Digi-CVET

Developing transversal digital competences for digital Continuous Vocational Education and Training in construction

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Emerging technologies: basic insights and exemplary digital application

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ΠΕΔΜΕΔΕ 1931 ΠΑΝΕΛΛΗΝΙΑ ΕΝΩΣΗ ΔΙΠΛΩΜΑΤΟΥΧΩΝ ΜΗΧΑΝΙΚΩΝ ΕΡΓΟΛΗΠΤΩΝ ΔΗΜΟΣΙΩΝ ΕΡΓΩΝ
PANHELLENIC ASSOCIATION OF ENGINEERS CONTRACTORS OF PUBLIC WORKS
Kröpelin Projekt GmbH
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What will you learn in this module?

- Introduction - What is BIM ?
- Information – Graphical & Non-Graphical
- Software
- Drawing basic tool & 3D modeling basic tool
- BIM integrated with AR
- Actor using BIM

WHAT IS BIM?

What does BIM mean?

BIM stands for: Building Information Modelling / Model / Management

We refer to **BIM modelling** during the building project development using a digital application.

We are referring to **BIM management** during the processes of the construction project throughout the whole cycle.

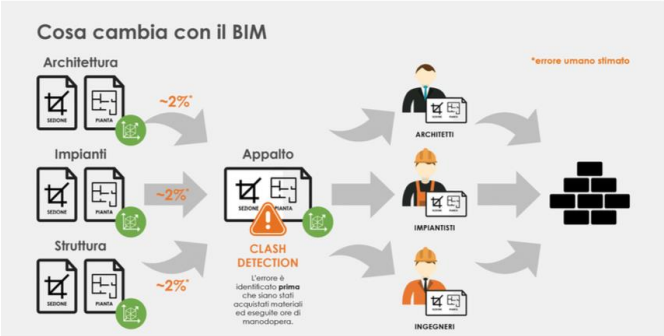
We refer to **BIM model** when we talk about the result.

Source: https://www.bimportale.com/bim-caratteristiche-vantaggi-operativi-parte/

BENEFITS OF USING BIM

Think BIM

Working with **BIM** applications allows to saves time and money



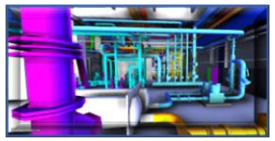
Source: https://www.coap.eu/appalti-e-progettazione-integrata-bim//

When building a construction, several professionals need to cooperate in the realization.

Each construction is the prototype of the project.

Working in a BIM environment allows to move the prototype creation into a virtual environment.

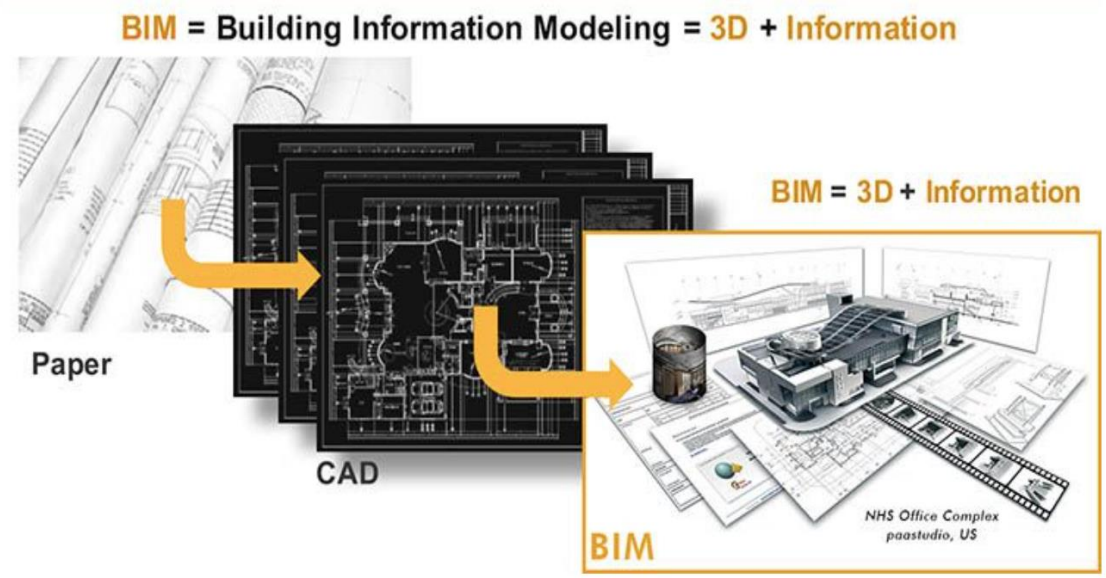
Working in a virtual environment allows to identify any errors before execution.



