

Digital Construction Standardization and the Italian Paradigm

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BIO

Senior BIM Advisor

Innovation and Service Excellence Award 2019

Task Group Leader –

European Standardization Committee

on Building Information Modelling TC 442

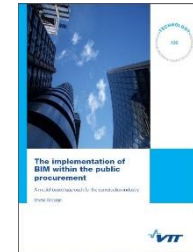
Assistant Editor – **BIM Dictionary** –

BIM Excellence Initiative

Best Woman 2017

Italian National Council of Engineers (CNI)

2013 Master Thesis on BIM in Public Procurement



WHY DIGITIZATION (IN THE CONSTRUCTION INDUSTRY)?



Source: web

WHY DIGITIZATION (IN THE CONSTRUCTION INDUSTRY)?

Alexa's listening. Say something intelligent.

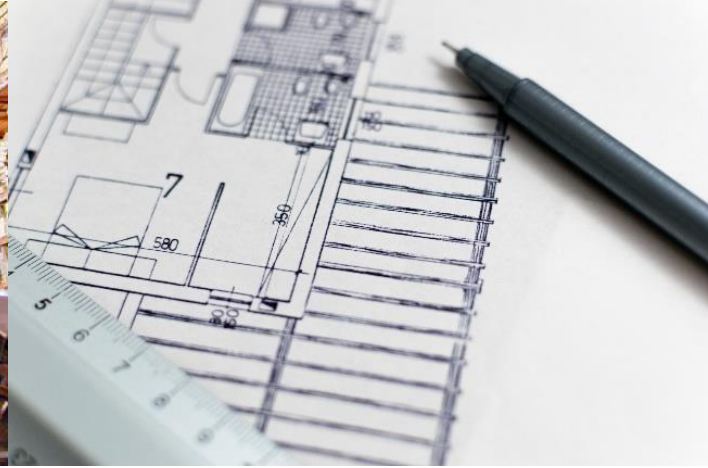
The
Economist

Siri's listening. Say something intelligent.

The
Economist

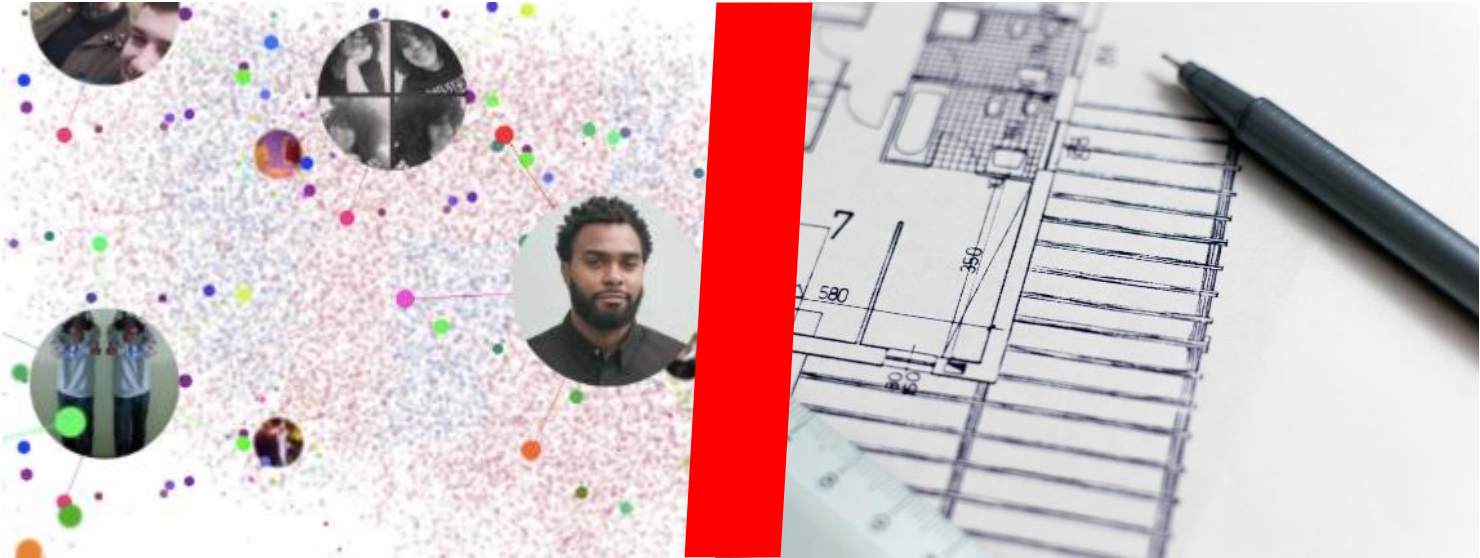
Source: The Economist

WHY DIGITIZATION IN THE CONSTRUCTION INDUSTRY?



Source: web

WHY DIGITIZATION IN THE CONSTRUCTION INDUSTRY?



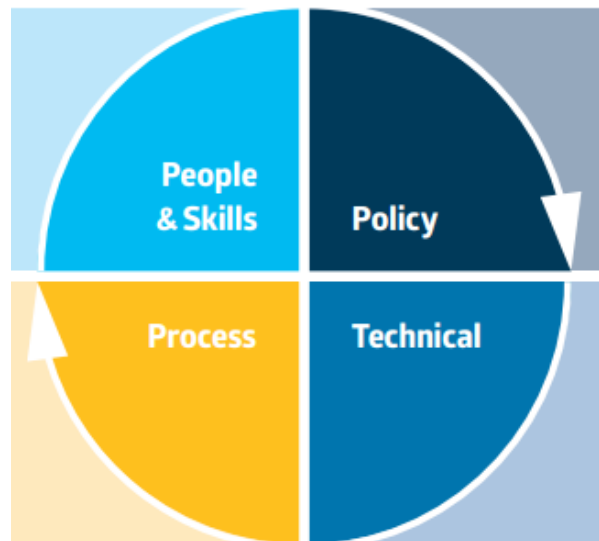
Source: web

CONSTRUCTION INDUSTRY



Source: Modernise or die

DIGITAL CONSTRUCTION



Source: EU BIM Task Group

ROLE OF STANDARDIZATION

Standardization is essential to progress.



