BIM4Ren

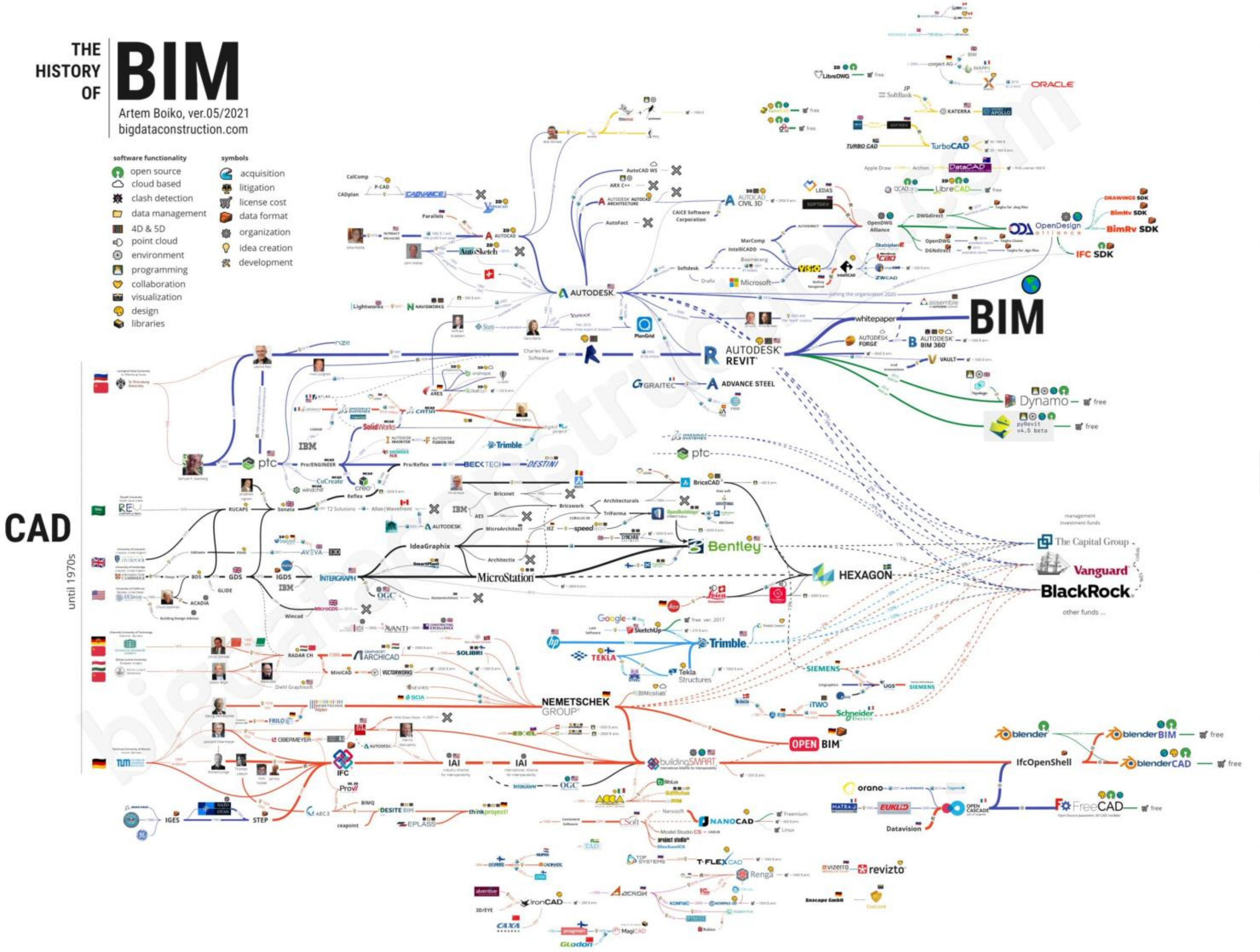
TRAINING

BIM Basics

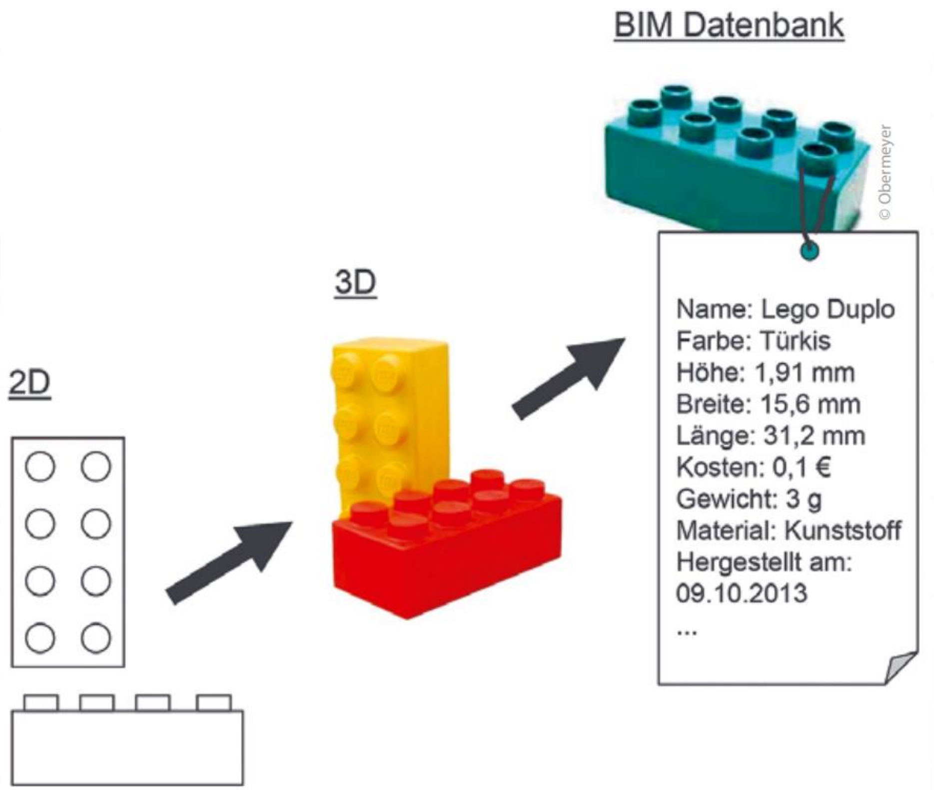
BIM as a way to manage information amongst the collaborators and across the project

