responseDate>2017-01-30T16:36:38Z</responseDate>
    <request identifier="digi.ub.uni-heidelberg.de:3533" verb="GetRecord" metadataPrefix ="ese">
      http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi   </request>
    <GetRecord>
        <record>
            <header>
                <identifier>oai:digi.ub.uni-heidelberg.de:3533</identifier>
                <datestamp>2016-12-16T14:57:20Z</datestamp>
            </header>
            <metadata>
                <oai_dc:dc xmlns:dcterms ="http://purl.org/dc/dcterms/"
                   xmlns:europeana ="http://www.europeana.eu/schemas/ese/"
                   xmlns:dc ="http://purl.org/dc/elements/1.1/"
                   xmlns:oai_dc ="http://www.openarchives.org/OAI/2.0/oai_dc/">
                    <dc:title> Zeitschrift für Ästhetik und allgemeine Kunstwissenschaft   </dc:title>
                    <dc:date>[ISSN 2195-6847] </dc:date>
                    <dcterms:issued>[ISSN 2195-6847] </dcterms:issued>
                    <dc:identifier>http://digi.ub.uni-heidelberg.de/diglit/zaak</dc:identifier>
                    <dc:identifier>urn:nbn:de:bsz:16-diglit-35337</dc:identifier>
                    <dc:language>de</dc:language>
                    <dc:type>Periodical</dc:type>
                    <dc:ispartof>Informationen zur Zeitschrift </dc:ispartof>
                    <dc:ispartof>art journals – Kunst- und Satirezeitschriften </dc:ispartof>
                    <dc:ispartof>DigiZeitschriften_Kunst</dc:ispartof>
                    <dc:ispartof>KunstwissenschaftlicheLiteratur </dc:ispartof>
                    <dc:ispartof>Druckschriften</dc:ispartof>
                    <dc:ispartof> Heidelberger historische Bestände – digital: Illustrierte Kunst-
                      und Satirezeitschriften des 19. und frühen 20. Jahrhunderts    </dc:ispartof>
                    <europeana:object>
                      http://digi.ub.uni-heidelberg.de/diglitData/introimage/zaak1906.jpg    </europeana:object>
                    <europeana:provider>UniversitätsbibliothekHeidelberg </europeana:provider>
                    <europeana:rights>
                      http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html    </europeana:rights>
                    <europeana:type>TEXT</europeana:type>
                    <europeana:isShownAt>http://digi.ub.uni-heidelberg.de/diglit/zaak</europeana:isShownAt>
                </oai_dc:dc>
            </metadata>
        </record>
    </GetRecord>
</OAI-PMH>
```

Title Issue
- no lang attribute
- exact **same title** than its **children objects**

Hierarchical Structure Issues
No resource but literals

Figure 21 : commented export of the ESE file related to this record
(see Appendix for a link to this file)

ESE (old data, Child record)