EDUCATION IS KEY

An International example:



MSc Digital Engineering Management

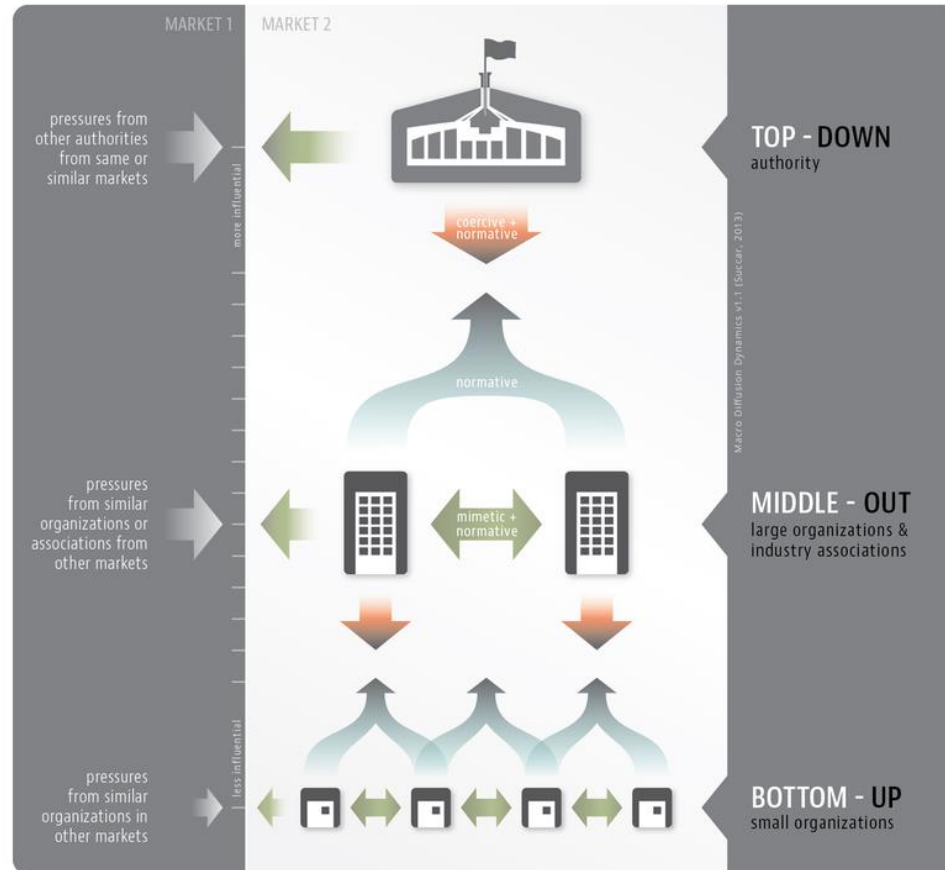


THE ITALIAN PARADIGM

Where to start?



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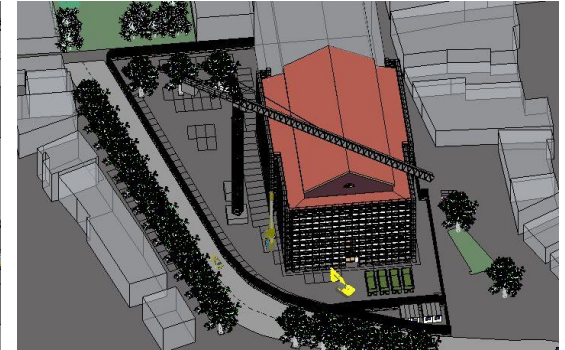
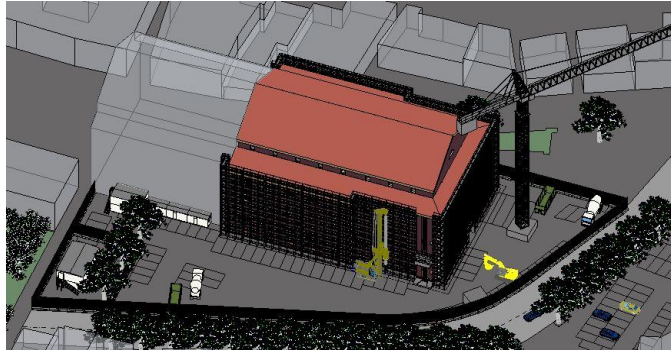
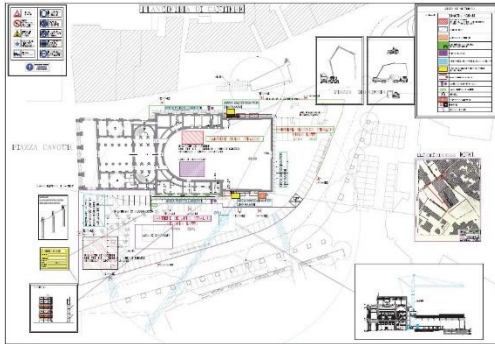


THE ITALIAN PARADIGM

1) **Research** and **Training** activities in Italian Universities (starting 2006)



Example:



