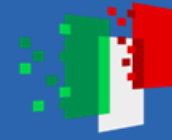




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Thinking Outside the Black Box: Insights from a Digital Exhibition in the Humanities

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Project CHANGES Spoke 4: goals

Focus: Impact that **digital cultural heritage (DCH)** has, comparing it with the current view on (in)tangible heritage – where DCH objects are defined through the **network of interlinked relations** they have with the cultural heritage environment and their provenance context, while (in)tangible objects are the result of selective processes defined and used by cultural heritage institutions during time.

How: By experimenting with different **templates of museums and art collections**, identified analysing ISTAT data, first designing pilot studies and best practices, further adapted and reused in institutions and contexts sharing similar characteristics.

Virtual technologies: knowledge graphs, Web-based environments, eXtended Reality, gamification, serious games, edutainment, 2D/3D models and multimedia, tools for digitization and simulation, Internet of Things and sensors networks, AI-based methods and tools, location-based technologies connected to GIS, etc.



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“Core” case studies

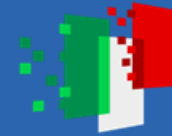




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Pilot for gathering acquisition/digitisation guidelines

Before developing final solutions for the “core” case studies, we have identified a **scenario that could serve as a common experimental ground** for a multidisciplinary group. This pilot is being used as a **baseline to define some approaches and methods**.



Obtaining a digital version of the **temporary exhibition** (ended in May 2023) [The Other Renaissance: Ulisse Aldrovandi and the wonders of the world](#), starting from its **digital twin**, organised and accessible online by users, using various devices (from home computers, smartphones, to tablets and VR headsets).



The need for a replicable approach

The methodologies used in the pilot need be **replicable** in the “core” case studies. The image on the right provides a simplified but useful definition of the terms reproducible, replicable, robust and generalisable.

However, let's keep in mind that there are **many classifications of reproducibility and replicability**, to account for contexts and disciplines where researchers lack complete control over the conditions of their studies, or the studies are of a highly interpretative nature.

		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable

Fig. 5 How the Turing Way defines reproducible research

The Turing Way Community. (2022). The Turing Way: A handbook for reproducible, ethical and collaborative research. Zenodo. doi: [10.5281/zenodo.3233853](https://doi.org/10.5281/zenodo.3233853).



Acquisition and digitisation process

Challenges:

- **High number of institutions** involved
- **Limited time and space** for data acquisition
- **Extremely varied size, materials, and nature of the objects**
- **Extremely varied exhibition setup** (objects, display cases, environmental elements to capture,...)

Solutions:

- **Careful and early planning of acquisition/processing workflows and tools implementation** (cross polarisation, setup schemas,...)
- **Careful and early planning of data and metadata models**
- **Real-time and simultaneous collection of metadata relating to processes and methodologies**



Saving temporary exhibitions in virtual environments: The Digital Renaissance of Ulisse Aldrovandi – Acquisition and digitisation of cultural heritage objects

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ABSTRACT

As per the objectives of Project CHANGES, particularly its thematic sub-project on the use of virtual technologies for museums and art collections, our goal was to obtain a digital twin of the temporary exhibition on Ulisse Aldrovandi called "The Other Renaissance", and make it accessible to users online. After a preliminary study of the exhibition, focusing on acquisition constraints and related solutions, we proceeded with the digital twin creation by acquiring, processing, modelling, optimising, exporting, and metadating the exhibition. We made hybrid use of two acquisition techniques to create new digital cultural heritage objects and environments, and we used open technologies, formats, and protocols to make available the final digital product. Here, we describe the process of collecting and curating bibliographical exhibition (meta) data and the beginning of the digital twin creation to foster its findability, accessibility, interoperability, and reusability. The creation of the digital twin is currently ongoing.