This project has received funding from the H2020 programme under Grant Agreement No. 820773

Introduction

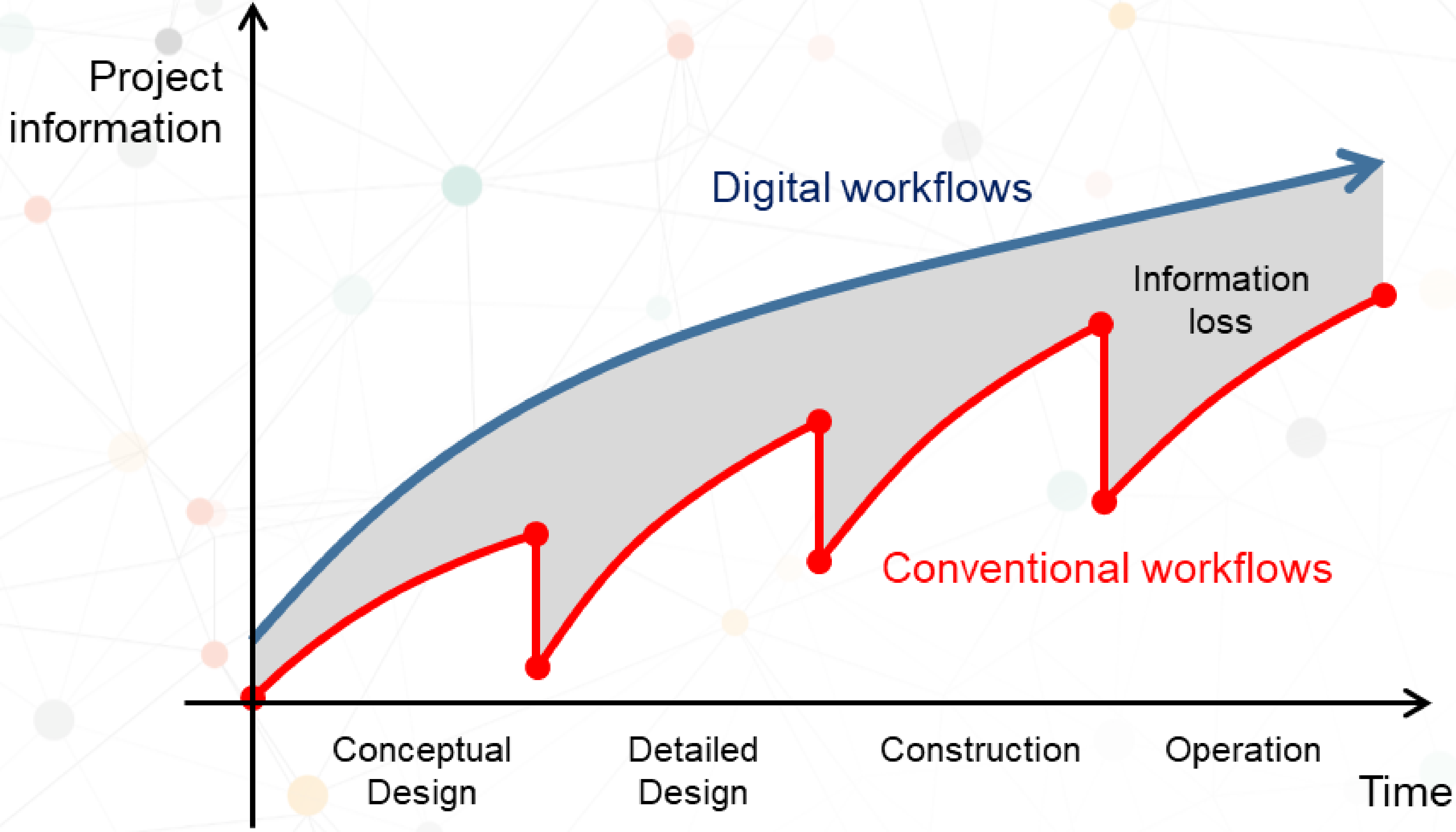


What is BIM?