Source: Galli Theatre 2013

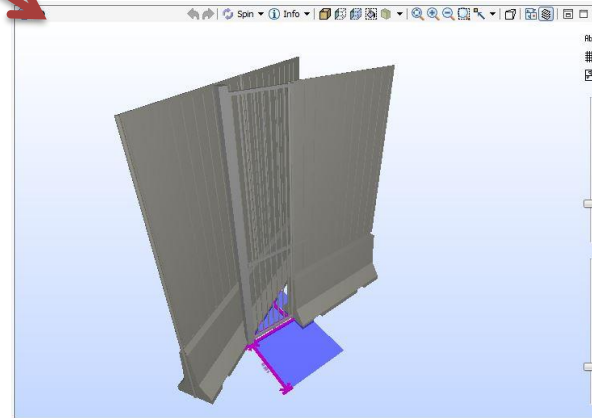
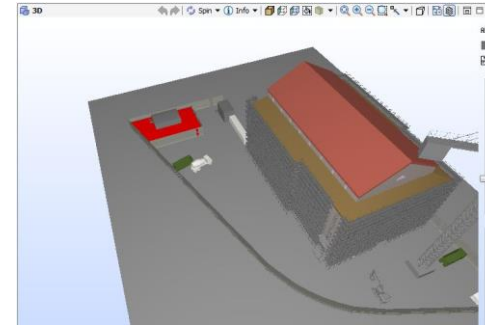
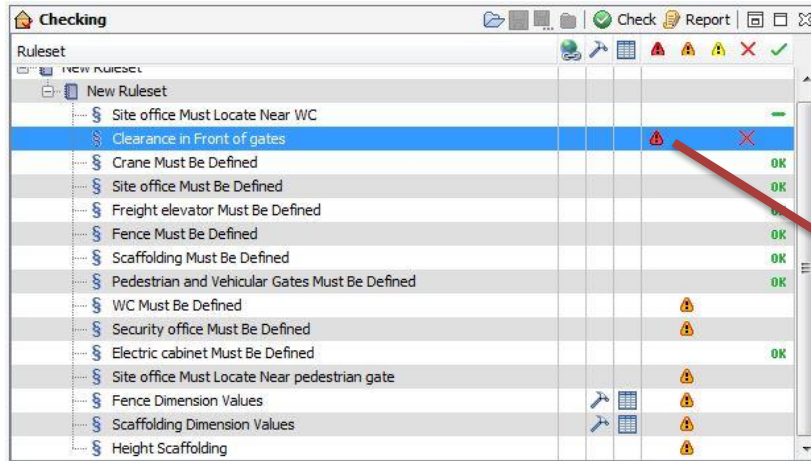


UNIVERSITY
OF BRESCIA

THE ITALIAN PARADIGM

1) Research and Training activities in Italian Universities

Example:

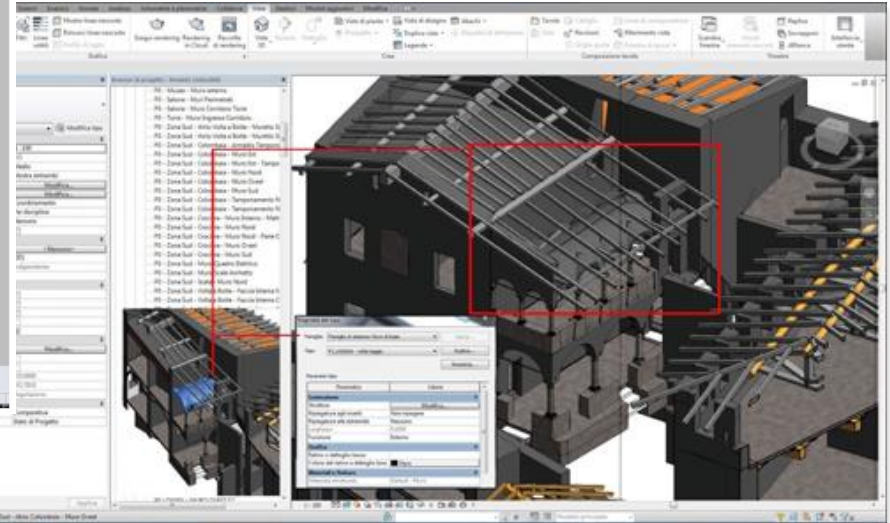
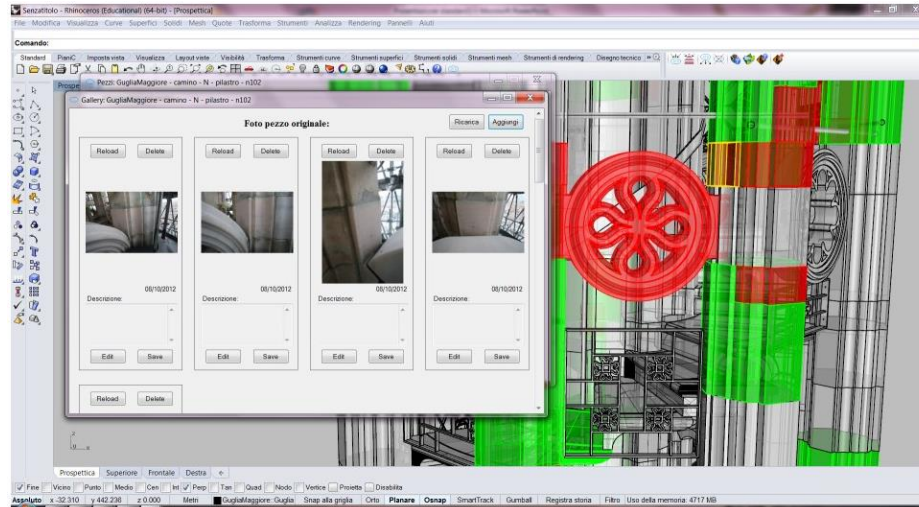


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1) Research and Training activities in Italian Universities