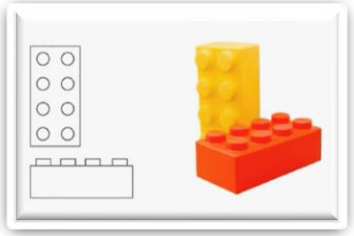
INFORMATION IN BIM

Graphical

All elements are parametric, and the images are displayed in 3D



During the design phase, working with parametric images allows to save time in the realization of the drawing and the project itself.



Source: https://www.infobuild.it/approfondimenti/bim-rivoluzione-digitale-edilizia-building-information-modeling

INFORMATION IN BIM

Non-graphical

Information related to the drawn element

Real brick

CAD brick

BIM brick

Each element drawn contains its own information such as: material type, strength, durability, heat resistance, information on disposal etc.

The BIM object is a digital representation of the element with all its physical characteristics.

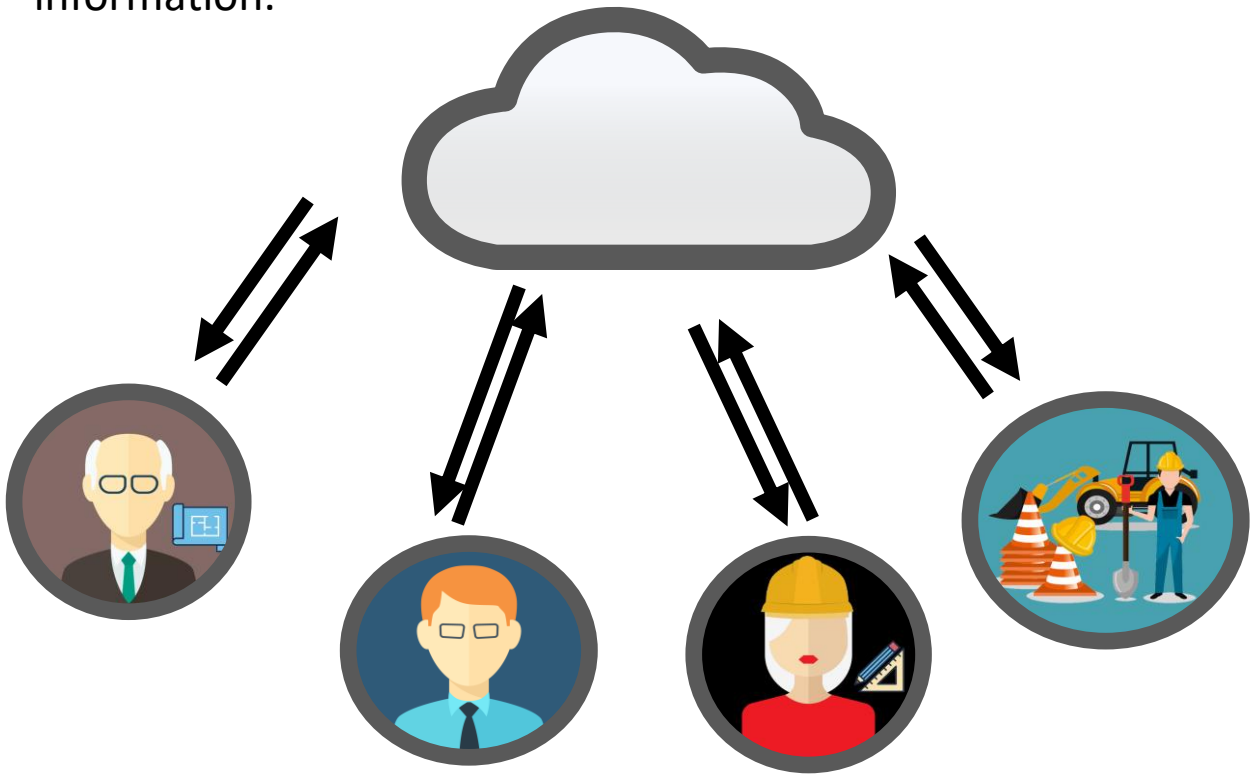
It is designed to simulate the real-life object's behavior in relation to the building structure

Source: https://blog.italcementi.it/it/bim-e-cemento-il-punto-dincontro-tra-fisico-e-digitale

SOFTWARE

Workspace

IFC is considered to be the universal open standard for exchanging BIM information.