```
<?xml version="1.0" encoding="UTF-8"?>
<OAI-PMH xmlns="http://www.openarchives.org/OAI/2.0/"
    xmlns:xsi ="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation ="http://www.openarchives.org/OAI/2.0/ http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd"  >
    <responseDate>2017-01-30T16:36:41Z</responseDate>
    <request identifier ="digi.ub.uni-heidelberg.de:3587" verb="GetRecord" metadataPrefix ="ese">
      http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi   </request>
    <GetRecord>
        <record>
            <header>
                <identifier>oai:digi.ub.uni-heidelberg.de:3587</identifier>
                <datestamp>2016-02-27T12:40:13Z</datestamp>
            </header>
            <metadata>
                <oai_dc:dc xmlns:europeana ="http://www.europeana.eu/schemas/ese/"
                    xmlns:dc ="http://purl.org/dc/elements/1.1/"
                    xmlns:oai_dc ="http://www.openarchives.org/OAI/2.0/oai_dc/"
                    xmlns:dcterms ="http://purl.org/dc/dcterms/">
                    <dc:title> Zeitschrift für Ästhetik und allgemeine Kunstwissenschaft   </dc:title>
                    <dc:date>1913</dc:date>
                    <dcterms:issued>1913</dcterms:issued>
                    <dc:identifier>http://digi.ub.uni-heidelberg.de/diglit/zaak1913</dc:identifier>
                    <dc:identifier>urn:nbn:de:bsz:16-diglit-35871</dc:identifier>
                    <dc:language>de</dc:language>
                    <dc:type>Volume</dc:type>
                    <dc:ispartof>Informationen zur Zeitschrift </dc:ispartof>
                    <dc:ispartof>art journals – Kunst- und Satirezeitschriften </dc:ispartof>
                    <dc:ispartof>Cendari</dc:ispartof>
                    <dc:ispartof>DigiZeitschriften_Kunst</dc:ispartof>
                    <dc:ispartof>KunstwissenschaftlicheLiteratur </dc:ispartof>
                    <dc:ispartof>Druckschriften</dc:ispartof>
                    <dc:ispartof> Heidelberger historische Bestände – digital: Illustrierte Kunst-
                      und Satirezeitschriften des 19. und frühen 20. Jahrhunderts   </dc:ispartof>
                    <europeana:object>
                      http://digi.ub.uni-heidelberg.de/diglitData/introimage/zaak1913.jpg   </europeana:object>
                    <europeana:provider>UniversitätsbibliothekHeidelberg </europeana:provider>
                    <europeana:rights>
                      http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html   </europeana:rights>
                    <europeana:type>TEXT</europeana:type>
                    <europeana:isShownAt>http://digi.ub.uni-heidelberg.de/diglit/zaak1913</europeana:isShownAt>
                </oai_dc:dc>
            </metadata>
        </record>
    </GetRecord>
</OAI-PMH>
```

Title Issue
- no lang attribute
- exact **same title** than its **parent object**

Hierarchical Structure Issues
No resource but literals

Figure 22 : commented export of the ESE file related to this record
(see Appendix for a link to this file)

Transformed files (EDM, child & parent record)

From ESE (former Europeana parent record)