1. Introduction

Several international policies support the focus on the universal use of digital data. Expressly, on Cultural Heritage (CH), both UNESCO and the EU have already provided clear guidelines for increasing the digitisation of heritage, considering aspects related to cataloguing systems as well as different ways for accessing cultural heritage objects and sites (e.g. *in situ* or decentralised). However, in the Italian context, expert

users often perceive CH as composed of tangible and intangible artefacts. In particular, Italian legislation and established and shared practices focused primarily on using material objects. To comply with current European policies and guidelines on CH, we need to go beyond this configuration and make its digital enhancement a permanent and widespread practice in museums and art collections, aiming at (a) increasing the knowledge, curation and management of artefacts in all forms, (b) expanding the involvement of the general public and

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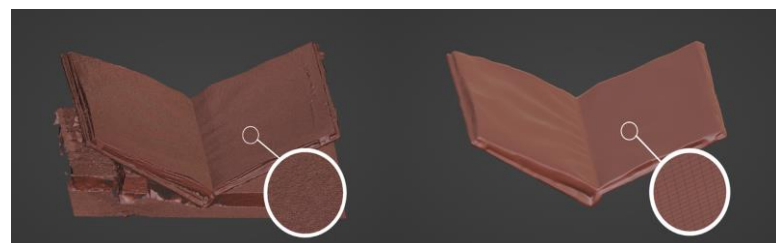


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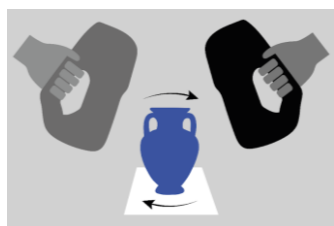
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The workflow

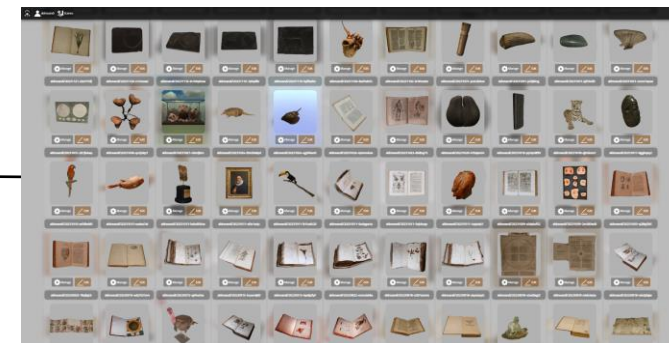
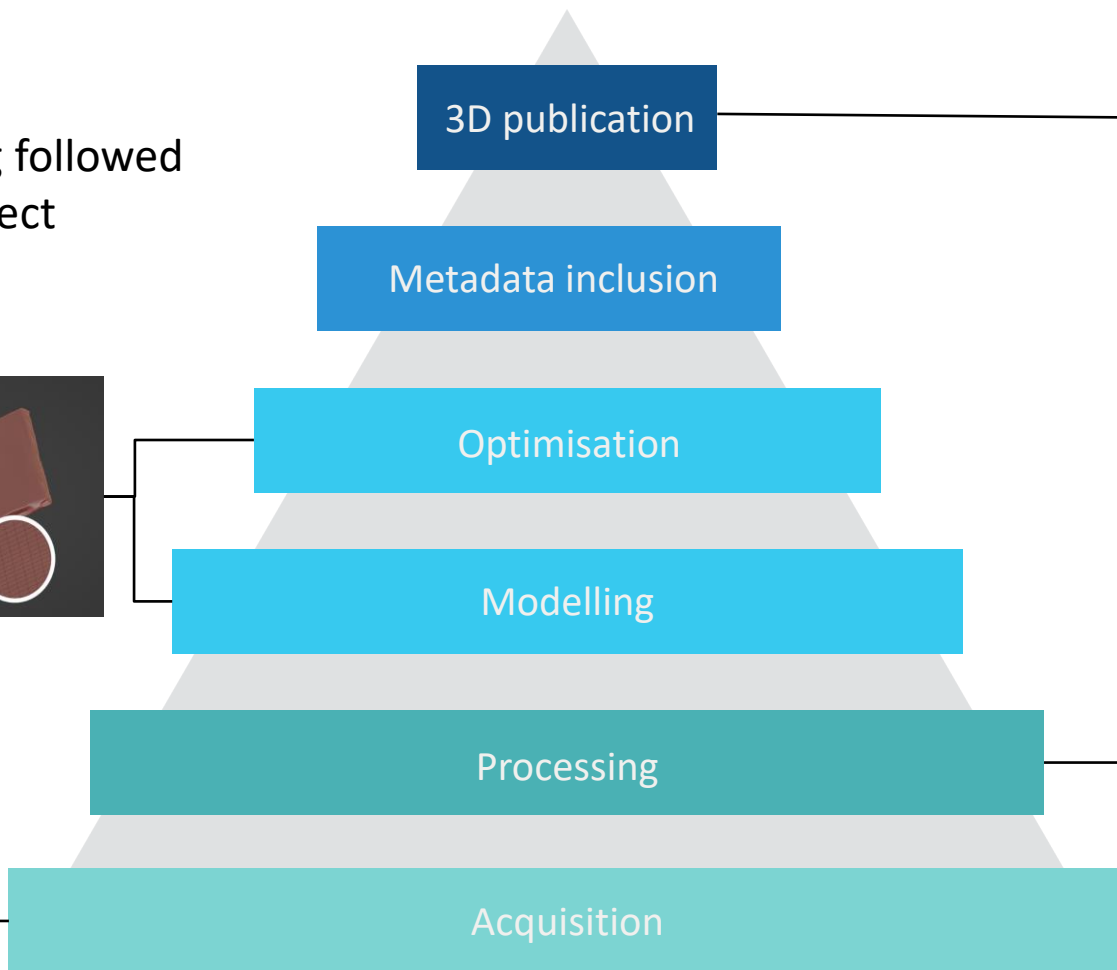
This same approach is being followed
across all phases of the project



