bSDD FOR ARTWORKS IN HBIM OPEN AND STANDARD-ORIENTED DOCUMENTATION

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ABSTRACT

This contribution shows part of a research activity aimed at supporting data documentation related to artworks and decorative apparatuses that characterize the architectural heritage using bSDD as a methodological tool. The proposal approach aims to provide specific information in SCAN-to-BIM processes, implementing HBIM models of decorative apparatuses or artworks with data on the state of conservation and morphological-structural composition according to the material of each component of the system (Lanzara and Scandurra, 2023). The main goal of this activity is the creation of open and detailed information models shareable and consultable via IFC exchange format (ISO 16739:2018), supporting conservation, prevention, maintenance and restoration of historical-artistic heritage. The use of codes, manuals, vocabularies and thesauri, and the multidisciplinary knowledge of specialists, shared within the theoretical and operational framework of the restoration and conservation of cultural heritage, informally contribute to supplement existing codes and to implement/define new datasets for information about deficient and not codified conservation states for specific materials. The structuring of the Data Dictionary is supported by ACCA software's usBIM.bSDD application, accessible via a collaborative web-based platform (Scandurra and di Luggo, 2023). According to the proposed workflow, shared terms and definitions can be integrated within the graphic model of the manufacts and structured within a CDE – Common Data Environment. The system, which has already been tested in the context of historical architecture, is currently being tested on movable and immovable decorative apparatuses and artworks, selected for their constituent materials and compositional complexity. This contribution presents the experimentation on the decorative apparatus of the major altar of the Church of Santa Maria di Costantinopoli in Naples.

1. INTRODUCTION

The definition of shared information models and the adoption of standard procedures based on open formats are increasingly important goals in the AEC area, especially to work on CH documentation, management and protection. Indeed, the methods and strategies consolidated to date do not allow for an easy and homogeneous approach to artefacts that by their intrinsic nature are unique. Data management is even more complex when referring to the movable and immovable decorative apparatuses that characterise the historical heritage: the variety of forms, materials, aggregations and their historical and conservation characteristics, the numerous relationships between studies at different scales and the multidisciplinary investigations involved in the intervention processes, highlight the need to identify protocols for multi-scalar and shared information systems (Pamart, et al., 2022).
Although BIM - integrated with laser scanning technologies and digital photogrammetry - revolutionizes the way of looking at the documentation and restoration of cultural heritage, up to artworks, it is still necessary to reason about the validation of models for the numerous architectural, archaeological and artistic artefacts that are not yet well defined in a digital environment from a semantic point of view and, therefore, about the ways of recording, verifying and consulting the archived information, both geometric and non-geometric (Biagini, et al., 2020). Artworks and movable decorations constitute relevant elements in the architectural context (Tucci et al., 2019), so advanced 3D object labelling systems, web platforms for semantic sharing and annotation and registration systems associated with free or normalised metadata, can ensure their documentation and preservation throughout their life cycle (D.lgs. n. 36/2023).
Collaboration between specialists from different disciplines (architects, engineers, restorers, archaeologists, diagnosticians, historians, humanists) has extended the required interoperability limits to documentation systems, managing a complex and diverse set of digital heritage objects of different types and formats and which are increasingly supported by 3D visual interfaces that decompose artefacts into meaningful elements through the use of vocabularies, thesauri or ontologies, structuring terms and concepts related to specific knowledge areas (DHRs_Digital Heritage Resources, DLS_Digital Library System, HeritageBIM, ExistentBIM, MuseumBIM, ArchaeoBIM); these advances have been accompanied by a remarkable proliferation of digital data formats and standards to meet the needs of preservation, exchange, retrieval and presentation of data on different platforms (Al-Barakati et al., 2014; Ramos and Remondino 2015; Manuel et al. 2019; Tucci et al., 2019; Apollonio et al., 2019; Adamopoulos and Rinaudo, 2019; Ferretti et al., 2022; Gaiani et al., 2021; Scandurra and di Luggo, 2023; Lanzara and Scandurra, 2023).
Focusing on defining open BIM tools and codes for decorative apparatuses and artworks to support conservation and restoration activities, part of the complexity is due to the need to systematise numerous information whose definitions are not yet fully standardised, to be unambiguous.
In this context, this contribution chooses to refer to the bSDD - Building Smart Data Dictionary.