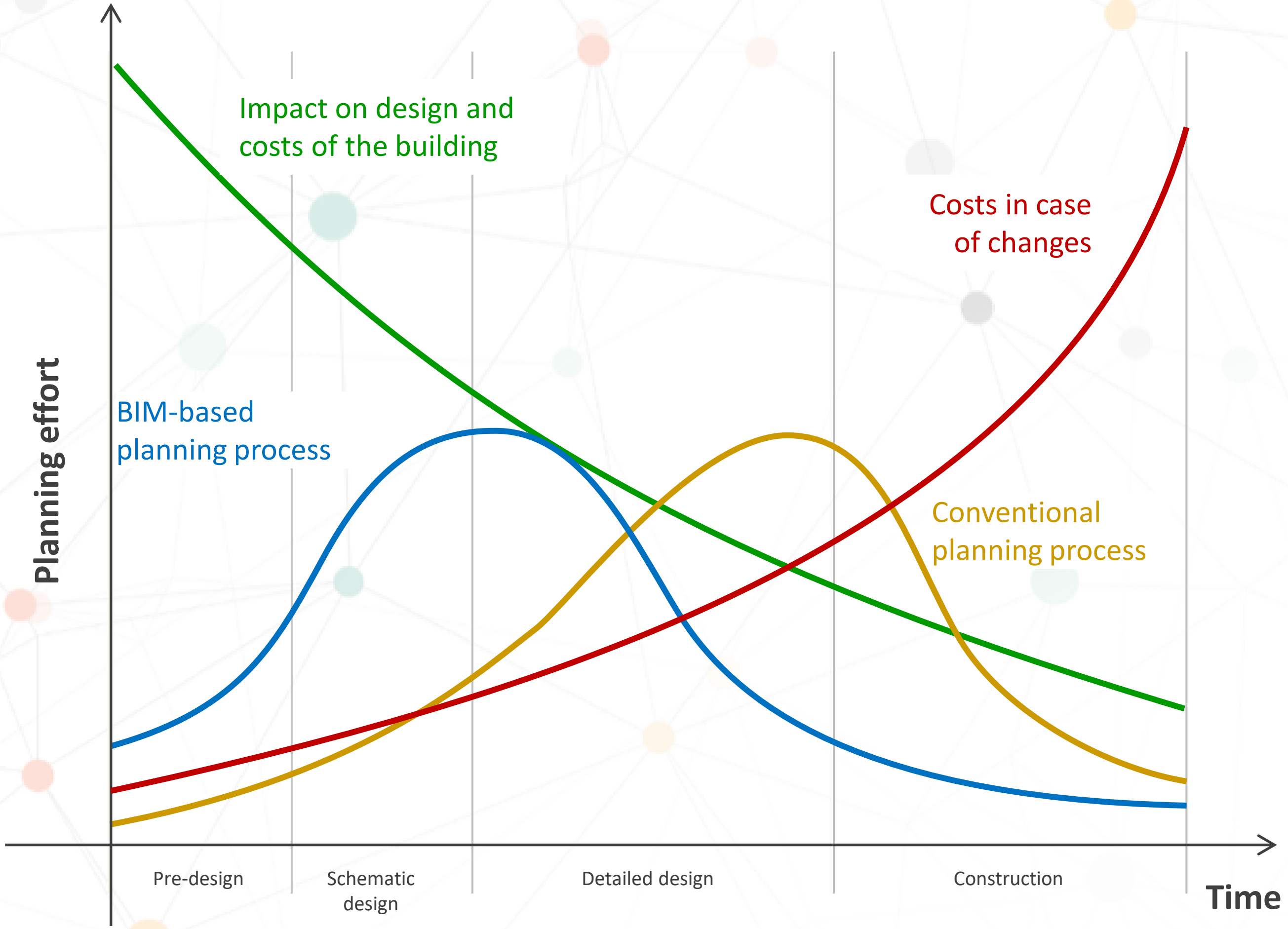
source: [Bock and Michaelis, 2019]

Project- and domain knowledge



source: [Borrmann, König, Koch, Beetz, 2018]

