



# BIRGIT



**BIM for historical existing buildings**  
March 2024 V1.0



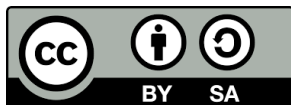
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## Block 3 – Lecture 3.2

# BIM for Historical Existing Buildings

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GISIG



## Learning outcomes

**At the end of this lecture, the learner is expected to be able to:**

- Understand the specialized application of BIM and its key benefits in the context of the historical building and structures
- List the steps of the HBIM process
- Describe some concrete possible applications of HBIM

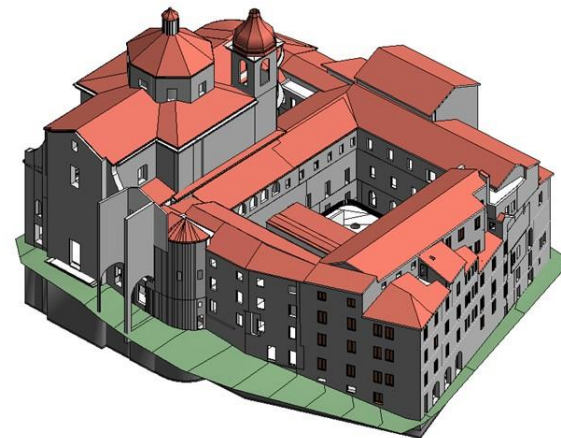
### Content of the lecture

1. Introduction
2. Key benefits
3. HBIM steps
4. HBIM applications

## 1. Introduction

**Heritage Building Information Modeling (HBIM)** is a specialized application of Building Information Modeling (BIM) tailored for the documentation, analysis, and management of *historic buildings and structures*.

The term **HBIM** was first used in 2009, in a scientific article by *Professor Maurice Murphy* of the Dublin Institute of Technology; since then, the topic has grown in popularity among practitioners and academics.



Source: <https://blog.masterpesenti.polimi.it/il-bim-per-gli-edifici-storici-creazione-caratterizzazione-e-sfruttamento-di-un-modello-bim/>

HBIM aims to create a comprehensive digital representation of a historic building, incorporating not only its physical geometry but also its historical, cultural, and architectural significance.

## 2. Key benefits

The use of HBIM for historic buildings include:

- ✓ **Enhanced Documentation and Understanding**
- ✓ **Improved Conservation and Restoration Planning**
- ✓ **Effective Communication and Collaboration**
- ✓ **Heritage Preservation and Knowledge Sharing**
- ✓ **Decision-Making Support**
- ✓ **Cost-Effectiveness and Efficiency**
- ✓ **Visualization and Public Engagement**
- ✓ **Sustainable Heritage Management**

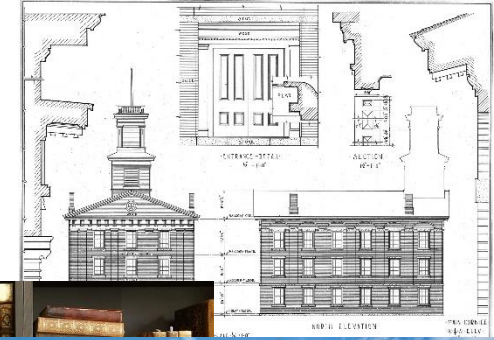
## 3. HBIM steps

The HBIM process typically involves the following steps:

### a. Data Acquisition

Gather and review all available historical information about the building, including:

- historical records
- architectural drawings
- photographs
- previous surveys.





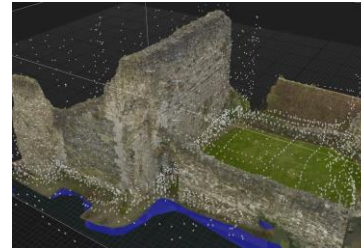
## 3. HBIM steps

The HBIM process typically involves the following steps:

### b. Survey and Data Collection

Conduct a detailed survey of the building using various techniques such as:

- laser scanning
- photogrammetry
- traditional surveying methods.





## 3. HBIM steps

The HBIM process typically involves the following steps:

### c. Data Processing and Analysis

Process the collected data to extract meaningful information, such as

- identifying building elements
- classifying materials
- detecting anomalies or deterioration.

This may involve using specialized software tools for data cleaning, segmentation, and classification.

## 3. HBIM steps

The HBIM process typically involves the following steps:

### d. HBIM Modeling:

Create a detailed HBIM model using BIM software, incorporating both geometric and non-geometric information.

This involves:

- creation of specific libraries of parametric objects
- assigning material properties
- linking historical data to specific elements within the model.

Considering then that existing buildings almost never present characteristics of regularity and repetitiveness, the parameterisation of the components becomes a rather complex operation with a considerable expenditure of time and resources.

## 3. HBIM steps

The HBIM process typically involves the following steps:

### **e. Model Validation and Review**

Validate the HBIM model against the collected data and historical records to ensure accuracy and consistency.

This may include performing clash detection, comparing dimensions, and reviewing models with historical architecture experts

## 3. HBIM steps

The HBIM process typically involves the following steps:

### f. Application and Management

Use the HBIM model for various purposes:

- conservation planning
- restoration interventions
- structural analysis
- heritage documentation.

The model can be used to simulate different scenarios, assess the impact of interventions, and make informed decisions about the building's preservation and management.

## 3. HBIM steps

The HBIM process typically involves the following steps:

### **g. Maintenance and Updates**

Maintain the HBIM model as a living document and update it with new information, building changes, and ongoing conservation efforts. This ensures that the model remains a valuable resource for future decision-making and heritage conservation

The HBIM process is iterative and may involve revisiting previous steps as new information becomes available or as the project progresses. The level of detail and complexity of the HBIM model will depend on the specific project requirements and the available resources.