The research starts from the 'state of preservation' domain already developed and tested in collaboration with ACCA software for documenting the decay of surfaces at the architectural scale (Scandurra and di Luggo, 2023), as it allows the structuring of a standard domain through the identification of common interests among several specialists involved in CH preservation operations. Indeed, the use of bSDD allows for the semantic mapping of simple and complex systems, from architectural to detailed scale, by integrating existing standards with specific standards (Majcher, 2020). Through discussions with restoration experts and experts in surveying artworks, the predisposed domain was re-evaluated so that it could integrate humanistic and scientific approaches and adapt it to a scale of detail not previously considered, trying to systematise normative gaps through knowledge and properties derived from accepted practices in documentation work.

1.1 Theoretical background

Among the professional figures involved in the process described in this paper, the cultural heritage restorer is a professional who, during the preliminary phase of the restoration work, defines and draws up the state of conservation of the object of intervention and, subsequently, implements a complex of direct and indirect actions aimed at restoring the state of the work, limiting the decay processes of the artefacts and ensuring their preservation, safeguarding their cultural value.
However, to date, there are few examples of reference codes or tools, *e.g.* datasheets, specifically structured for the definition, recording and systematisation of information, and they are often not based on the use of unambiguous and shared standard data.
The Ministry of Culture provides documents to support emergency interventions for crisis units in the disasters event. These sheets are very concise, but they have the great advantage of being organised by material (G.U. no. 169 of 23 July 2015). Other forms *(e.g.*, condition report, facility report, etc.) are part of the management of museum works (MiBACT forms).
The material of which the works are made generates a basic distinction within the state of preservation and execution technique. An important difference, from which derives the need for specific methods of analysis, intervention, conservation and monitoring, is due to the nature of the material - organic (*e.g.* paintings on canvas, panel, wooden sculpture) or inorganic (*e.g.* metals, stone), (Fassina, 2023). The need for such systematisation is due to the different modus operandi of conserving, restoring and reading the work in its complex microcosm of alterations and degradations with respect to the constituent materials in relation to the surrounding environment. But also a pre-definition of what will be the conservation characteristics to provide the correct guidelines during the intervention and maintenance phase (Baroni and Mander, 2021).
It would be important to use intuitive tools that can form an accurate record during the inspection and can also be implemented and questioned by the other actors involved in CH conservation (architects, engineers, archaeologists, diagnosticians, biologists, chemists, etc.). It would be necessary to identify an effective method for the restitution of the artwork (2D mapping, 3D models, photos, sheets) through the combined use of graphical and textual tools/functions aimed at collecting and systematising what is necessary to determine the anamnesis of the artefact, with reference to the use of organised lists that univocally gather together, thus shareable, the existing decay phenomena for each type of material involved.
The European Directive 98/34/EC defines the term 'standard' as a technical specification approved by a standardisation organisation, not mandatory but used repeatedly. In Italy, UNI is responsible for standards, with the Cultural Heritage Commission Nor.Ma.L., which has been dealing with standardisation in the cultural heritage sector since 1996.
As far as the state of conservation of materials is concerned, an analysis of the existing legislation has revealed gaps and discrepancies: much has been done for stone materials (starting with the NorMal 1/88 recommendations, later transposed in UNI 11182/2006) and something has also been done on other types of materials such as wood (UNI 1130/2004, *Cultural Heritage, Wooden Artefacts, Terminology of Wood Degradation*); however, many other areas of activity and other materials used in this sector remain to be explored.
The creation of a European standard in this area, based on recognised standard methodologies, would enable a unified scientific approach to cultural heritage conservation, promoting synergy between professionals from different disciplines in the EU member states. In this sense, the CEN/TC 346: *Conservation of Cultural Property Committee* has been working on a standardisation proposal since 2002 about the terminology related to movable and immovable artefacts and the state of conservation of the constituent material to define a common language in the European context (Fassina, 2010).
In recent years a step forward has been taken with the UNI CEN/TS 17135:2021: this document defines terms used in cultural heritage conservation to describe the alteration of objects and aims to clarify concepts and improve communication between those working on Cultural Heritage on how to evaluate the results of different conservative and restoration treatments. Furthermore, the provisions reported in the recent UNI 11897:2023 provide the reference for general terms to describe the alteration of multiple types of objects.
Based on these frameworks and related reflections, the implementation of the "state of conservation" domain structure (Scandurra and di Luggo, 2023) started with the help of usBIM.bSDD editor from ACCA software. The tool was used as a pretext to systematise the data collection needed to document the state of conservation of heritage parts, incorporating the normative indications suggested by UNI and the technical indications of sector experts. In fact, the domain was organised starting from the identification of the construction materials of the artefacts and for each one the possible pathologies of degradation were identified. For each pathology, all the properties necessary for specific characterisation were identified, *e.g.* the nature of the phenomenon (chemical, physical, biological, mechanical, etc.), the description, the date of documentation, the mode of diffusion, the type of modification caused to the original material support, the results of specialist analyses, causes, etc.
Hence, each type of decay and its properties or characteristics, described by means of specific data categories, becomes tickable from a list referable to a single and common reference glossary, within which the description and causes of the listed phenomena are specified: sheets and other functionalities, manageable during data recording and graphic modelling and accessible via web-based ACDat/CDE, enrich the information system (*e.g.* 2D grids for each identified alteration or degradation phenomenon, 3D mapping and links to photographic images).