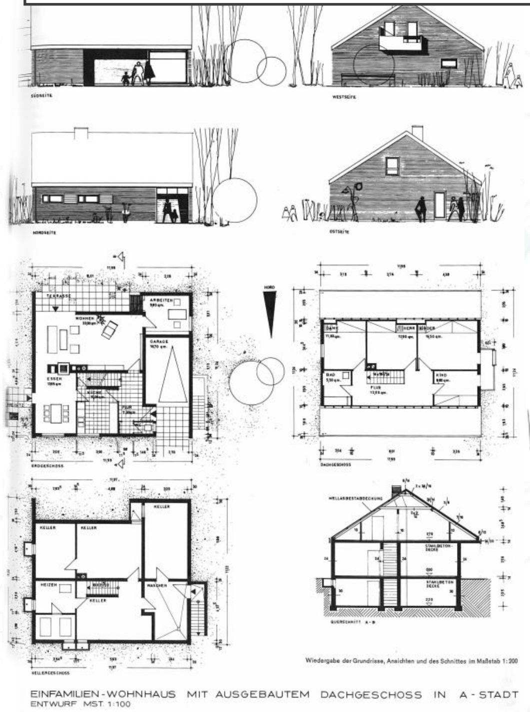
Planning effort and „Frontloading“

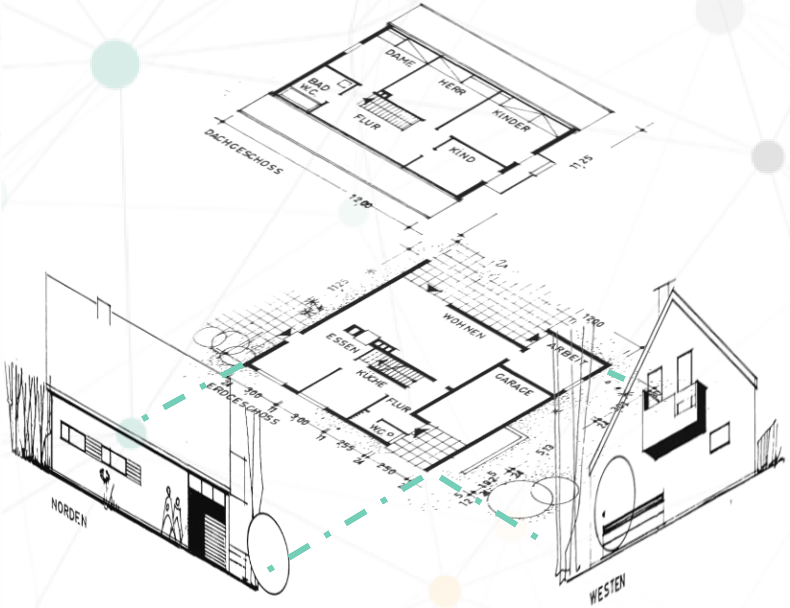


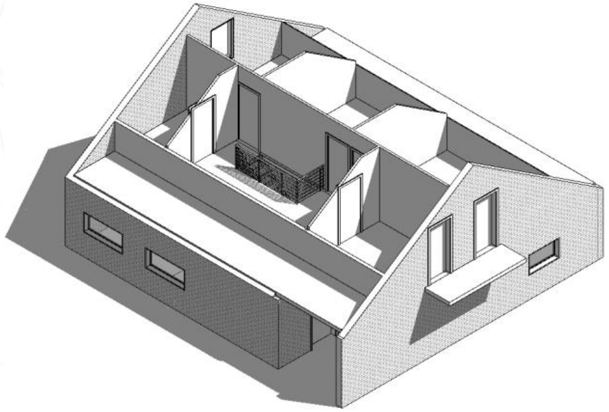

Design
Spatial allocation
Variant Design
Conceptional Design
Planning
Cross-domain coodrination
Cost estimation
Simulations, Calculations
Construction
4D Simulation
Construction site logicstics
Accounting
Operation
Facility Management, Maintenance
Refurbishment
Demolition
Recycling
Revitalization
Building Information Model