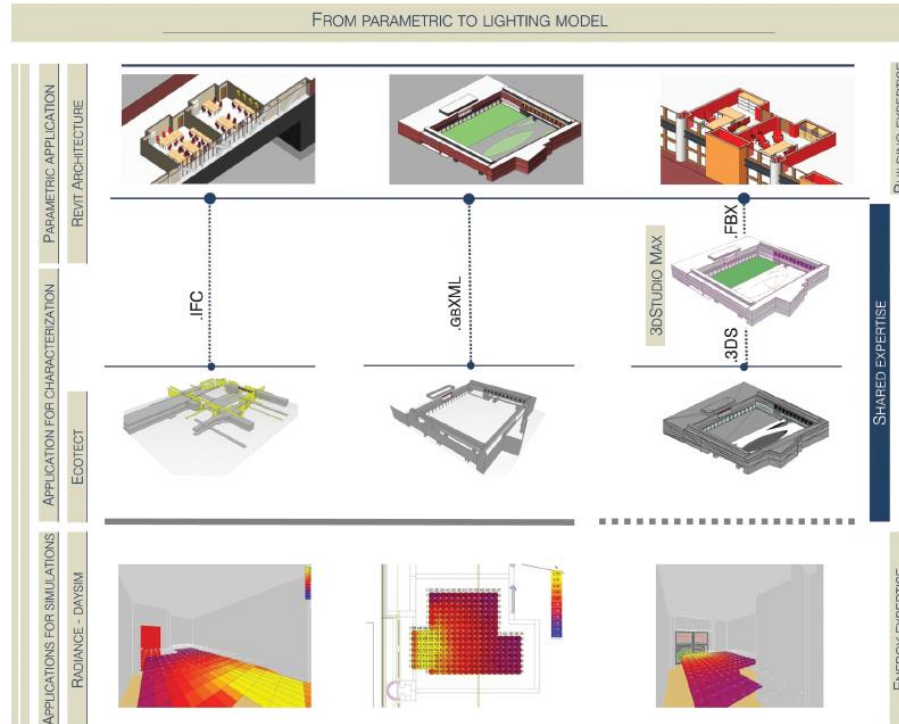
Example:



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1) Research and Training activities in Italian Universities

Example:



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2) Software-house or dealers provide **tools**

Examples:



HARPACEAS
the BIM expert

TeamSystem

ACCA
ACCA SOFTWARE

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3) **Associations** to support the technical implementation and promoting open solutions



One of the 20 Chapters of buildingSMART International



2017

15 companies

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4) Increasing use of **BIM tools** by **contractors** and **design firms**

Example:

BIM User Group Italia



50+ professionals



Source: BIM Portale

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5) Legislative Decree 50/2016 –

Adoption of European Directives 2014/23/UE, 2014/24/UE and 2014/25/UE



Art 23(13) of D.lgs. 50/2016

includes the possibility of requiring BIM methodology in Public Procurement

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6) 2016-2017 Creation of Governmental task Group on BIM Italian BIM Mandate (2017)



Governo Italiano

Ministero delle Infrastrutture e dei Trasporti

HOME MINISTERO TEMI COME FARE PER COMUNICAZIONE AMMINISTRAZIONE TRASPARENTE

Home > Ricerca Normativa > Decreto Ministeriale numero 560 del 01/12/2017

Decreto Ministeriale numero 560 del 01/12/2017

Descrizione breve

Adottato il decreto 1 dicembre 2017, n. 560 che stabilisce le modalità e i tempi di progressiva introduzione dei metodi e degli strumenti elettronici di modellazione per l'edilizia e le infrastrutture

In attuazione dell'articolo 23, comma 13, del decreto legislativo 18 aprile 2016, n. 50, "Codice dei contratti pubblici", il Ministro delle Infrastrutture e dei Trasporti ha adottato il decreto n. 560 del 1 dicembre 2017 che definisce le modalità e i tempi di progressiva introduzione, da parte delle stazioni appaltanti, delle amministrazioni concedenti e degli operatori economici, dell'obbligatorietà dei metodi e degli strumenti elettronici specifici, quali quelli di modellazione per l'edilizia e le infrastrutture, nelle fasi di progettazione, costruzione e gestione delle opere e relative verifiche.

Il decreto entra in vigore decorsi quindici giorni dalla data di pubblicazione su questo sito.

CORTE DEI CONTI

MINISTRO DELL'INFRASTRUTTURE E DEI TRASPORTI

Il Ministro delle Infrastrutture e dei Trasporti

VISTO il decreto legislativo 18 aprile 2016, n. 50, e successive modificazioni, recante: "Codice dei contratti pubblici" ed in particolare l'articolo 23;

VISTO il comma 13, del citato articolo 23 del codice dei contratti pubblici, che, nel prevedere che le stazioni appaltanti possono richiedere per le nuove opere nonché per interventi di recupero, riqualificazione o varianti, prioritariamente per i lavori complessi, l'uso dei metodi e strumenti elettronici specifici quali quelli di modellazione per l'edilizia e le infrastrutture, dispone, altresì, che con decreto del Ministro delle Infrastrutture e dei Trasporti, da adottare entro il 31 luglio 2016, anche avvalendosi di una Commissione appositamente istituita presso il medesimo Ministero, senza oneri aggiuntivi a carico della finanza pubblica sono definiti le modalità e i tempi di progressiva introduzione dell'obbligatorietà dei suddetti metodi presso le stazioni appaltanti, le amministrazioni concedenti e gli operatori economici, valutata in relazione alla tipologia delle opere da affidare e della strategia di digitalizzazione delle amministrazioni pubbliche e del settore delle costruzioni;

VISTO il decreto legislativo 7 marzo 2005, n. 82, recante il codice dell'amministrazione digitale;

VISTO il decreto del Ministro delle Infrastrutture e dei Trasporti del 15 luglio 2016 n. 242, con il quale è stata istituita la Commissione con il compito di individuare le modalità e i tempi di progressiva introduzione dell'obbligatorietà, presso le stazioni appaltanti, le amministrazioni concedenti e gli operatori economici, dei metodi e strumenti elettronici specifici, quali quelli di modellazione per l'edilizia e le infrastrutture, valutata in relazione alla tipologia delle opere da affidare e della strategia di digitalizzazione delle amministrazioni pubbliche e del settore delle costruzioni;