2. METHODOLOGICAL APPROACH

This work investigates the opportunity to create a shared, unambiguous and openBIM information system to document the alterations and degradations of artworks characteristic of the historic architectural heritage, using bSDD as a methodological tool (figure 1).

Figure 1. Methodological Workflow and main tools.

The approach adopted needs to start from the decomposition of the artworks system, according to two different, although closely related, points of view: on the one hand, it distinguishes the compositional characteristics useful to understand the typological specificity of the artefact and the constituent semantic tree (preliminary step); on the other hand, it distinguishes the attributes useful to link all the properties that define its state of conservation (main step). In this regard, the references mainly consulted were regulations, guidelines and sector manuals.

2.1 Preliminary step

The typological, morphological, and compositional awareness is necessary to produce the digital twin of the artefact, so that it can be mimetic of the relationships existing between the various parts and be of support to anchor the information data.
This aspect is supported by the 3D digital surveys, the study of the techniques used for their realisation and the artistic history, and it also helps to understand the influence of each individual part of the artwork on the others, also in terms of its state of conservation. In fact, there are artworks that are configured as micro-architectures composed of a considerable number of parts and sub-parts and different materials (Lanzara and Scandurra, 2023).
Thus, the definition of the digital twin consists of:
1. acquisition and processing of 3D survey, collection of historical-artistic data, understanding of the techniques and materials used;
2. decomposition of the model through the recognition of semantically significant elements and attribution of recognised nomenclatures;
3. identification and decomposition of each element into material subsystems (wood, stone, metal);
4. model import into an openBIM platform;
5. identification/mapping of anomalous areas, *i.e.* areas potentially characterised by alteration or degradation phenomena.

2.2 Main step

For the definition of the characteristics useful to understand the state of conservation of artworks, an important role is played by the materials of which the artwork is made because each reacts differently to intrinsic and extrinsic stresses that change it over time. The cultural values and qualities associated with physical transformation are specific and unique to each piece of artefact, but they depend by context and material conditions. These processes have a strong impact on the meanings and values associated with the artefact, so it is necessary to identify not only the decay phenomena themselves but also all the information that allows us to understand their causes, effects and potential need to intervene or conserve them as a tangible sign of the artefact's history.
With reference to the BIM approach, to recording and verification of the state of conservation of the asset, the morphological, compositional, structural and constructive nature of the case studies necessitates the enhancement of the information dimension above all so that reality-based models (*proxy* objects) or object-oriented models have significance and are truly helpful for management.
Thus, the definition of the information data was based on:
1. identification of typic pathologies for each material (wood, metals, stone);
2. analysis of manuals and norms and identification of the terminology and categories commonly used in the sector's practices for every pathology;
3. systematisation of information into classes, subclasses, properties and properties sets to be integrated into the structure data of the "State of Preservation" domain, according to the bSDD structure (Scandurra and di Luggo, 2023);
4. once the case study is chosen, the specific information is compiled and assigned to its digital twin.
This procedure is useful to add state of conservation data - using the domain created - onto IFC models, making therefore information available in openBIM systems.

3. APPLICATION: CASE STUDY

The case study chosen for the test is the main altar decorative apparatus of the Church of Santa Maria di Costantinopoli in Naples, Italy. The choice derives because it is an artwork made up of numerous components differing in scale of detail and materials.
During the 17th century, there was a continuous dialogue between architecture, sculpture, painting and decoration in the artistic sphere, fully summarised in the conformation of the high altar of Santa Maria di Costantinopoli. It is therefore proposed as a micro-architecture, strongly related to the architecture that host it (the church), but itself made up of different types of artworks that have their own autonomous identity although they are part of a single composition (figure 2).
This made a broader verification of the applicability of the data structure built with the implementation of the "state of preservation" domain possible.

Figure 2. The decorative apparatuses of the presbyterial area in the Church of S. Maria di Costantinopoli in Naples.