```
<?xml version="1.0" encoding="UTF-8"?>
<rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:ore="http://www.openarchives.org/ore/terms/" xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcterms="http://purl.org/dc/terms/">
    <edm:ProvidedCHO rdf:about="diglit_zaak">
    <ore:Aggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zaak">
        <edm:aggregatedCHO rdf:resource="diglit_zaak">
        <edm:dataProvider>UniversitätsbibliothekHeidelberg </edm:dataProvider>
        <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zaak"/>
        <edm:object
           rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/zaak1906.jpg"/>
        <edm:provider>UniversitätsbibliothekHeidelberg </edm:provider>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
    </ore:Aggregation>
    <ore:Proxy rdf:about="diglit_zaak">
        <dc:date> [ISSN 2195-6847] </dc:date>
        <dc:identifier>urn:nbn:de:bsz:16-diglit-35337</dc:identifier>
        <dc:language>de</dc:language>
        <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
        <dc:title>Zeitschrift für Ästhetik und allgemeine Kunstwissenschaft  </dc:title>
        <dc:type>Periodical</dc:type>
        <dcterms:isPartOf>Informationen zur Zeitschrift </dcterms:isPartOf>
        <dcterms:isPartOf>art journals – Kunst- und Satirezeitschriften </dcterms:isPartOf>
        <dcterms:isPartOf>DigiZeitschriften_Kunst</dcterms:isPartOf>
        <dcterms:isPartOf>KunstwissenschaftlicheLiteratur </dcterms:isPartOf>
        <dcterms:isPartOf>Druckschriften</dcterms:isPartOf>
        <dcterms:isPartOf>Heidelberger historische Bestände – digital: Illustrierte Kunst- und
           Satirezeitschriften des 19. und frühen 20. Jahrhunderts  </dcterms:isPartOf>
        <dcterms:issued> [ISSN 2195-6847] </dcterms:issued>
        <edm:type>TEXT</edm:type>
    </ore:Proxy>
    <edm:EuropeanaAggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zaak">
        <edm:aggregatedCHO rdf:resource="diglit_zaak">
        <edm:country>Germany</edm:country>
        <edm:language>de</edm:language>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
    </edm:EuropeanaAggregation>
</rdf:RDF>
```

Remaining Title Issue
(duplicated values)

Remaining Hierarchical Structure Issues

Figure 23 : commented export of the transformed file (ESE to EDM) related to this record (see Appendix for a link to this file)

From ESE (former Europeana child record)

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
3      xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
4      xmlns:ore="http://www.openarchives.org/ore/terms/" xmlns:dc="http://purl.org/dc/elements/1.1/"
5      xmlns:dcterms="http://purl.org/dc/terms/">
6      <edm:ProvidedCHO rdf:about="diglit_zaak1913">
7      <ore:Aggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zaak1913">
8          <edm:aggregatedCHO rdf:resource="diglit_zaak1913">
9          <edm:dataProvider>UniversitätsbibliothekHeidelberg </edm:dataProvider>
10         <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zaak1913"/>
11         <edm:object
12             rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/zaak1913.jpg"/>
13         <edm:provider>UniversitätsbibliothekHeidelberg </edm:provider>
14         <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
15         <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
16     </ore:Aggregation>
17     <ore:Proxy rdf:about="diglit_zaak1913">
18         <dc:date>1913</dc:date>
19         <dc:identifier>urn:nbn:de:bsz:16-diglit-35871</dc:identifier>
20         <dc:language>de</dc:language>
21         <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
22         <dc:title>Zeitschrift für Ästhetik und allgemeine Kunstwissenschaft  </dc:title>
23         <dc:type>Volume</dc:type>
24         <dcterms:isPartOf>Informationen zur Zeitschrift </dcterms:isPartOf>
25         <dcterms:isPartOf>art journals – Kunst- und Satirezeitschriften </dcterms:isPartOf>
26         <dcterms:isPartOf>Cendari</dcterms:isPartOf>
27         <dcterms:isPartOf>DigiZeitschriften_Kunst</dcterms:isPartOf>
28         <dcterms:isPartOf>KunstwissenschaftlicheLiteratur </dcterms:isPartOf>
29         <dcterms:isPartOf>Druckschriften</dcterms:isPartOf>
30         <dcterms:isPartOf>Heidelberger historische Bestände – digital: Illustrierte Kunst- und
31           Satirezeitschriften des 19. und frühen 20. Jahrhunderts  </dcterms:isPartOf>
32         <dcterms:issued>1913</dcterms:issued>
33         <edm:type>TEXT</edm:type>
34     </ore:Proxy>
35     <edm:EuropeanaAggregation rdf:about="http://digi.ub.uni-heidelberg.de/diglit/zaak1913">
36         <edm:aggregatedCHO rdf:resource="diglit_zaak1913">
37         <edm:country>Germany</edm:country>
38         <edm:language>de</edm:language>
39         <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de/"/>
40     </edm:EuropeanaAggregation>
41 </rdf:RDF>
42
```

Remaining Title Issue
(duplicated values)

Remaining Hierarchical Structure Issues

Figure 24 : commented export of the transformed file (ESE to EDM) related to this record (see Appendix for a link to this file)

From METS (current Europeana parent record)