Source: Scuola Costruzioni Vicenza Andrea Palladio

To ensure efficient information exchanges, it is good practice to adopt open data formats (Open BIM), which guarantee the electronic exchange of information between the various software available on the market.

On the market there is a plurality of computer programs allowing to design in BIM language.

SOFTWARE

Workspace

CDE: (Common Data Environment) is the space where the info are shared by the parties involved on a BIM project.
Could be a cloud or an online server.

FILES FORMAT

Proprietary Closed	Proprietary Open	IFC
Any file format for which the complete technical specifications are not freely available	Any file format that is published and free to be used by everybody	IFC is a standardized, digital description of the built asset industry. It is an open, international standard (ISO 16739-1:2018) and promotes vendor-neutral, or agnostic, and usable capabilities across a wide range of hardware devices, software platforms, and interfaces for many different use cases.

Source: https://www.buildingsmart.org/standards/bsi-standards/industry-foundation-classes/

SOFTWARES

Softwares

Autodesk Revit
Graphisoft Archicad
ACCA Edificius
Allplan Architecture
Trimble Tekla Structures
Autodesk Civil 3D
Bricsys BricsCAD BIM
Nemetschek Vectorworks 2021

There are many softwares on the market. Which one to use depends on the type of project and the type of definition you want to obtain.

GRAPHISOFT Archicad®

Source: Scuola Costruzioni Vicenza Andrea Palladio

LIBRARY

DEFINITION OF LOD IN BIM

The term LOD is an acronym that has two different meanings, depending on whether you consider its English or American definition

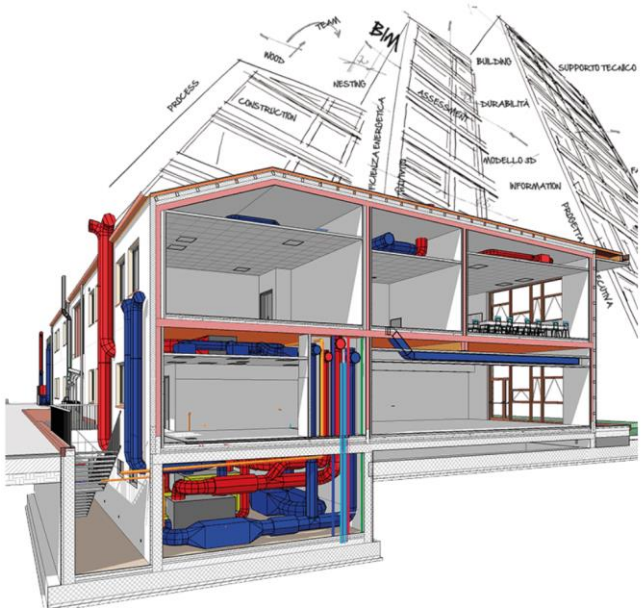
- For the English LOD indicates the “Level of Definition”.
- For Americans, it is the “Level of Development”
- We can refer to the ”D” as well as “Level of Details”

Source: https://biblus.accasoftware.com/en/what-are-lod-and-loin-in-bim-and-what-are-they-for/

LIBRARY

Library and LOD

LOD Level of Definition/Development but also Detail depends on:



Many producers of materials or finished products implement their own price lists and catalogues that can be exported into the BIM format.