3.1 Artistic and historical analysis of the system

The decorative apparatus of the major altar in Santa Maria di Costantinopoli was built in the church of the same name following the transformations commissioned by Frà Nuvolo in 1600 (Ambrasi, 1976). The monumental 'altar machine' (Sricchia Santoro and Zezza, 2008), erected to close off the area of the choir behind according to the dictates of the Counter-Reformation, is described without an author in the guidebooks of historians De Lellis, Sarnelli and Parrino, while it is attributed to Cosimo Fanzago by Carlo Celano "*vedesi un bel capoaltare di marmi mischi e commessi, opera disegnata e guidata dal Cavalier Cosimo*" (Celano, 1692). Built starting in 1639, the altar presents the mensa isolated from the structure behind it, which becomes a true scenic backdrop where the marbles act both as a frame for the image of the Virgin and as parts of the architecture. Specifically, the altar rises above the floor of the church, is decorated with richly carved veined marble and, in the centre, has a richly decorated tabernacle closed by a door in silver and coper alloy. It ends at the sides with two large altar heads in the shape of cherubs. The aedicula consists of two pairs of columns in marble, with Corinthian capitals supporting a tall entablature. The latter ends with a curved broken pediment on which rest two plaster statues representing Purity and Mansuetude. In the centre of the structure, a polychrome intarsia frame frames the fresco of the Virgin of Constantinople. The altar is connected to the side walls of the presbytery by two masonry curtains covered with polychrome marble slabs where two carved wooden doors open. The doors are flanked by columns of yellow Spanish brocatelle with marble capitals ending in a simple entablature with a brocatelle architrave. On the architrave, two modillions support a broken pediment on which a papier-mâché statue stands.

3.2 Digital survey of the system

The digital survey of the Fanzago's altar was organised to produce a 3D document useful to preserve the artefact in digital form and, above all, to support the phases of semantic segmentation and reading of the state of conservation. In this regard, in the choice of technology, importance was given to the need to replicate as much as possible the material texture and colour, in addition to the metric and morphological characteristics, so that the effects of decay phenomena would be evident. Reality-based surveying techniques and, specifically, digital photogrammetric survey, are particularly suitable for 3D acquisition of artefacts of which a high photorealistic rendering as well as a high geometric detail is to be obtained while using relatively low-cost devices and in a short time.

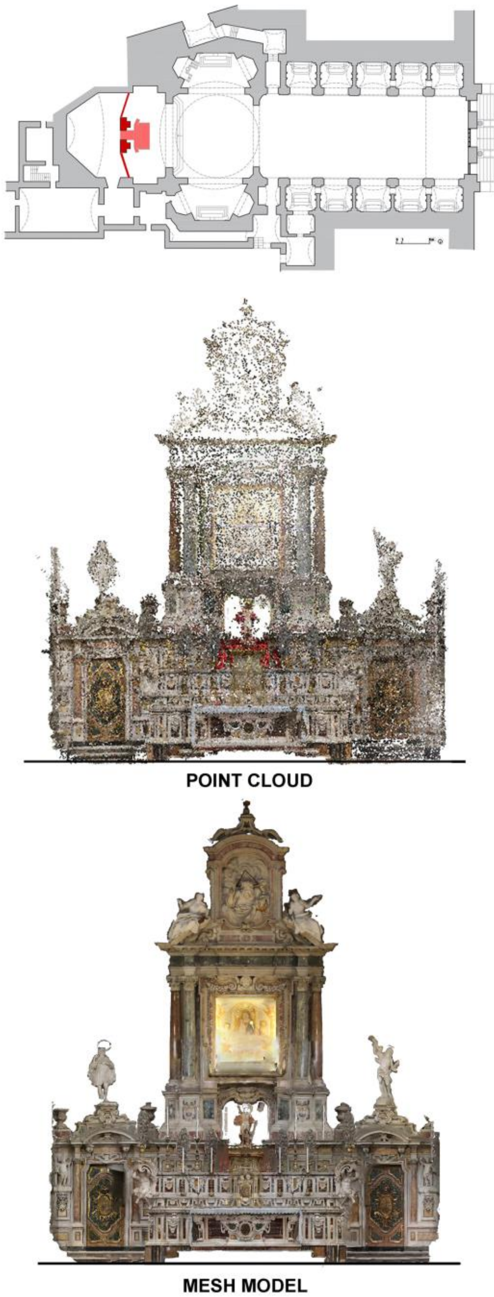

Figure 3. The digital photogrammetric model of the decorative apparatus of the presbyterial area in the church of Santa Maria di Costantinopoli in Naples.