## 4. HBIM applications

HBIM is still an evolving methodology, but it has already gained widespread recognition as a valuable tool for the preservation and management of historic buildings.

Here are some examples of HBIM applications:

- **Historical Preservation and Restoration**
- **Documentation of Heritage Sites**
- **Visualization for Tourism and Education**
- **Structural Analysis and Monitoring**
- **Urban Planning and Development**

As technology advances and HBIM processes become more refined, its impact on heritage conservation is expected to grow even further.

## 4. HBIM applications

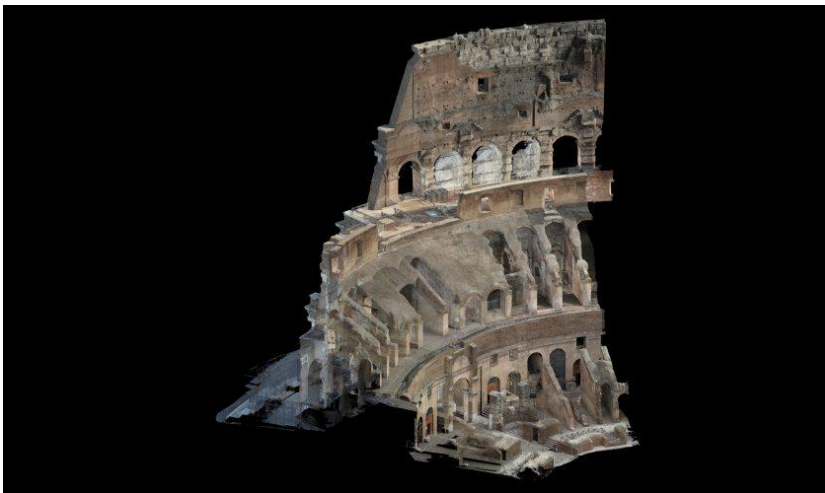
The following slides show some specific examples of how HBIM has been applied in various projects.

These examples demonstrate the versatility and effectiveness of HBIM in addressing various challenges related to historic buildings. As HBIM technology continues to evolve, its applications are expected to expand even further, contributing significantly to the preservation and management of our cultural heritage.



## 4. HBIM applications

**1. Conservation of the Colosseum, Rome, Italy:** HBIM was used to create a detailed model of the Colosseum, incorporating its complex geometry, historical data, and material properties. This model was used to plan and simulate restoration interventions, ensuring that they were compatible with the building's historical value and structural integrity.

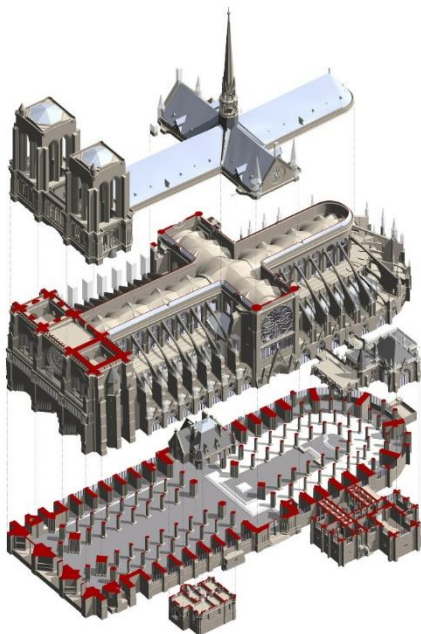


The project drawn up by the Colosseum Archaeological Park (Rup Dr. Federica Rinaldi) has involved leading companies, each with specific skills, in the sector for several months (a temporary grouping that won a public tender launched by Invitalia and consists of CONSORZIO FUTURO in RICERCA CFR of Ferrara - the agent - which is responsible for the scientific coordination of the activities, GEOGRA' Srl of Sermide, ETS Srl and JANUS Srl of Rome).

Source: <https://colosseo.it/2022/08/colosseo-3d-avviato-primo-rilievo-tridimensionale-integrato-hbim/>

## 4. HBIM applications

**2. Restoration of Notre-Dame Cathedral, Paris, France:** Following the devastating fire in 2019, HBIM played a crucial role in the restoration of Notre-Dame Cathedral.



The HBIM model provided a comprehensive understanding of the building's structure and allowed architects to plan the reconstruction process accurately.

### Autodesk, France

They thought that it would be important to help with BIM and they started to work with a company to create a BIM model of the cathedral pre-fire based on laser scans created by art and architectural historian Andrew Tallon. Belgian-born Tallon had carried out a laser scan of Notre-Dame in 2010. With the backing of a European arts documentary he set out to capture the cathedral from top to bottom using a Leica Geosystems laser scanner, starting at the west-side entrance.

Tallon's laser scans were the only really accurate as-built measurements of the cathedral.

## 4. HBIM applications

**3. Virtual Tours of Pompei, Italy:** HBIM was utilized to create immersive virtual tours of the ancient Roman city of Pompeii. These virtual tours allow visitors to explore the ruins of Pompeii digitally, providing a unique and engaging educational experience.



The project is carried out by the Archaeological Park of Pompei together with the Federico II University of Naples, the Polytechnic University of Milan and the Institute of Cultural Heritage Sciences of the CNR.

The processing of the digital platform has been carried out by Acca Software, developer of the Edificius and usBIM programmes.

*Surveys for the BIM three-dimensional modelling of Arianna's Domus*

Source: <http://pompeisites.org/comunicati/nuove-tecnologie-per-il-monitoraggio-dello-stato-di-conservazione-dei-manufatti-archeologici/>

**Thank you for your attention.**



<https://birgitproject.eu/>

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