VISTO il decreto del Ministro delle Infrastrutture e dei Trasporti del 31 agosto 2016 n. 297, con il quale la predetta Commissione è stata integrata con la partecipazione alla medesima di un rappresentante della rete nazionale delle professioni dell'area tecnico-scientifica;

VISTA la proposta della Commissione sottoposta a consultazione pubblica;

VISTI gli esiti della consultazione pubblica;

VISTA la proposta della Commissione del 17 settembre 2017, a seguito della consultazione pubblica;

VISTA la nota del Dipartimento per le Infrastrutture e i Sistemi Informativi e Statistici n.11719 del 19 ottobre 2017;

VISTA la nota dell'Ufficio Legislativo n.40694 del 25 ottobre 2017;

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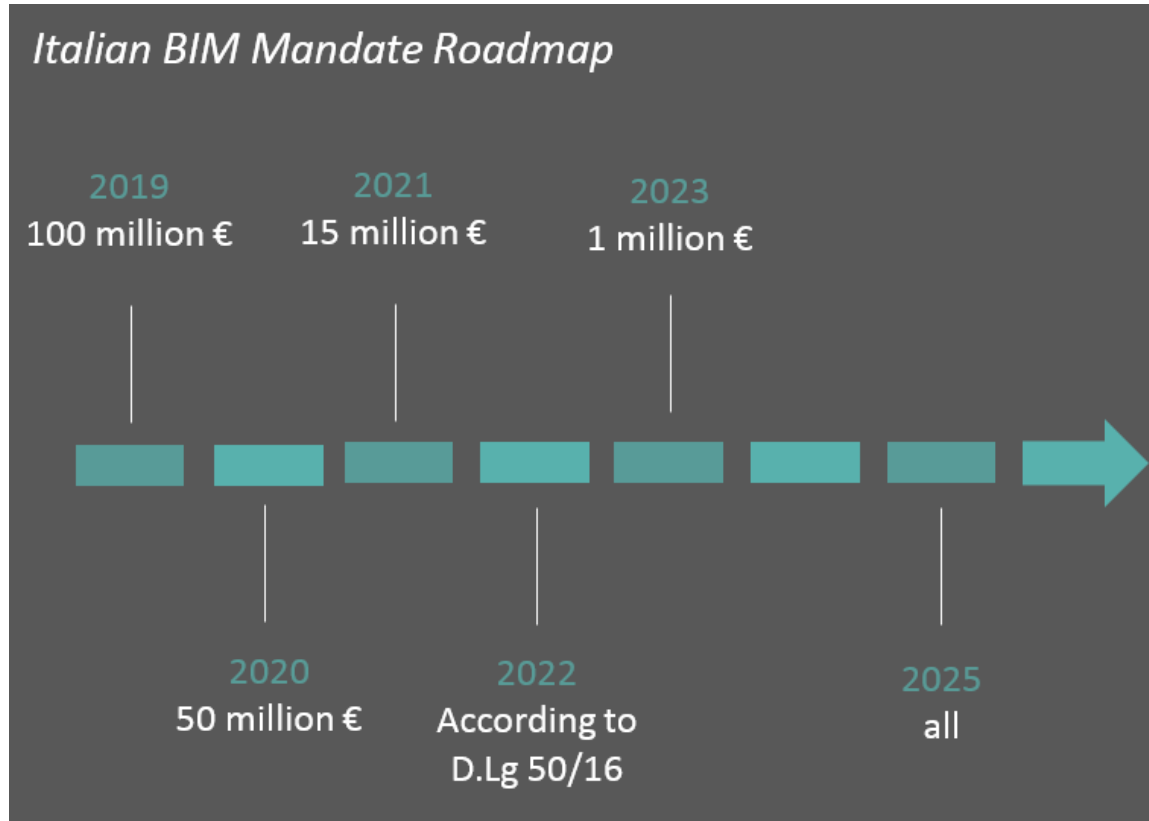
Keypoints

- *Introduction*
- *Aims*
- *Definition*
- *Preparatory Compliance*
- *Interoperability*
- *Optional use of tools and methods*
- *Timeline*
- *EIR*
- *Monitoring Committee*
- *Become Law*



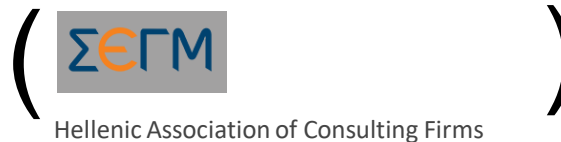
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Italian BIM Mandate (2017)