Therefore, a Canon EOS 1200D reflex camera was used for the altar, completed with a 24 mm lens chosen because of the circulation possibilities and the distance allowed for the operations. Photographs were taken manually and supported by a telescopic pole only for shooting the highest areas of the altar. The frames were imported into the *Agisoft Metashape* software and processed following the usual work pipeline from alignment to the construction of a textured mesh model, which was subsequently exported in OBJ format. The orientation and dimensions of the model were set with the aid of control points appropriately set in the scene during the acquisition phase and verified through the more extensive laser scanner survey that covered all the other areas of the church, including part of the altar (figure 3).

3.3 Semantic decomposition and analysis of system, sub-system and elements

The polygonal model was edited to be segmented into first, second and third level components. This operation, although recent research envisages automatic or semi-automatic procedures supported by AI, machine learning and deep learning (Croce et al., 2023), was manually conducted, recognising the unicity of the case study as well as the need to operate with successive segmentations oriented to the specific documentation goal. In fact, an initial segmentation segmented the altar into its constituent parts from a semantic and compositional point of view; the subsequent segmentation made the different elements belonging to each of the previous distinguishable parts; the third segmentation took into account the sub-elements, mostly also coinciding with the different material identifications (*i.e.* wood, stone and metals, to which were added - within the goal of this experimentation - among others, the entries relating to *e.g.* canvas paintings, not included in the previous version of the 'state of preservation' domain):

1. sub-systems/macro-blocks of the composition (altar, basement of the back scene, central block and summit block or entablature);
2. decomposable elements and sub-elements for each sub-system (*e.g.* antependium, altar table, tabernacle, sculpture, candelabra, etc.);
3. parts and sub-parts that can be disassembled for each sub-element (*e.g.* tabernacle door: metal cover wooden box, metal frame, lock and mechanical constraints).

Finally, all the components were identified for each of the macro-blocks according to their geometric, mechanical and functional characteristics, distinguishing, for example, mobile, semi-fixed and fixed elements; monolithic and decomposable blocks; materials. Fixed elements include all the decorative and architectural elements made of stone material, in particular the marble columns (bases, shafts, capitals: monolithic - layered elements), the marble tabernacle, four 18th-century stucco statues, marble ornaments and coverings. The immovable and stratified manufacts/elements also include the fresco on the back of the top part of the apparatus. Among the semi-fixed elements, *i.e.* hinged and/or demountable, composed of different materials, one can distinguish the tabernacle door (metal alloy and wood), the gold details of the fresco housed in the central body of the apparatus and the polychrome doors of the lateral blocks (wood and metal). Among the movable and/or decomposable/disassemblable elements, which enrich and complete the composition, one can distinguish the metal candelabra, the altar palms and the fresco of Santa Maria di Costantinopoli (15th century), made by an unknown Neapolitan artist on a tuff support and placed in the in the central block (figure 4).