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:dcterms="http://purl.org/dc/terms/"
  xmlns:ore="http://www.openarchives.org/ore/terms/">
  <edm:ProvidedCHO rdf:about="diglit_zaak"/>
  <ore:Aggregation rdf:about="zaak_Aggregation">
    <edm:aggregatedCHO rdf:resource="diglit_zaak"/>
    <edm:dataProvider>Universitätsbibliothek Heidelberg</edm:dataProvider>
    <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zaak"/>
    <edm:object rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/zaak1906.jpg"/>
    <edm:provider>Universitätsbibliothek Heidelberg</edm:provider>
    <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
    <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
  </ore:Aggregation>
  <ore:Proxy rdf:about="diglit_zaak"/>
    <dc:description>Shelfmark: Universitätsbibliothek Heidelberg, G 124-8 </dc:description>
    <dc:identifier>urn:nbn:de:bsz:16-diglit-35337</dc:identifier>
    <dc:identifier>ISSN 2195-6847</dc:identifier>
    <dc:identifier>oai:digi.ub.uni-heidelberg.de:3533</dc:identifier>
    <dc:language>de</dc:language>
    <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
    <dc:source>Universitätsbibliothek Heidelberg</dc:source>
    <dc:subject xml:lang="de">Informationen zur Zeitschrift </dc:subject>
    <dc:subject xml:lang="en">Further information on the journal </dc:subject>
    <dc:title xml:lang="de">Zeitschrift für Ästhetik und allgemeine Kunstwissenschaft </dc:title>
    <dc:type xml:lang="en">Periodical</dc:type>
    <dc:type>Text</dc:type>
    <dcterms:hasPart rdf:resource="diglit_zaak1906"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1907"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1908"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1909"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1910"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1911"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1912"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1913"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1914"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1915"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1916"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1917"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1919"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1920"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1921"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1922"/>
    <dcterms:hasPart rdf:resource="diglit_zaak17_1924"/>
    <dcterms:hasPart rdf:resource="diglit_zaak18_1925"/>
    <dcterms:hasPart rdf:resource="diglit_zaak19_1925"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1926"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1927"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1928"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1929"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1930"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1931"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1932"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1933"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1934"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1935"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1936"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1937"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1938"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1939"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1940"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1941"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1942"/>
    <dcterms:hasPart rdf:resource="diglit_zaak1943"/>
    <dcterms:isPartOf xml:lang="de">DigiZeitschriften_Kunst</dcterms:isPartOf>
    <dcterms:isPartOf xml:lang="de">Kunstwissenschaftliche Literatur</dcterms:isPartOf>
    <dcterms:isPartOf xml:lang="de">Druckschriften</dcterms:isPartOf>
    <dcterms:isPartOf xml:lang="de">Heidelberger historische Bestände — digital: Illustrierte Kunst-
     und Satirezeitschriften des 19. und frühen 20. Jahrhunderts </dcterms:isPartOf>
    <dcterms:isPartOf xml:lang="de">Sammlung5 - Kunstzeitschriften </dcterms:isPartOf>
    <dcterms:spatial xml:lang="de">Stuttgart</dcterms:spatial>
    <edm:type>TEXT</edm:type>
  </ore:Proxy>
  <edm:EuropeanaAggregation rdf:about="zaak_EuropeanaAggregation">