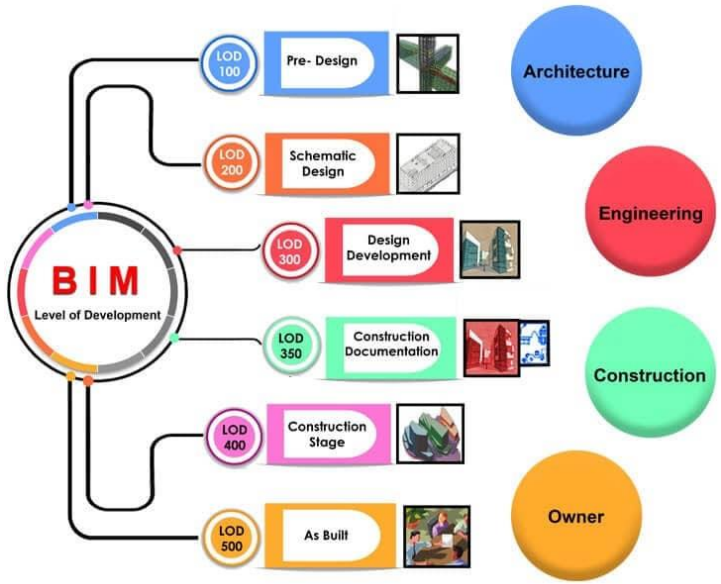
This becomes a real library that further facilitates BIM design.

Source: https://www.xlamdolomiti.it/news/scarica-gratis-le-nuove-librerie-revit-di-xlam-dolomiti

LIBRARY

Level of Definition/Development (LOD)

The use of the LOD depends on the request for expression of the project.



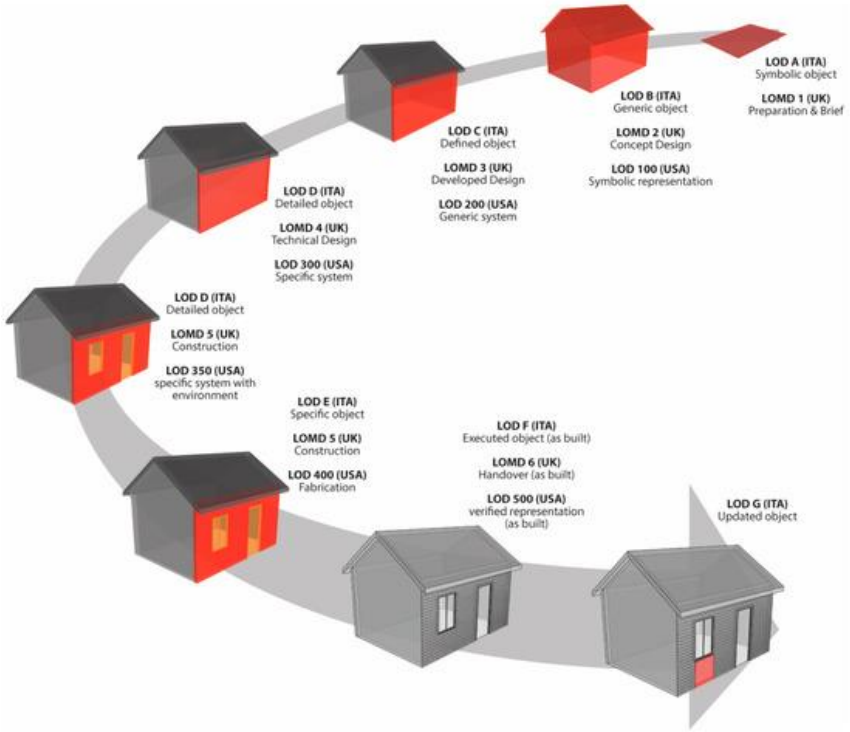
The quantity and quality of the information content of the objects that make up the digital BIM models are defined as LODs or levels of definition/ development.

Each element of the model must be a verified representation in terms of size, shape, position, quantity and orientation of the actual installation and placement in the project.

Source: https://www.srinsofttech.com/bim-level-of-development-lod-300-400-500.html

LIBRARY

Level of Definition/Development/Detail (LOD)



https://www.mdpi.com/2571-9408/2/3/141?type=check_update&version=1

The definition/development of LOD depends on the standard applied:

ISO 19650
PAS 1192-2
UNI 11337

American standards? UK standards? Italian standards?