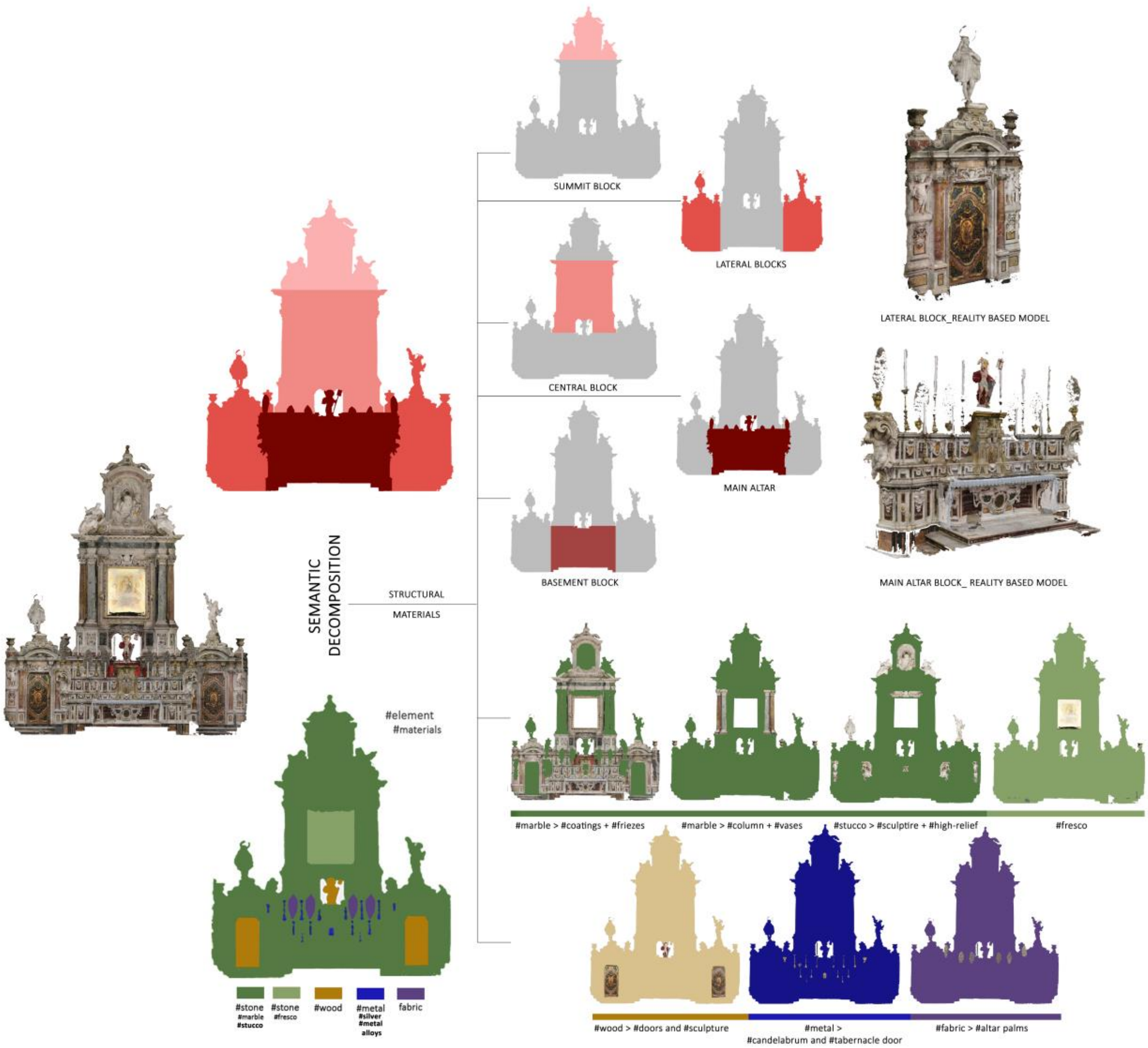

Figure 4. Semantic decomposition of the decorative apparatus: compositional and material analysis

Some details, such as the metal door of the tabernacle, are also surveyed in detail, following the disassembly of the component parts in the context of laboratory analyses aimed at the restoration activity of the artwork.

3.4 Decomposition and digitalisation of micro – elements: sub – elements, parts and sub-parts

To test the multiscalarity of the process among the decomposable elements characterising the system, the little door (silver and copper alloy) of the tabernacle of the high altar was identified.
It is a part of the sub-element tabernacle composed of numerous components or sub – parts, also made of different materials and, therefore, subject to different deterioration and different procedures of documentation and restoration:
- front cover (*metal alloy*, *recto* and *verso*);
- back box (*metal alloy*, *recto* and *verso*):
- wooden core (*recto* and *verso*);
- frame (*metal* alloy, inside and outside);
- lock (metal alloy);
- hinges (metal alloy);
- nails (metal).

The survey of each piece allows the registration/conservation of the pre-restoration state, which is important for future comparisons with the post-restoration state. In particular, the *recto* and *verso* of the cover, the inside and outside faces of the back box, the inside and outside sides of the frame, the wooden core, the mechanical constraints, locks, hinges, screws and nails (later replaced), were digitally photogrammetrically recorded (figure 5). The digital photogrammetric survey was carried out using a Canon EOS 250D reflex camera, 24. Megapixels. No polarising filters were used to mitigate the reflectivity of the metal. The survey of the pieces was repeated in the post-restoration step to allow the comparison between the models during the different steps and according to preventive strategies.

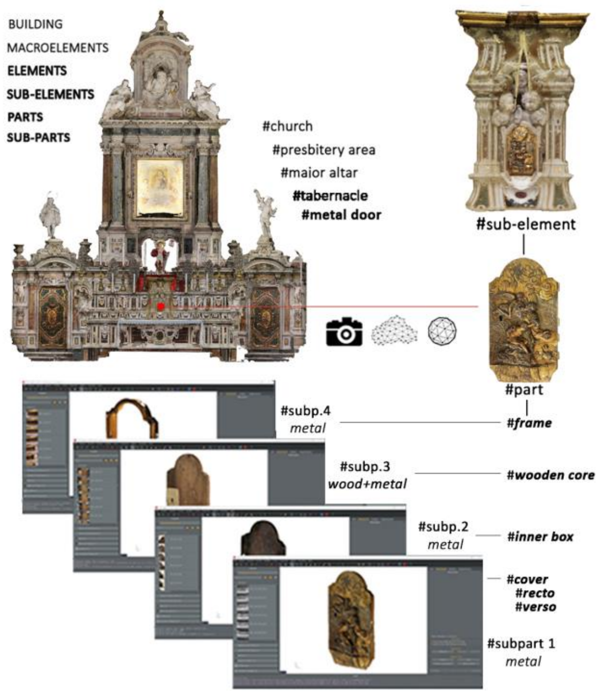

Figure 5. The metal door of the tabernacle (silver-copper alloy and wood): compositional and material analysis.