    <edm:aggregatedCHO rdf:resource="diglit_zaak"/>
    <edm:country>Germany</edm:country>
    <edm:language>de</edm:language>
    <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
  </edm:EuropeanaAggregation>
</rdf:RDF>
```

Optimized Title
Relevant **lang attribute** based on the language of the record

Retrieved Hierarchical Structure
Top-bottom relations are implemented through new **dcterms:hasPart** elements populated with **@rdf:resources**

Optimized Hierarchical Fields
- additional type values
- lang attributes (English & German)

Figure 25 : commented export of the transformed file (METS to EDM) related to this record (see Appendix for a link to this file)

From METS (current Europeana child record)

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:edm="http://www.europeana.eu/schemas/edm/"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:dcterms="http://purl.org/dc/terms/"
  xmlns:svcs="http://rdfs.org/sioc/services#" xmlns:ore="http://www.openarchives.org/ore/terms/"
  xmlns:doap="http://usefulinc.com/ns/doap#">
  <edm:ProvidedCHO rdf:about="diglit_zaak1913"/>
  <edm:WebResource
    rdf:about="http://diglit.ub.uni-heidelberg.de/image/zaak1913/000_1_Titelblatt_ROEM_1.jpg/full/full/0/default.jpg">
    <dc:format>image/jpg</dc:format>
    <dcterms:isReferencedBy>http://digi.ub.uni-heidelberg.de/diglit/iiif/zaak1913/manifest.json</dcterms:isReferencedBy>
    <svcs:has_service
      rdf:resource="http://diglit.ub.uni-heidelberg.de/image/zaak1913/000_1_Titelblatt_ROEM_1.jpg"/>
  </edm:WebResource>
  <ore:Aggregation rdf:about="zaak1913_Aggregation">
    <edm:aggregatedCHO rdf:resource="diglit_zaak1913"/>
    <edm:dataProvider>Universitätsbibliothek Heidelberg</edm:dataProvider>
    <edm:isShownAt rdf:resource="http://digi.ub.uni-heidelberg.de/diglit/zaak1913"/>
    <edm:isShownBy
      rdf:resource="http://diglit.ub.uni-heidelberg.de/image/zaak1913/000_1_Titelblatt_ROEM_1.jpg/full/full/0/default.jpg"/>
    <edm:object rdf:resource="http://digi.ub.uni-heidelberg.de/diglitData/introimage/zaak1913.jpg"/>
    <edm:provider>Universitätsbibliothek Heidelberg</edm:provider>
    <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
    <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
  </ore:Aggregation>
  <ore:Proxy rdf:about="diglit_zaak1913"/>
    <dc:description>Shelfmark: Universitätsbibliothek Heidelberg, G 124-8 </dc:description>
    <dc:identifier>urn:nbn:de:bsz:16-diglit-35871</dc:identifier>
    <dc:identifier>oai:digi.ub.uni-heidelberg.de:3587</dc:identifier>
    <dc:language>de</dc:language>
    <dc:rights>http://www.ub.uni-heidelberg.de/helios/digi/nutzung/Welcome.html</dc:rights>
    <dc:source>Universitätsbibliothek Heidelberg</dc:source>
    <dc:subject xml:lang="de">Informationen zur Zeitschrift </dc:subject>
    <dc:subject xml:lang="en">Further information on the journal </dc:subject>
    <dc:title xml:lang="de">Zeitschrift für Ästhetik und allgemeine Kunstwissenschaft -
      1913</dc:title>
    <dc:type xml:lang="en">Periodical</dc:type>
    <dc:type>Text</dc:type>
    <dcterms:isPartOf rdf:resource="diglit_zaak"/>
    <dcterms:isPartOf xml:lang="de">Cendari</dcterms:isPartOf>
    <dcterms:isPartOf xml:lang="de">DigiZeitschriften_Kunst</dcterms:isPartOf>
    <dcterms:isPartOf xml:lang="de">Kunstwissenschaftliche Literatur</dcterms:isPartOf>
    <dcterms:isPartOf xml:lang="de">Druckschriften</dcterms:isPartOf>
    <dcterms:isPartOf xml:lang="de">Heidelberger historische Bestände — digital: Illustrierte Kunst-
     und Satirezeitschriften des 19. und frühen 20. Jahrhunderts </dcterms:isPartOf>
    <dcterms:isPartOf xml:lang="de">Sammlung5 - Kunstzeitschriften </dcterms:isPartOf>
    <dcterms:created>1913</dcterms:created>
    <edm:type>TEXT</edm:type>
  </ore:Proxy>
  <edm:EuropeanaAggregation rdf:about="zaak1913_EuropeanaAggregation">
    <edm:aggregatedCHO rdf:resource="diglit_zaak1913"/>
    <edm:country>Germany</edm:country>
    <edm:language>de</edm:language>
    <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/3.0/de"/>
  </edm:EuropeanaAggregation>
  <svcs:Service
    rdf:about="http://diglit.ub.uni-heidelberg.de/image/zaak1913/000_1_Titelblatt_ROEM_1.jpg">
    <dcterms:conformsTo rdf:resource="http://iiif.io/api/image"/>
    <doap:implements rdf:resource="http://iiif.io/api/image/2/level2.json"/>
  </svcs:Service>
</rdf:RDF>
```