CAD vs BIM

Traditional Process

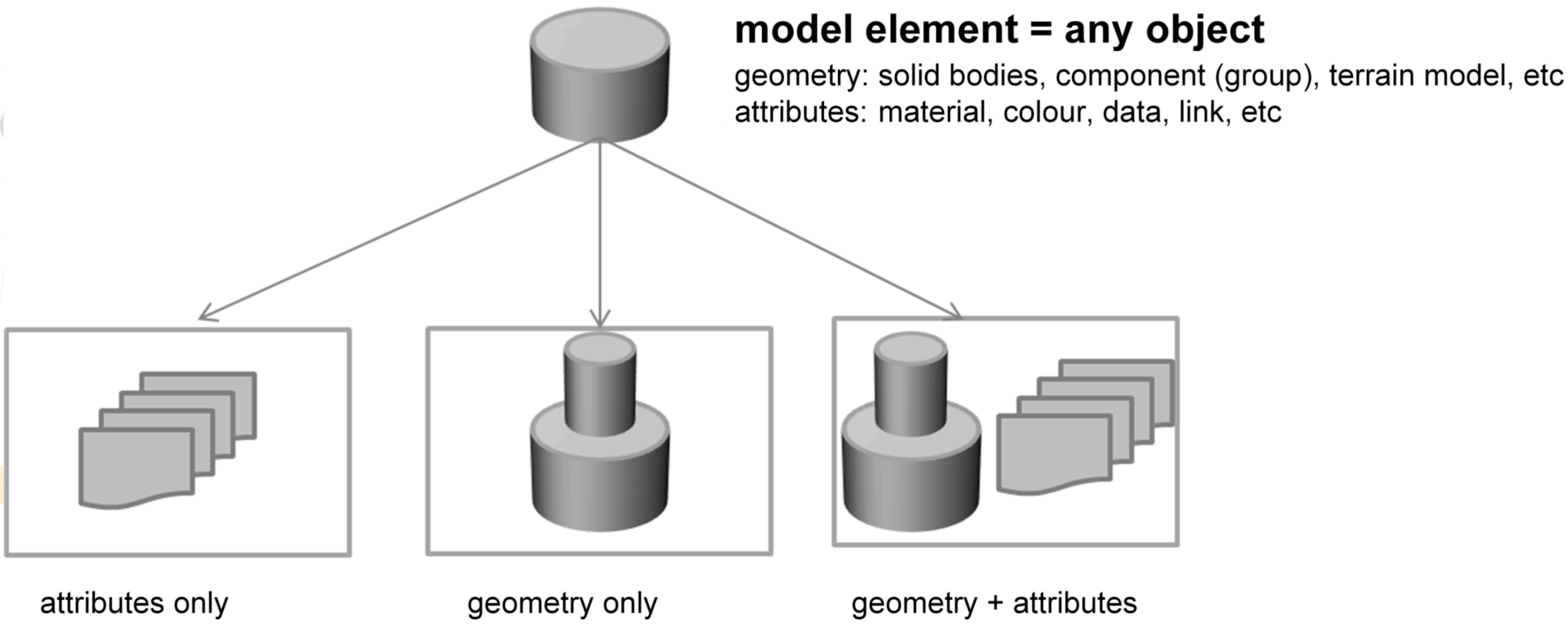






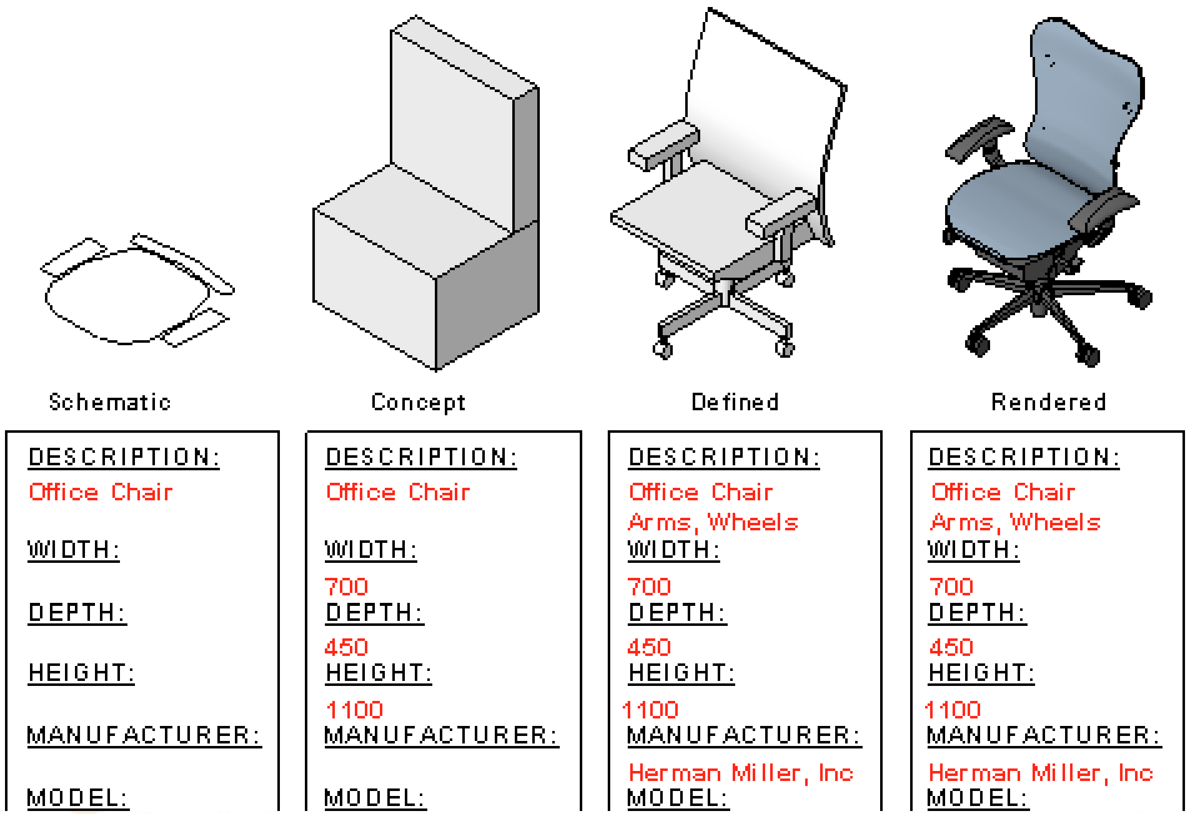
3D / BIM Process

3D vs BIM


model element = any object
geometry: solid bodies, component (group), terrain model, etc
attributes: material, colour, data, link, etc
attributes only
geometry only
geometry + attributes