4. DIGITAL TOOLS

To test the process on different materials, the state of conservation has been mapped on two artifacts, the door of the left lateral block, a wooden manufact with frame and carvings in silver and polychrome painted surfaces, and iron hinges, lock and handle and the door of the tabernacle, silver metal alloy - copper and wooden core, described in the previous paragraph.
HBIM 3D mapping of the state of preservation has been tested on the *recto* and *verso* of the metal alloy door of the tabernacle of the high altar (Figures 6) and on the polychrome wooden door of the lateral block (Figures 7) by recording of chemical, physical and mechanical decay phenomena, indicating name, type, definition, causes, affected layer and distribution modes for each phenomenon or damage.
The OBJ models, transformed into IFC, were imported into ACCA software's usBIM web platform, which it used as a common workspace. For the purposes of experimentation, it was decided to first import the mesh models into the BIM authoring software *Edificius* as generic *proxies 3D object*, to proceed with the object-oriented 3D mapping of the state of preservation (HBIM bar: Decay Area and Crack *proxy* objects), (Lanzara et al., 2021) and with the export in IFC format.

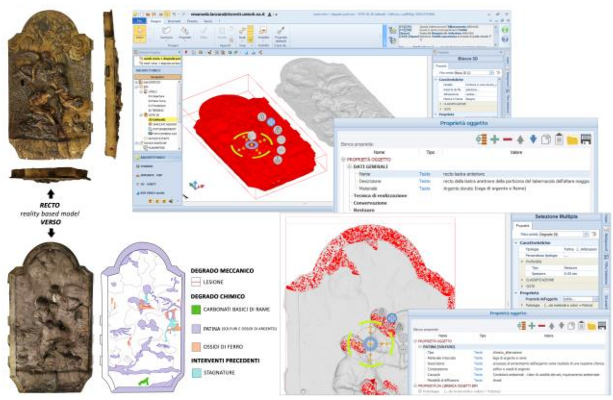

Figure 6. 3D Decay mapping of the metal cover (*verso*).