LIBRARY

Level of Definition/Development/Detail (LOD)

Level of “D” contained in the represented element

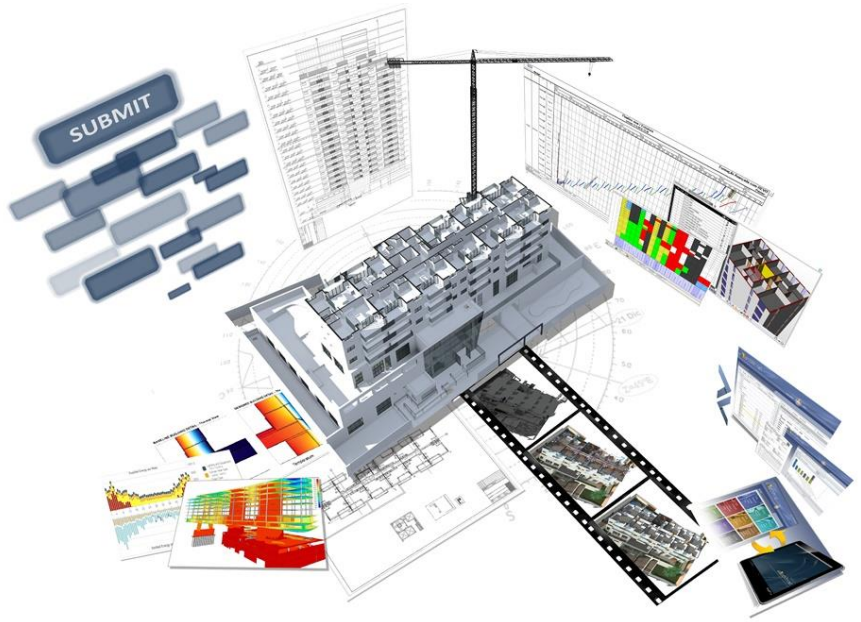
The level of detail/definition or development of an object must be considered as the set of all information of a geometric and non-geometric type (normative, economic, etc.) that can be represented in graphic form (2D and 3D) and in alphanumeric form in order to give rise to a more correct evaluation of information contents such as time (4D), costs (5D), sustainability (6D) and management (7D).

Source: https://www.infobuild.it/approfondimenti/bim-rivoluzione-digitale-edilizia-building-information-modeling/#Ambiente-di-condivisione-dei-dati-ACDat-o-CDE

3D MODELING BASIC TOOL

Project outcome

Using modelling and simulation tools in the architectural project allows to evaluate the performance outcomes.



The designer has several modelling tools that formulate results according to the choices made in terms of performance.
The models represent the object in a realistic way from various points of view such as: geometric, thermal, resistance and evaluate its behavior with respect to a given manifestation (for example, acoustics) using mathematical relationships.
Modelling means predicting the future state of a phenomenon, describing its probable evolution, to understand it and give it an interpretation.
Precise input data is required to obtain output data that can then be processed according to the complexity and visualization needs

Source: https://www.teknoring.com/news/building-information-modeling/gli-strumenti-di-modellazione-e-simulazione-nel-progetto-di-architettura/

BIM INTEGRATED WITH AR

Augmented Reality

The use of digital applications allows to connect augmented reality applications.

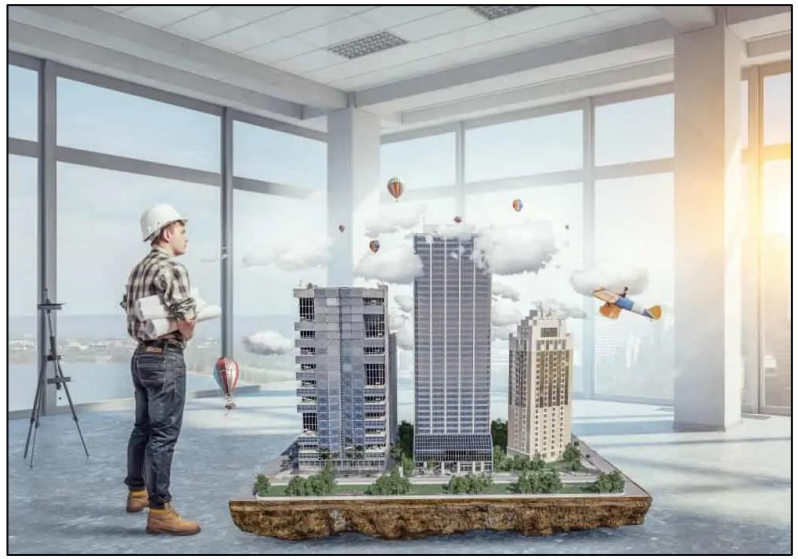
Hardware and Software may be fully integrated to AR remote communication wearable solution allowing remote users to live the situation on-site as if they were present and on-site workers to receive support while staying focused on their job with an all-in-one “hands-free” solution.