Level of Development

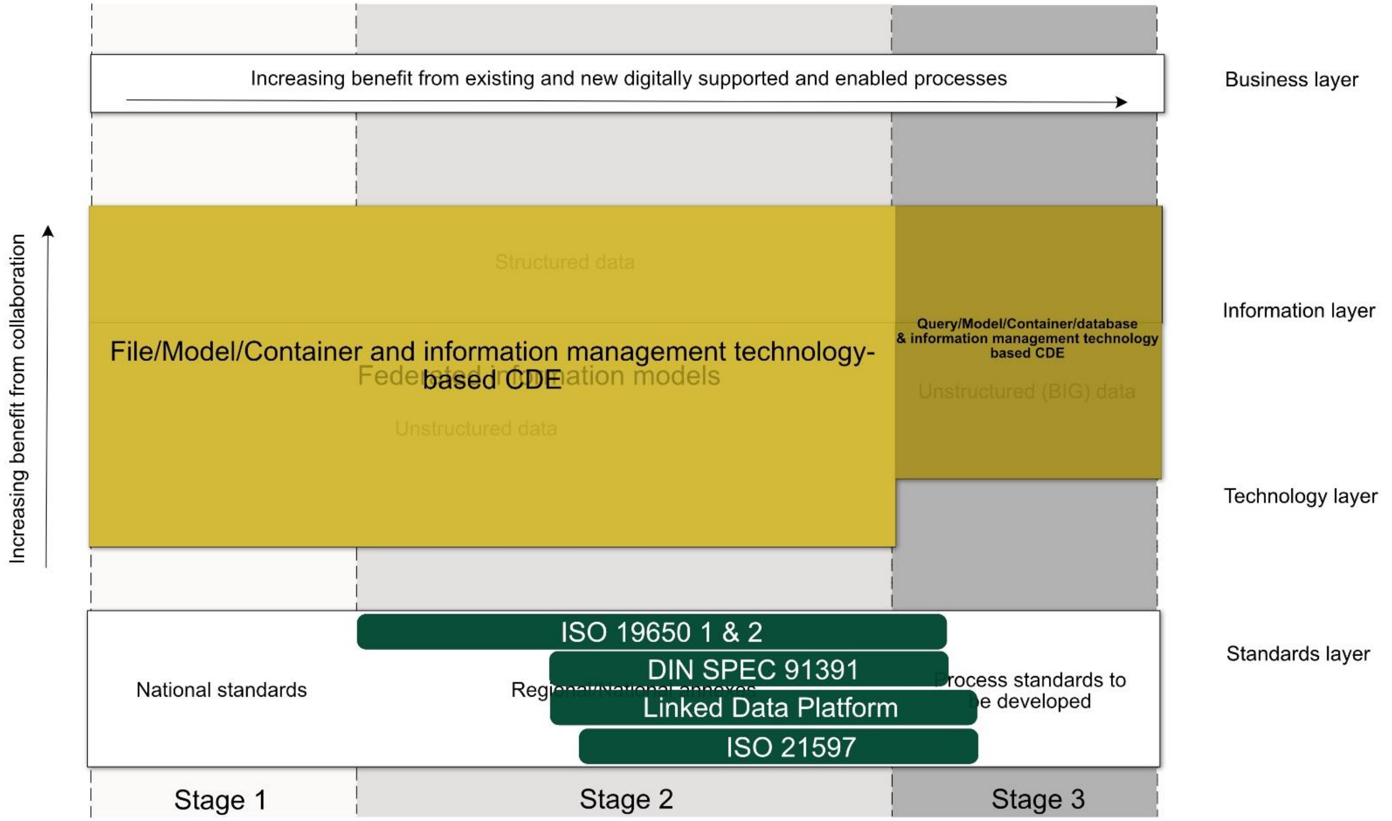
LOD 100 LOD200 LOD300 LOD400



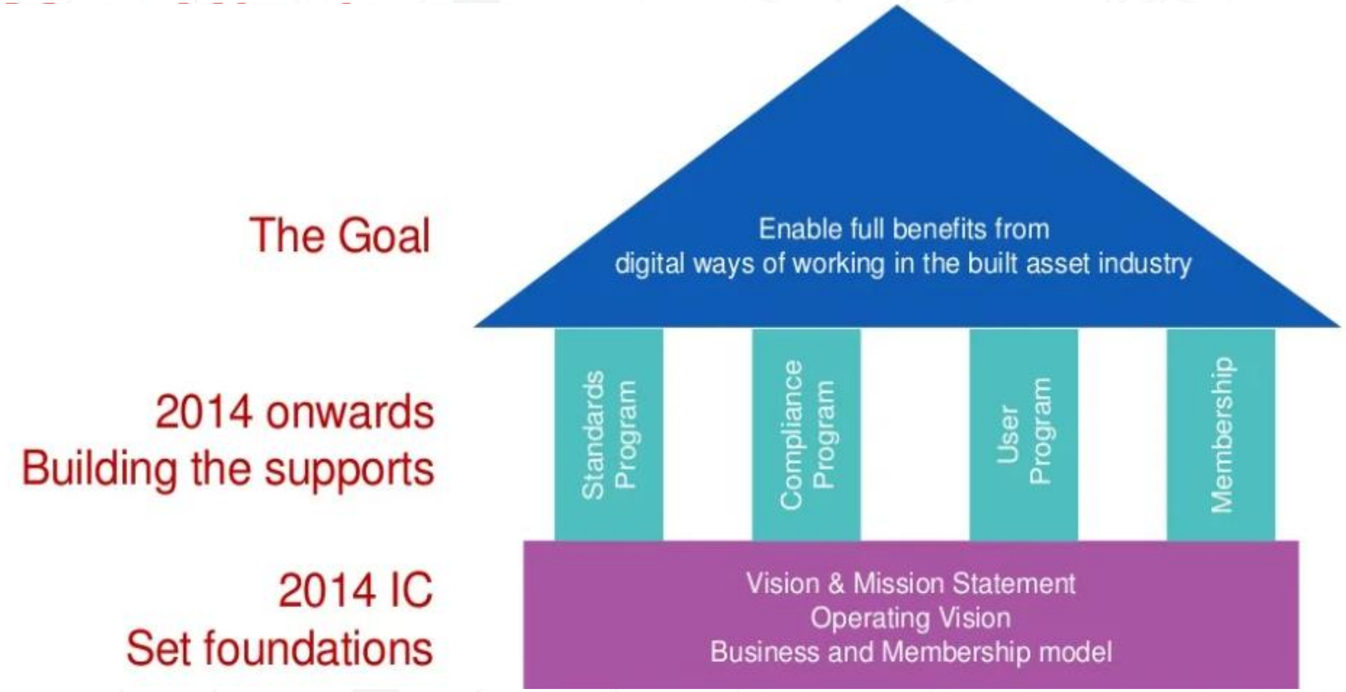
BIM Wedge

Level 0	Level 1	Level 2	Level 3	
	2D 3D	BIMs AIM SIM FIM BSIM BRIM	iBIM IDM, IFC, IFD	
CAD	Proprietary Formats	Proprietary formats + COBie	ISO standards	Exchange Formats
Drawings	Geometric models	Coordinated Discipline-specific BIM models	Integrated, interoperable Building Information Models for the entire life-cycle	Depth of information
Paper	File-based collaboration	Central manage-ment of files (Common Data Environment), Shared libraries	Cloud-based model management (BIM Hub)	Coordination and Collaboration

BIM Stages


Increasing benefit from existing and new digitally supported and enabled processes
Business layer
Structured data
File/Model/Container and information management technology-based CDE
Federated information models
Unstructured data
Query/Model/Container/database & information management technology based CDE
Unstructured (BIG) data
Information layer
Technology layer
Increasing benefit from collaboration
ISO 19650 1 & 2
DIN SPEC 91391
Linked Data Platform
ISO 21597
National standards
Regional/National annexes
Process standards to be developed
Standards layer
Stage 1
Stage 2
Stage 3