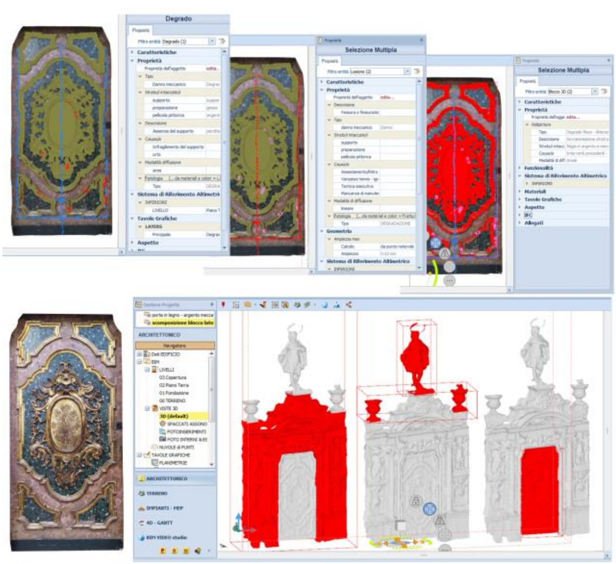

Figure 7. 3D Decay mapping of the wooden door

4.1 Mapping information on the IFC model

The analysis of the norms and the discussion with experts in the restoration field led to the addition of multiple items not initially foreseen in the bSDD 'state of preservation' so that it could also be used to characterise the specific condition of movable and immovable artworks, in all their parts.
The update of the new version of the bSDD therefore sees the addition of new materials (in particular, canvases and woods) and the implementation of characteristic decay items for metals. The first ones were tested on one of the polychrome door of the left lateral block, while the second ones were tested on the metal door of the tabernacle, partly highlighting the semantic correspondence with pathologies also referable to other materials (*e.g. patina* assumes the same name also in the case of other materials) and partly the exclusive belonging to the specific category (*e.g.* iron oxides or patinas composed of silver sulfides and chlorides), both characterized by specific chemical compositions, or the phenomenological variation to be detailed in the specific attributes in the completion of the properties (*e.g.* the difference between corrosion in stone materials and corrosion in metals).
However, after organising these specifications in the bSDD structure, having uploaded the IFC models with the relevant degradation areas or material mesh segmentations to ACCA's web-based platform, the bSDD editor application allowed the specific detailing information to be attributed to each area or portion. All that was required was to select the previously interpreted portions and assign them the specific bSDD item, detailing the relevant properties element by element (figure 8).
The tool also offers the possibility of colouring the model portions differently according to the characterising phenomenon, offering more immediately comprehensible visual readings, also supporting decision-making processes in this sense.
Saving the data of the specific domain chosen in the platform allows the IFC model to absorb its properties so that they can be read by anyone viewing it, in any IFC viewer, thus achieving the objectives of transparency, sharing, openness and standardisation, which are indispensable for efficient work processes through BIM (figure 9).

5. CONCLUSION

The main aim of this research activity is to support the Scan-to-HBIM processes for the planning, management, implementation and archiving of pre, during and post-restoration activities on artworks and movable or immovable decorative apparatuses characterising the architectural and historical-artistic cultural heritage, favoring collaboration between the various professionals involved through the systematisation of information that can be shared and read in IFC.
This work is part of the research activities aimed at recognising, defining and systematising data on the state of conservation of systems that are semantically hybrid from a geometric-compositional and functional point of view, in that they are characterized by the co-presence of micro-architectures or architectural systems, such as decorative apparatuses and fixed furnishings, and mobile and immovable artefacts.
In particular, with reference to the specific case study investigated, which is strongly characterized by the simultaneous presence of several materials, the structuring of a new part of domain "state of preservation" about the documentation system of the state of conservation of organic elements, such as painted artefacts on wooden and canvases support, is underway, as well as the completion of the data about metal and alloy artefacts, in order to initiate the process of creating and disseminating recording systems based on the use of common and open data in open BIM systems, according with the recent provisions describing the alteration of multiple typologies of objects (UNI 11897:2023)
For example, among the peculiar elements characterising the activities of analysis, intervention, conservation and monitoring of artefacts on support made of organic material, such as paintings on canvas and wooden boards and sculptures, the preliminary phases of the cognitive intervention converge in the characterization of the infesting species, where present, as well as a sampling of the agents of degradation (*e.g.* xylophagous insects, molds), indispensable to support the decision-making process of intervention.
Finally, it should be emphasised that even the visual analysis of degradation in digital twins mapped in BIM can determine the identification of the specific pathology: for example, in the case of wood, from the size of the flicker holes it is possible to determine, approximately, the type of responsible insect (Orata, 2017; Gambetta, 2010; Saccani, 2009). Future goals include the need to link these findings to specific graphical reference solutions, which are currently not unambiguous.

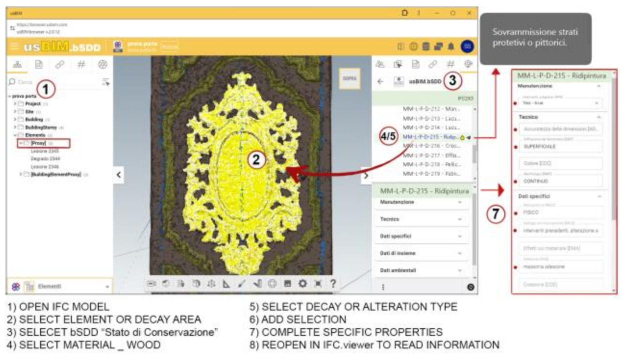

Figure 8. Association of bSDD with degradation areas.

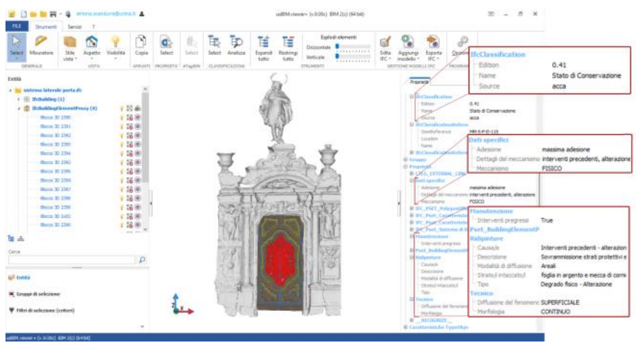

Figure 9. IFC querying information.

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