Optimized Title
Relevant **lang attribute** based on the language of the record

Retrieved Hierarchical Structure
Bottom-up relations are implemented through a new **dcterms:isPartOf** element populated with **@rdf:resource**

Optimized Hierarchical Fields
- additional type values
- lang attributes (English & German)

Figure 26 : commented export of the transformed file (METS to EDM) related to this record (see Appendix for a link to this file)

Published records

From METS (current Europeana parent record)

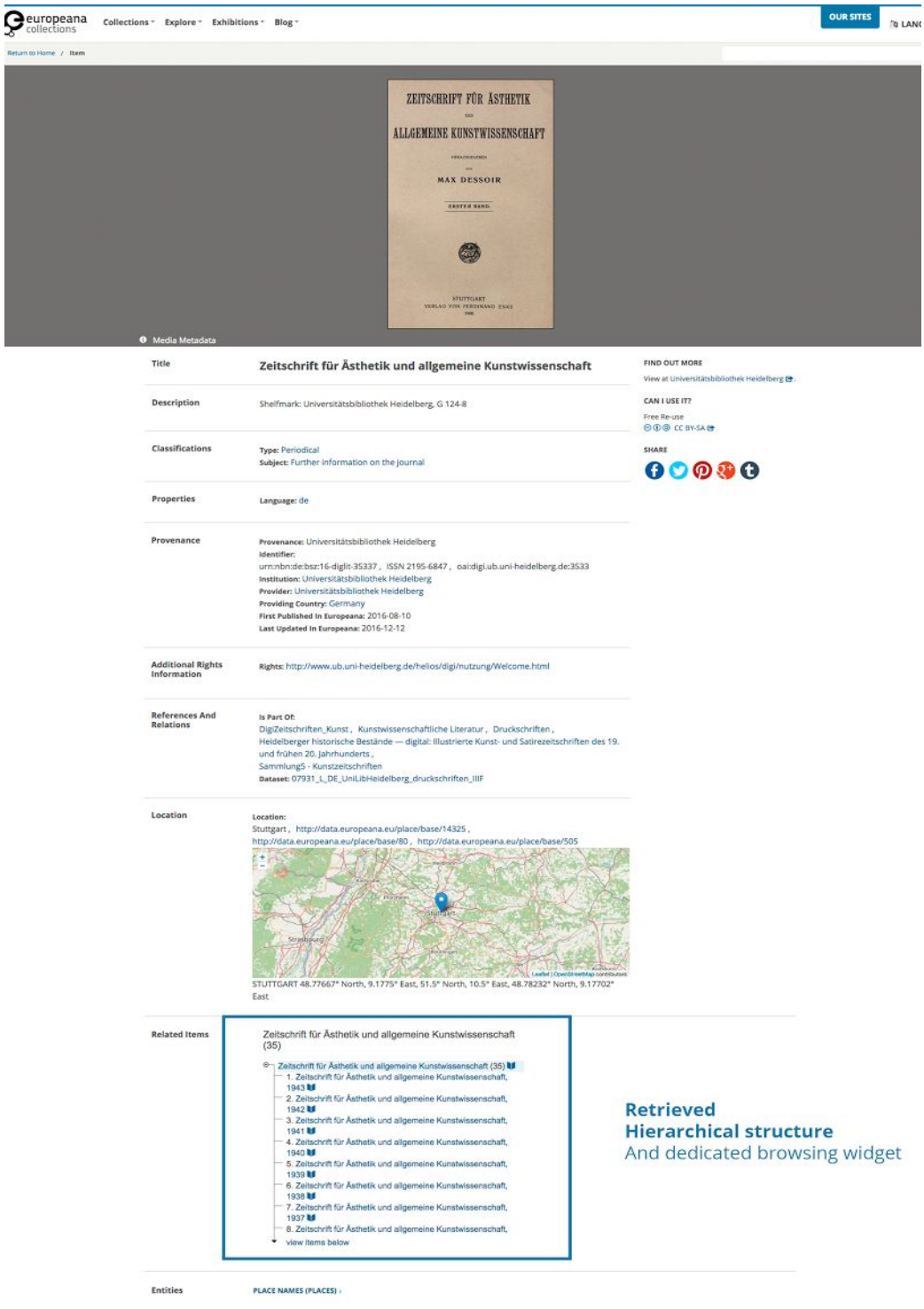


Figure 27 : commented screenshot of the related page in Europeana (see Appendix for a link to this resource)

From METS (current Europeana child record)