Source: https://kiber.tech/?gclid=CjwKCAjw9qiTBhBbEiwAp-GE0aXmfELySxwFaDZe2WaY1UBTEuYYa61F7au82cDcIPKiJMGvZgoy6xoCP08QAvD_BwE

BIM INTEGRATED WITH AR

Augmented Reality

Using BIM models in combination with Augmented Reality enables interesting use cases for BIM managers and architects.



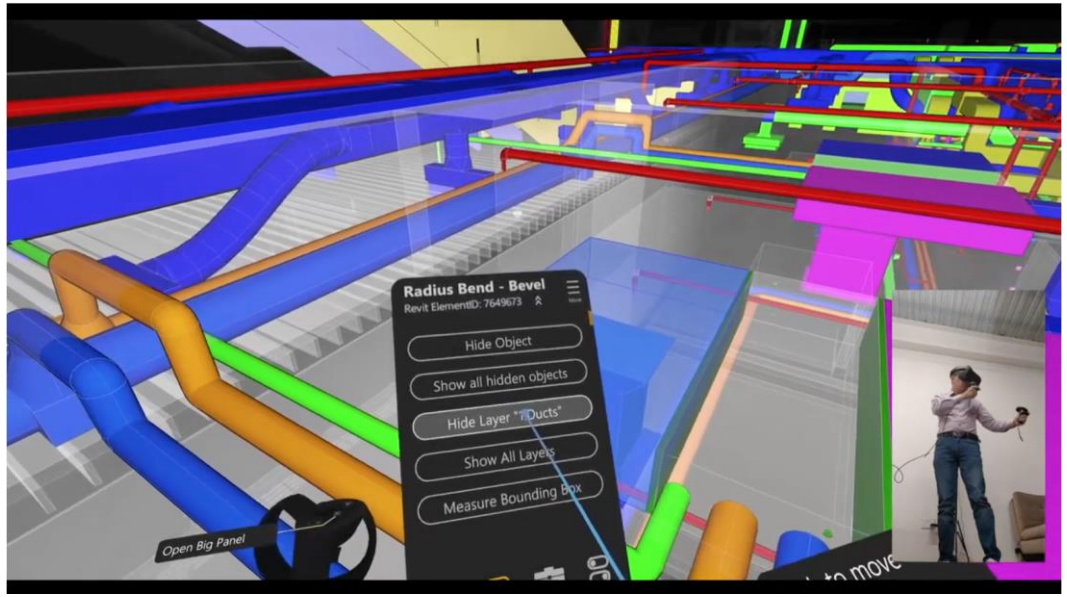
- Visualizing an entire project/building before it is even built, in its future location
- Selectively visualizing specific layers of the BIM model, over an existing building or over a 3D model, for example the water or the electrical system
- Early identification and correction of structural problems like pipeline clashes

Sourcehttps://www.inglobetechnologies.com/getting-started-augmented-reality-bim-manager/

BIM INTEGRATED WITH AR

Augmented Reality

Technology transporting computer-generated objects into the real physical environment, through the use of applications or software, headsets, viewers and other intelligent devices.



Augmented Reality allows to view virtual elements in the real environment.
It offers many advantages for designers, companies and clients operating in the construction and BIM sectors.

Sourcehttps://www.youtube.com/watch?v=9cla8-Cyysc

BIM INTEGRATED WITH AR

Augmented Reality vs Virtual Reality

They are often confused for their ability to create a sort of "bridge" between the physical world and the digital world, but there are many elements of difference.

Source https://bim.acca.it/realta-aumentata-nelle-costruzioni-bim/

BIM INTEGRATED WITH AR

AUGMENTED REALITY

Augmented Reality amplifies the real world with the overlay of digital content.

In short, augmented reality starts from our reality and adds something to it.

It does not "teleport" elsewhere, it simply adds content and information to a place or object.

Source https://bim.acca.it/realta-aumentata-nelle-costruzioni-bim/

BIM INTEGRATED WITH AR

VIRTUAL REALITY

Virtual Reality recreates a digital environment that completely replaces the real world.

When we talk about VR we mean a technology capable of transporting us to a reality different from the one we live in, thanks to the use of particular devices such as viewers and controllers.

Source https://bim.acca.it/realta-aumentata-nelle-costruzioni-bim/

References

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