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BIM in Public Tenders



2015
5 tenders

2016
26 tenders



2017
86 tenders



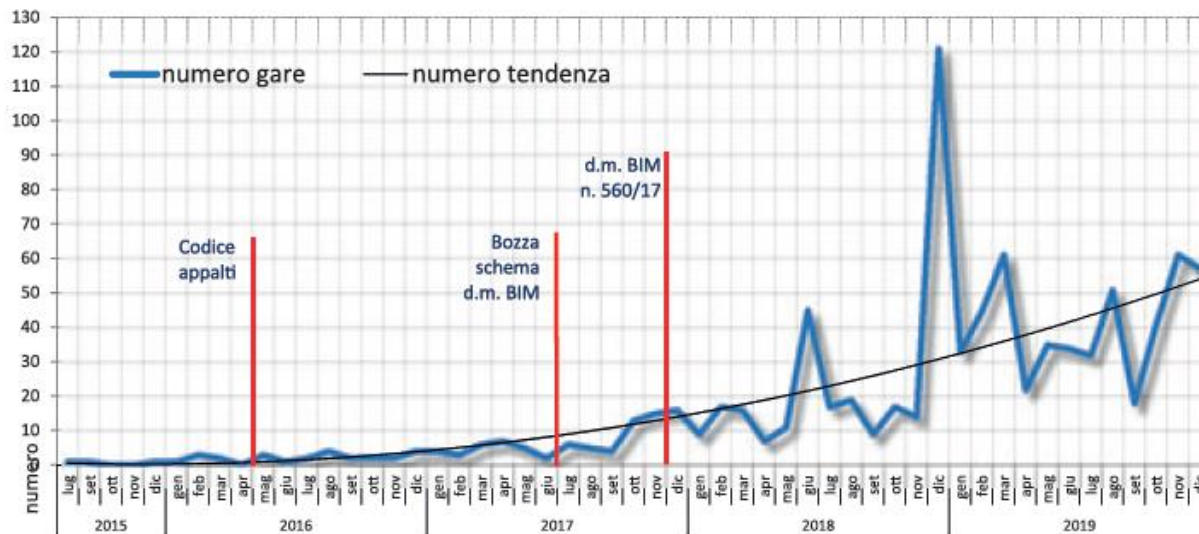
2018
268 tenders



2019
478 tenders

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BIM in Public Tenders



Fonte: indagine OICE sul BIM 2019

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Pietro Baratono
Angelo Ciribini

Source: EU BIM Task Group

BIM& LEGAL IMPLICATIONS

The collaborative and transparent nature of BIM decreases the number of claims leading to disputes and potential litigation

(Eastman *et al.*, 2011)

The legal implications of BIM are considered a barrier against its implementation



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INTERNATIONAL



International
Organization for
Standardization



EUROPEAN



European
Committee for
Standardization



NATIONAL



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7) Publication of **Italian BIM Standards** (from 2009)



UNI 11337

part 1

Models, documentation and objects

part 2

Denomination and classification

part 3

LOI for construction products

part 4

LOD

part 5

Informative flows

part 6

Example of EIR

part 7

Roles, skills

part 8

Project Management and Information Management

part 9

Building Book

THE ITALIAN PARADIGM



UNI 11337-4:2017

Page 23

Table C.6 Example LOD for door

LOD A	LOD B	LOD C	LOD D	LOD E	LOD F	LOD G
Geometry Architectural element represented by a 2D symbol.	Geometry Geometric representation of the vertical architectural hole with approximate shape, size and position.	Geometry Vertical architectural element with correct shape, size and position.	Geometry Vertical architectural element with real shape and size, and correct position. It represents all the physical elements that make up the fixture and accessory components.	Geometry Vertical architectural element with real shape and size, and correct position. It represents all the physical elements that make up the fixture and accessory components.	Geometry Mounted brand-specific door fixture. As in LOD E (as-built survey).	Geometry Door fixture. New work: as in LOD E (with updates). Maintenance and management on existent elements: as in LOD C or D (starting from).
Object 2D graphic	Object Hole in a 3D solid	Object Composite 3D solid	Object Complex 3D solids	Object Complex 3D solids	Object Door fixture	Object Door fixture
Characteristics - Approximate positioning	Characteristics - Simple outline geometries - Dimensions - Thermal and acoustic requirement definition - Material definitions	Characteristics - Number of window leaves - Opening type - Acoustic transmission design performance - Thermal insulation design performance - Component definition	Characteristics - Accessory components - Shutter type - Finishes - Constructional details - Component details, without reference to individual products	Characteristics - Acoustic transmission with the effective value declared by the supplier for the future - Effective thermal insulation value declared by the supplier - Supplier's mounting sheet - Substrate material - Technical data sheets	Characteristics - Maintenance manual Classification (UNI 8290, CSI, etc.) - Product certification - Approval certificate	Characteristics - Maintenance manual Classification (UNI 8290, CSI, etc.) - Product certification - Approval certificate

UNI 11337-4:2017

Table C.13 Example LOD for in situ concrete columns

LOD A	LOD B	LOD C	LOD D	LOD E	LOD F	LOD G
Geometry Vertical or pseudo-vertical linear structural element represented by a 2D symbol.	Geometry Vertical or pseudo-vertical linear structural element represented by a sketched axonoid solid	Geometry Vertical or pseudo-vertical linear structural element represented by a solid with dimensions calculated according to the technical standards.	Geometry Vertical or pseudo-vertical linear structural element represented by a solid with dimensions equal to the real dimensions. It models all the reinforcements in their correct positions.	Geometry Vertical or pseudo-vertical linear structural element represented by a solid with dimensions equal to the real dimensions. It includes all the reinforcements in their correct positions, material supplier-specific data, the reinforcement management.	Geometry As in LOD E (as-built survey).	Geometry New work: as in LOD F (with updates). Maintenance and management on existent elements: as in LOD C or D (starting from).
Object 3D solid	Object Complex 3D solid	Object Complex 3D solid	Object Complex 3D solids	Object Complex 3D solids	Object Complex 3D solids	Object Complex 3D solids
Characteristics - Possible materials - Standard reinforcement incidence	Characteristics - Possible materials - Standard reinforcement incidence	Characteristics - Calculation materials - Calculated reinforcement incidence	Characteristics - 3D reinforcement - Constructional details	Characteristics - Laying management - List of reinforcement - Any reinforcement cage production	Characteristics - Test certificates - Maintenance plan	Characteristics - Maintenance/replacement plan - Maintenance party - Type of work