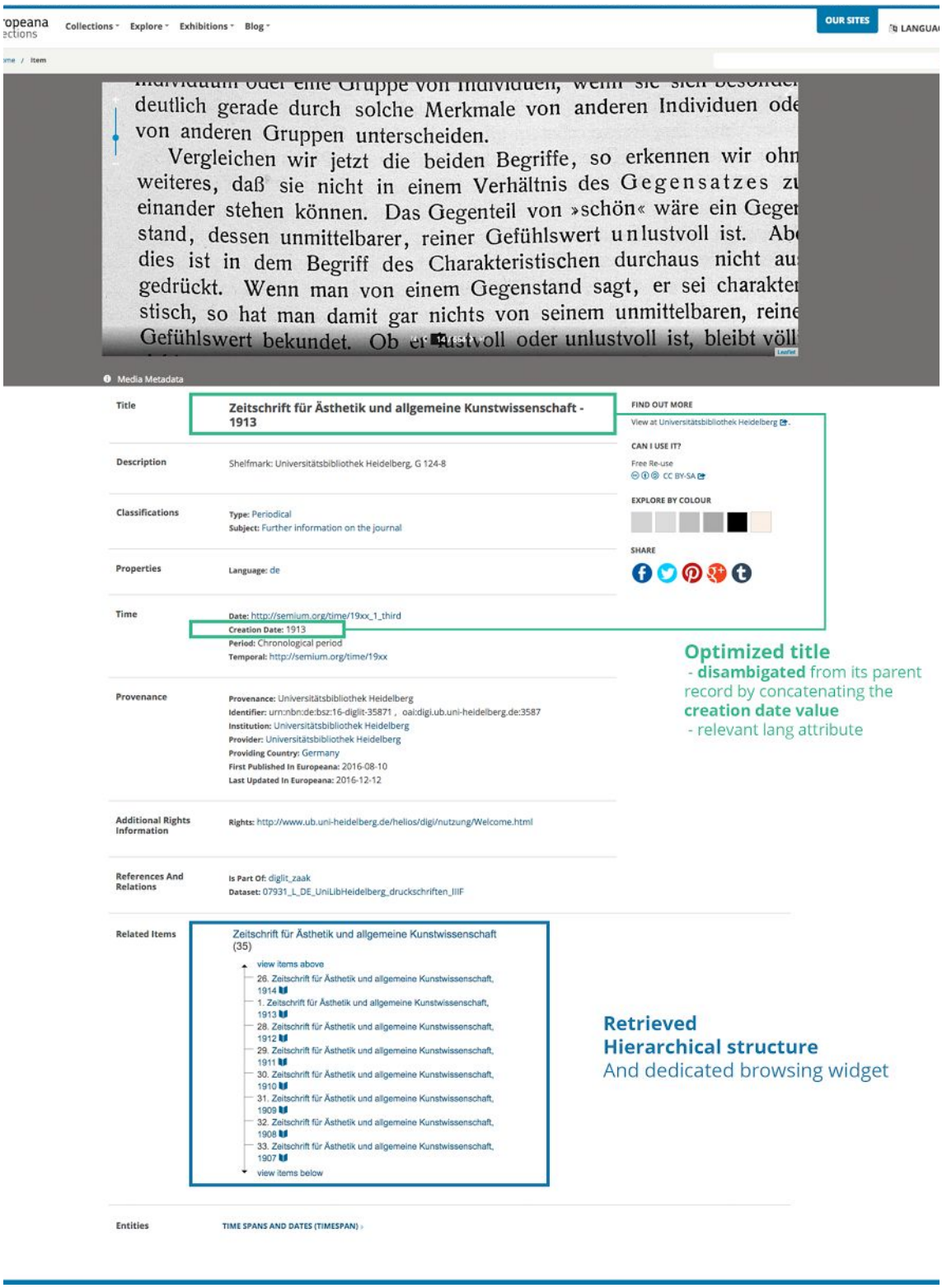


Figure 28 : commented screenshot of the related page in Europeana (see Appendix for a link to this resource)

Conclusion

Improving data quality is an ongoing process and one of the focus points at Europeana. Further work is being done on the Heidelberg case to refine the metadata and representation of information, and adding additional fields from the source data. One of the issues that is already resolved, for instance, is a problematic enrichment for "Salem, Germany"[4] which has a big impact since a considerable part of the Heidelberg datasets consist of material that has been produced in this location.

Further work is being done on various metadata fields, with positive preliminary results. After a new analysis of the metadata from a book historical perspective, some recommendations have been made with regards to picking extra metadata fields with meaningful information and refining existing fields. Examples of the work being carried out is the extraction of the table of contents and the scientific description of the cultural object, refining representation of the dates, and refining dc:type and dc:subject with more unique values for further improved findability.