buildingSMART



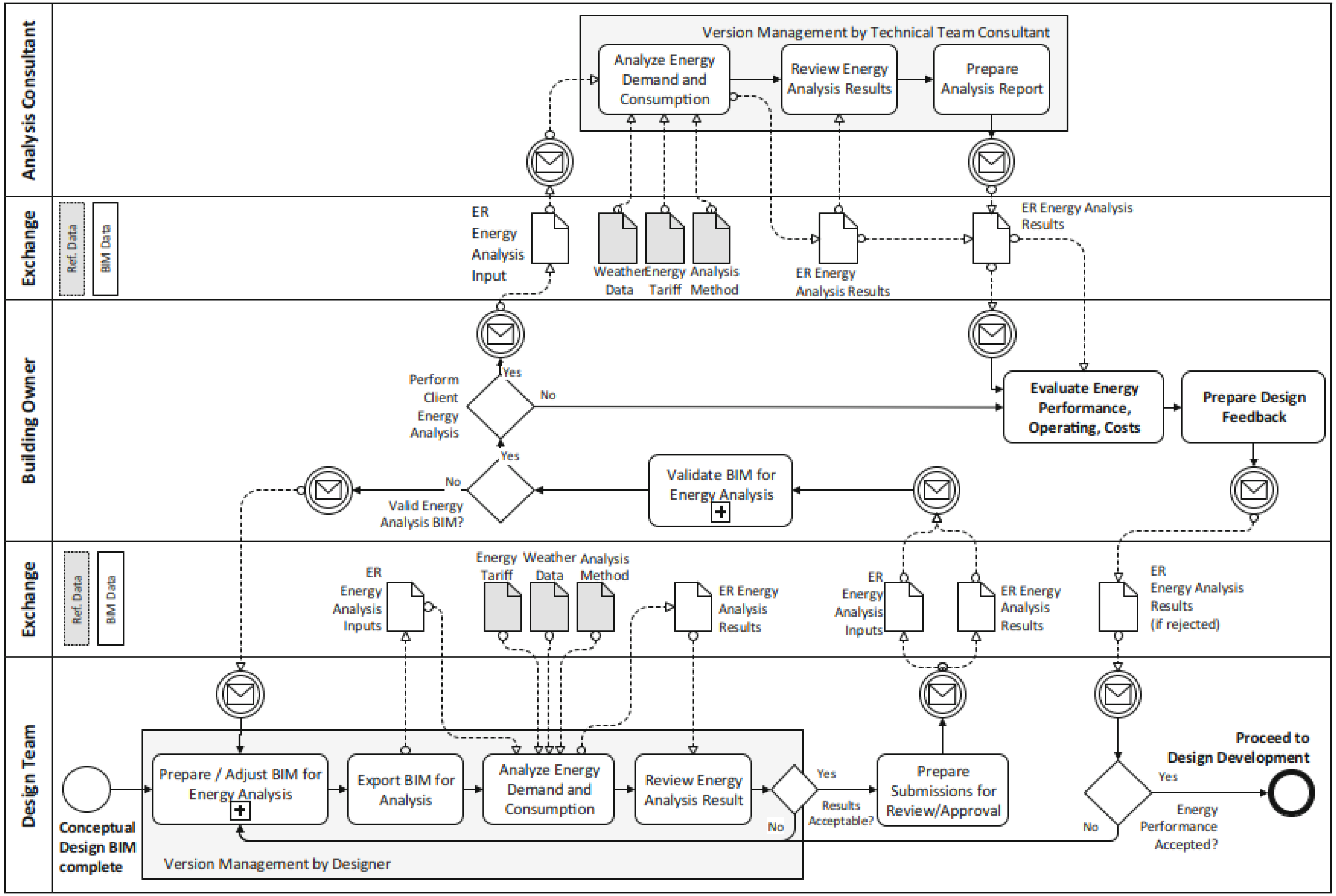
https://www.slideshare.net/coBuilder_International/an-overview-of-buildingsmart

buildingSMART

Building	Infrastructure	Product	Technical	Regulatory	Special Purpose
ISO IDM Standard	IFC4 Infra alignment 1.0 (Deployment)	IFC mapping into bSDD	Linked building data ifcOWL	E-submission common guidelines	Marketing IFC today
IDM for building programming	IFC Alignment next phase 1.1	Data dictionary enabler	mvdXML Trust in BIM deliverables	Automated code checking	Develop IFC for design & construction
Global BIM guide wiki	IFC Road & Rail	Product templates and BIM objects	[Augmented reality]		People & process certification
MVD FM Handover	IFC Asset Management	IFC Primer. Real life object mapping			bSI PAS Korean & Chinese Road Rail Specification
MVD Energy simulation	IFC Bridge				DfMA & Offsite
MVD Scheduling	Integrated Digital Built Environment				IDM Model Setup
MVD Quantity take off	IFC for Infra Road map				
MVD Annotation	Infra overall architecture				
IDM Curtain walling					
IDM Configurator					

https://www.slideshare.net/coBuilder_International/an-overview-of-buildingsmart

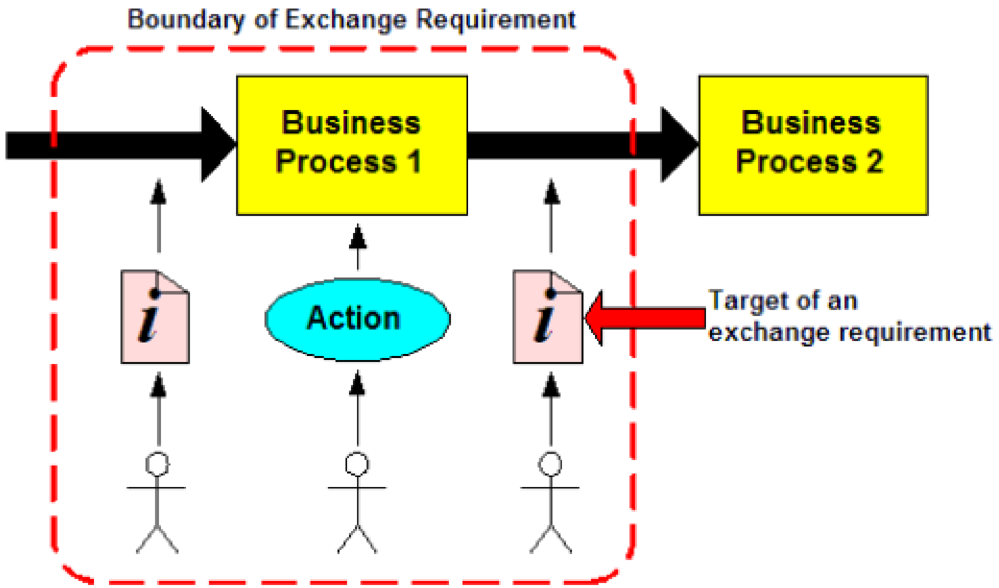
Information Delivery Manual (IDM)