UNI 11337-4:2017

Table C.8 Example LOD for spaces

LOD A	LOD B	LOD C	LOD D	LOD E	LOD F	LOD G
Geometry 2D outline.	Geometry Approximate volumes.	Geometry Representation of the volume environment with the finishes identified.	Geometry Representation of the volume environment with the horizontal and vertical finish thicknesses identified.	Geometry Representation of the volume environment with the horizontal and vertical finish system, sub-system and specific components represented with real brand-specific thicknesses.	Geometry Finished opening. New work: as in LOD E (as-built survey).	Geometry Finished opening. New work: as in LOD F (with updates). Maintenance and management on existent elements: as in LOD C or D (starting from).
Object Lines	Object 3D volume	Object 3D volume with finishes	Object 3D volume with finish stratigraphy	Object 3D volume with finish stratigraphy with real thicknesses	Object Finished volume with brand-specific materials	Object Finished volume with materials
Characteristics - Approximate positioning	Characteristics - Opening use/function definition	Characteristics - Finishing material definitions - Finish package thickness - Surface dimensional information	Characteristics - Finish stratigraphy details - Thicknesses of all the finishes - Material details - Ventilation and lighting data - Plant information/types - Location (MBS geographic code)	Characteristics - Support materials and laying information with specification and technical data sheet for brand-specific products and parts	Characteristics - Maintenance manual Classification (UNI 8290, CSI, etc.) - Product certification - Approval certificate	Characteristics - Maintenance date - Installation observed



Source: UNI 11337-4

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INTERNATIONAL



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EUROPEAN



European
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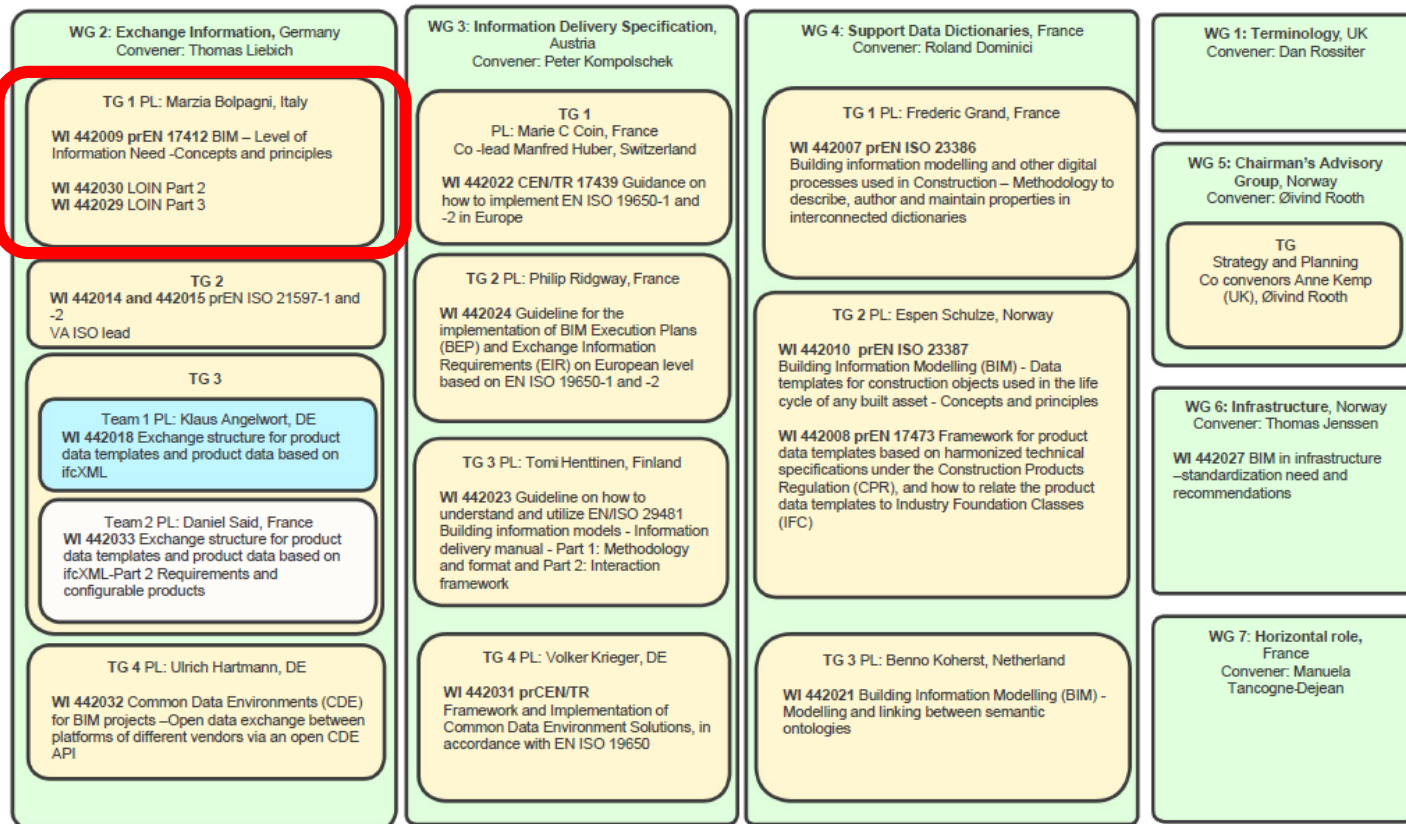


NATIONAL



Structure of CEN/TC 442 – Building Information Modelling - BIM

Chair Øivind Rooth
Secretary Lisbet Landfald



INFORMATION REQUIREMENTS

«I WANT BIM»

«I WANT a BIM format»

«I WANT BIM Level 2»

«I WANT BIM according to PAS1192-2»

«I WANT BIM according to ISO 19650»

«I WANT LOD 300»

INFORMATION REQUIREMENTS

TG 1 Building Information Modelling — Level of Information Need — Part 1: Concepts and principles



WHY | PURPOSE

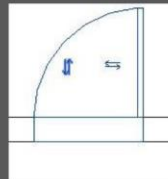
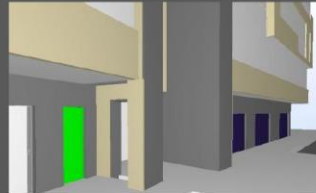