Reconstruction and retopology



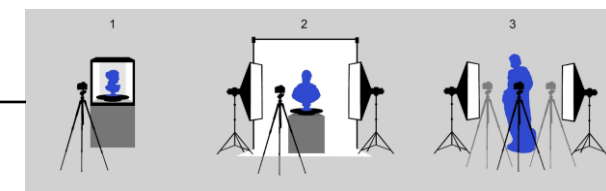
Structured light projection scanner



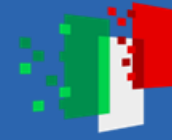
 ATON framework



Structure from Motion (SfM) software

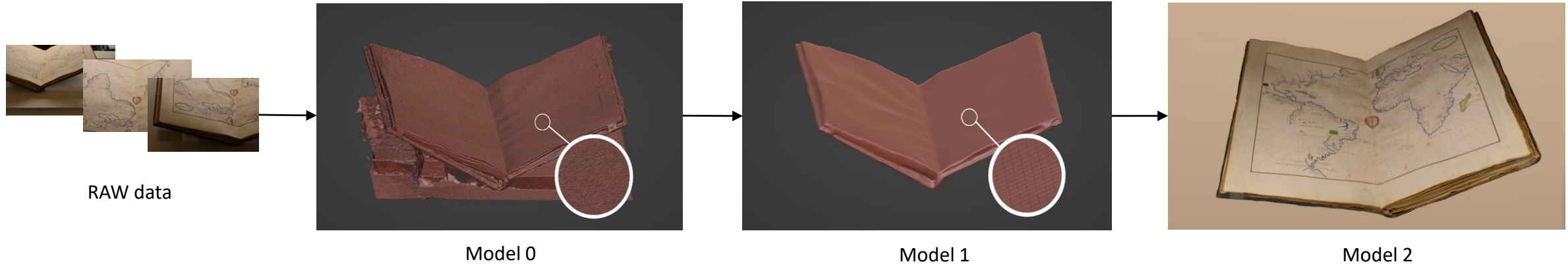


Photogrammetry



Data manipulation and Interpretation transparency

Storing different **derivative versions** for each 3D model:



Downloading, when possible, a **processing report** from the software used

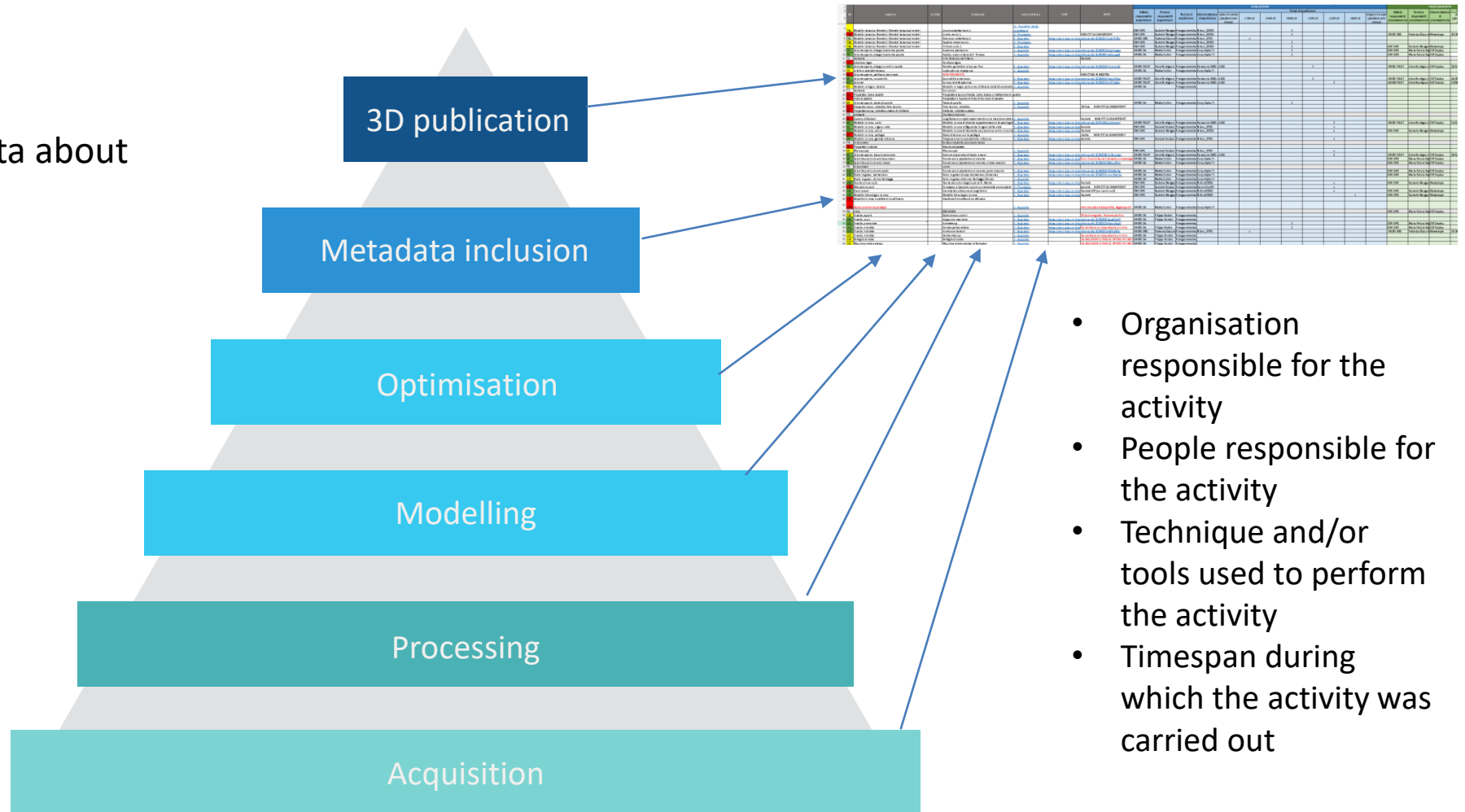
Using **interoperable formats** for each data level to allow access from different platforms



The workflow

Process Table for storing data about the digitisation process

Creation of a digitisation record for each object that includes metadata related to each step and their outputs (e.g. acquired model, processed model, optimised model, etc.)