[4] Every instance of Salem in the Europeana portal, regardless of further location details, was enriched with (among others) locations in Germany, Sweden, Spain, and the province of Valencia. Salem, Massachusetts was never included in this list. In the case of Heidelberg, only the enrichment for Salem, a town in Germany, is desired.

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Appendix

***NB** : Besides the original ESE and METS (XML) records, you'll find here the final JSON-LD records. These files are extended version of the transformed EDM (XML) records presented earlier in this document, and are embedded with a lot more data being added after the records get processed through the Europeana Semantic enrichment workflow and the Hierarchical Object plugin.*

Record	ESE	METS	Europeana JSON-LD	Final display
IIIF implementation	http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi?verb=GetRecord&identifier=digi.ub.uni-heidelberg.de:1063&metadataPrefix=ese	http://digi.ub.uni-heidelberg.de/diglit/zantani1548/mets	http://www.europeana.eu/portal/en/record/07931/diglit_zantani1548.json	http://www.europeana.eu/portal/en/record/07931/diglit_zantani1548.htm
General normalization & additional fields	http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi?verb=GetRecord&identifier=digi.ub.uni-heidelberg.de:1063&metadataPrefix=ese	http://digi.ub.uni-heidelberg.de/diglit/zantani1548/mets	http://www.europeana.eu/portal/en/record/07931/diglit_zantani1548.json	http://www.europeana.eu/portal/en/record/07931/diglit_zantani1548.html
Creators / Contributors normalization	http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi?verb=GetRecord&identifier=digi.ub.uni-heidelberg.de:19477&metadataPrefix=ese	http://digi.ub.uni-heidelberg.de/diglit/kieser1664/mets	http://www.europeana.eu/portal/en/record/07931/diglit_kieser1664.json	http://www.europeana.eu/portal/en/record/07931/diglit_kieser1664.html
Hierarchies implementation Parent record	http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi?verb=GetRecord&identifier=digi.ub.uni-heidelberg.de:3533&metadataPrefix=ese	http://digi.ub.uni-heidelberg.de/diglit/zaak/mets	http://www.europeana.eu/portal/en/record/07931/diglit_zaak.json	http://www.europeana.eu/portal/en/record/07931/diglit_zaak.html
Hierarchies implementation Child record	http://diglit.ub.uni-heidelberg.de/cgi-bin/digioai.cgi?verb=GetRecord&identifier=digi.ub.uni-heidelberg.de:3587&metadataPrefix=ese	http://digi.ub.uni-heidelberg.de/diglit/zaak1913/mets	http://www.europeana.eu/portal/en/record/07931/diglit_zaak1913.json	http://www.europeana.eu/portal/en/record/07931/diglit_zaak1913.html

Document history

Version	Editor	Date	Comments
v0.1	Pierre-Edouard Barrault	21/12/2016	First draft
v0.2	Pierre-Edouard Barrault	4/1/2017	Revision based on comments from Marjolein de Vos and Kirsten de Hoog
v0.3	Marjolein de Vos	4/1/2017	Addition of a section on Recommendations for further improvements
v0.4	Pierre-Edouard Barrault	23/1/2017	Revision based on comments from Valentine Charles, Cecile Devarenne, and Antoine Isaac - New IIIF section, new "Highlights" subsections - New graphical content
v0.5	Pierre-Edouard Barrault	26/1/2017	Major revision based on suggestions/comments from Valentine Charles and Kirsten de Hoog, plus Marjolein de Vos' conclusion
v0.6	Pierre-Edouard Barrault	27/1/2017	Shortened version - METS records screenshots removed - New Appendix section, with links to various files including METS
v0.7	Pierre-Edouard Barrault	27/1/2017	New section Conclusion added by Marjolein de Vos
v0.8	Pierre-Edouard Barrault	31/1/2017	Revision based on comments from Antoine Isaac
v0.9	Pierre-Edouard Barrault	10/3/2017	Revision in the Hierarchies section (update on both graphical content and text)

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