WHAT | LEVEL OF INFORMATION NEED

MODEL USES	MODEL USES
2D Documentation	Constructability Analysis
3D Detailing	Cost Estimation
As-constructed Representation	Egress and Ingress Analysis
Generative Design	Energy Use
Laser Scanning	Finite Element Analysis
Photogrammetry	Fire and Smoke Simulation
Record Keeping	Lighting Analysis
Surveying	Quantity Take-off
Visual Communication	Reflectivity Analysis
	Risk and Hazard Assessment
Conceptualization	Safety Analysis
Construction Planning	Security Analysis
Demolition Planning	Site Analysis
Design Authoring	Solar Analysis
Disaster Planning	Spatial Analysis
Lean Process Analysis	Structural Analysis
Lift Planning	Sustainability Analysis
Operations Planning	Thermal Analysis
Selection and Specification	Virtual Reality Simulation
Space Programming	Whole Life Cycle Analysis
Urban Planning	Wind Studies
Value Analysis	
	3D Printing
Accessibility Analysis	Architectural Modules
Acoustic Analysis	Prefabrication
Augmented Reality Simulation	Casework Prefabrication
Clash Detection	Concrete Precasting
Code Checking & Validation	Construction Logistics
	Mechanical Assemblies
	Prefabrication

Provide the correct **geometry**, **attributes** and associated **documentation** related to a specific purpose and no more

Geometry



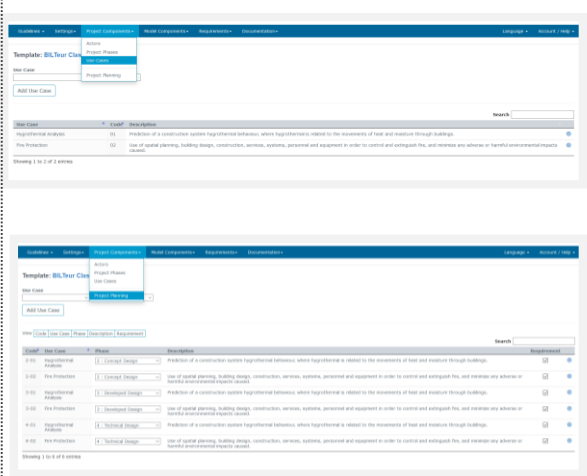
Attributes

Type Properties	
Family:	M_Single-Flush
Type:	0915 x 2134mm
Type Parameters	
Parameter	Value
Construct Use	Exterior
Function	By role
Construction Type	
Materials and Finishes	Door - Panel
Door Material	Door - Frame
Frame Material	
Dimensions	
Thickness	51.0
Height	2134.0
Trim Projection Ext	25.0
Trim Projection Int	25.0
Trim Width	76.0
Width	915.0
Rough Height	
Analytical Properties	
Analytic Construction	<None>
Visual Light Transmittance	
Solar Heat Gain Coefficient	
Thermal Resistance (R)	
Heat Transfer Coefficient (U)	
Identity Data	
Keynote	
Model	
Manufacturer	
Type Image	
URL	
Description	
Assembly Code	
Cost	
Type Mark	15
OmniClass Number	23.30.10.00
OmniClass Title	Doors
Code Name	
IFC Parameters	

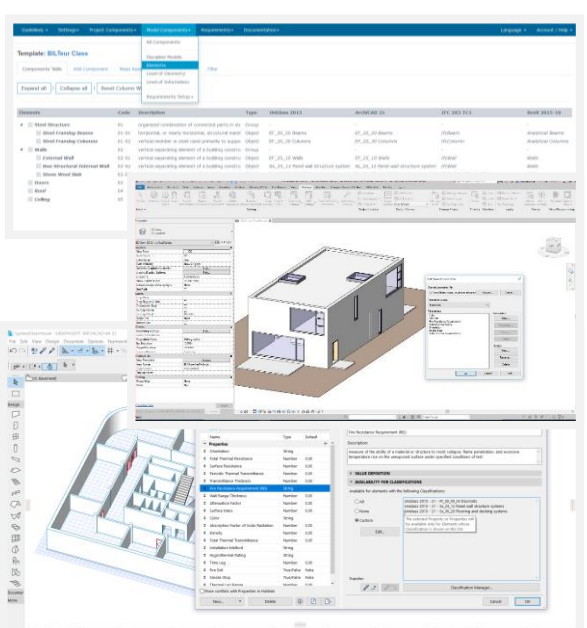
Source: Model Uses | BIM ThinkSpace

Role of Standards

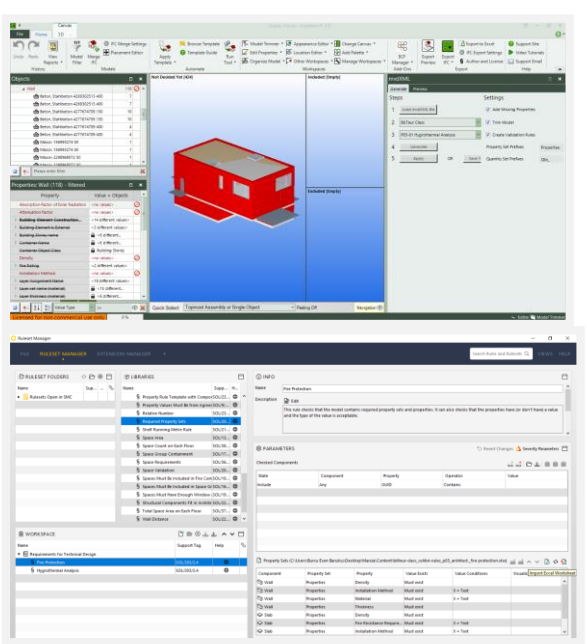
Define requirements



Create information container



Model checking



“Innovation deals with Technology, Process and Policy.

If we apply Technology to wrong Processes and Policies, we are not innovating; we are just facilitating an inefficient (and dangerous) way of working! ”

Dr. Marzia Bolpagni

Senior BIM Advisor



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