- Organisation responsible for the activity
- People responsible for the activity
- Technique and/or tools used to perform the activity
- Timespan during which the activity was carried out



The objects

Object Table for storing data about the physical objects

Creation of a cataloguing description for each object, based on official museum records and notes

Controlled data values aligned with existing vocabularies and authority lists



- Titles
- Identifiers
- Types
- Techniques
- Subjects
- Roles of people involved
- Collections
- Keepers
- ...



Towards transparent data publishing

RDF representation of
physical objects, digital
counterparts and
digitisation workflow

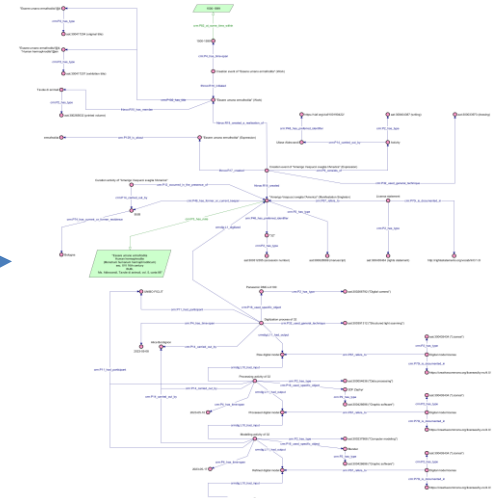
Reuse of

- CIDOC CRM for representing objects and contextual data
- CRMdig for representing the digitisation stages

ID	Nome	Descrizione	Autore	URL	URI	Versione	Stato	Tipologia	Descrizione	Autore	URL	URI	Versione	Stato	Tipologia
...

ID	Nome	Descrizione	Autore	URL	URI	Versione	Stato	Tipologia	Descrizione	Autore	URL	URI	Versione	Stato	Tipologia
...

CIDOC
CRM
CRM^{dig}





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Strengths of our approach

Any reality-capture or source-based model is affected by the lens of interpretation (of a human or software) → **tracking steps for the creation of a 3D model is essential to give transparency to these interpretations**, facilitating the repeatability of the creation process.

Metadata and documentation relating to **processes** (who does what, when) and **methodologies** (how and why) need to be **collected while the research is ongoing**, or the information is lost.

Furthermore, “The Other Renaissance” was a **temporary exhibition**: objects on loan have been returned, and the rooms where the exhibition took place have changed use → the documentation of the process makes it possible to judge (at least to a certain extent) the **relationship between the digital twin and the physical collection**.

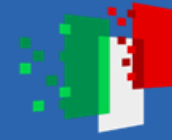
This information is crucial for scientific scrutiny but would otherwise have been lost on the day the temporary exhibition closed.



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Challenges and possible solutions

Documenting the project workflow in this manner requires **careful planning, specific competencies, and it is extremely time-consuming**. Additionally, like so many other important research activities, these efforts are **not rewarded by** current academic evaluation systems → <https://coara.eu/>

Data curation practices, Data Management Plans and other Open Science practices are becoming more common but more needs to be done:

- more **explicit attention needs to be devoted to research methodologies,**
- **guidelines on how to report study protocols, methodologies and procedures** are needed, especially in the (digital) humanities.

A careful documentation of the study design, data collection, and analysis techniques help reflect and make explicit all possible influencing factors and is a fundamental tool for reliability and rigour and for opening the “black box” of research.



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Thank you!