Document a process using BPMN 2.0 and IDM and IDS principles and (evolving) standards

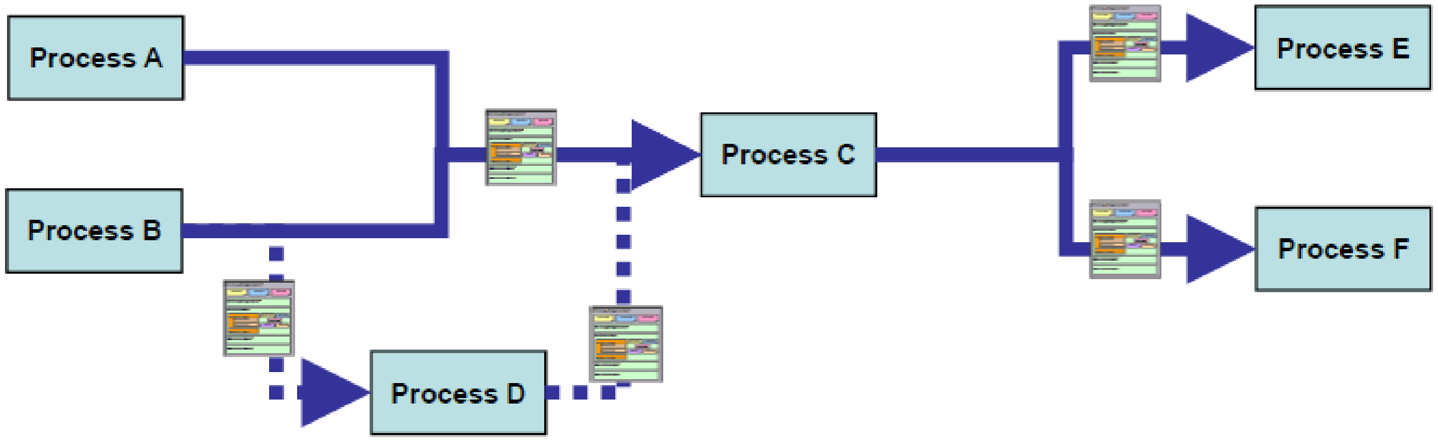
- Identify Use case
- Model Process Map
- Model Exchange Requirement

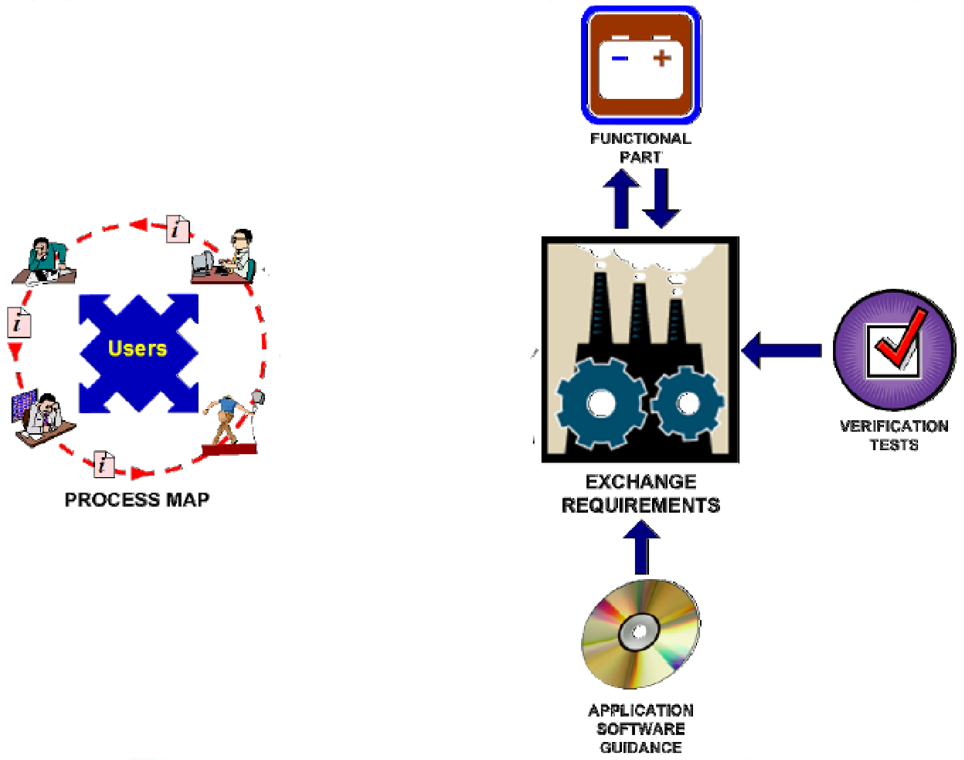
Exchange Requirements (ER)



- An ER captures the role of actors
  - performing an action
    - set the value of an item of information
  - providing the input
  - benefiting from the output
- The target of an ER is the resulting output information

Exchange Requirements (ER)





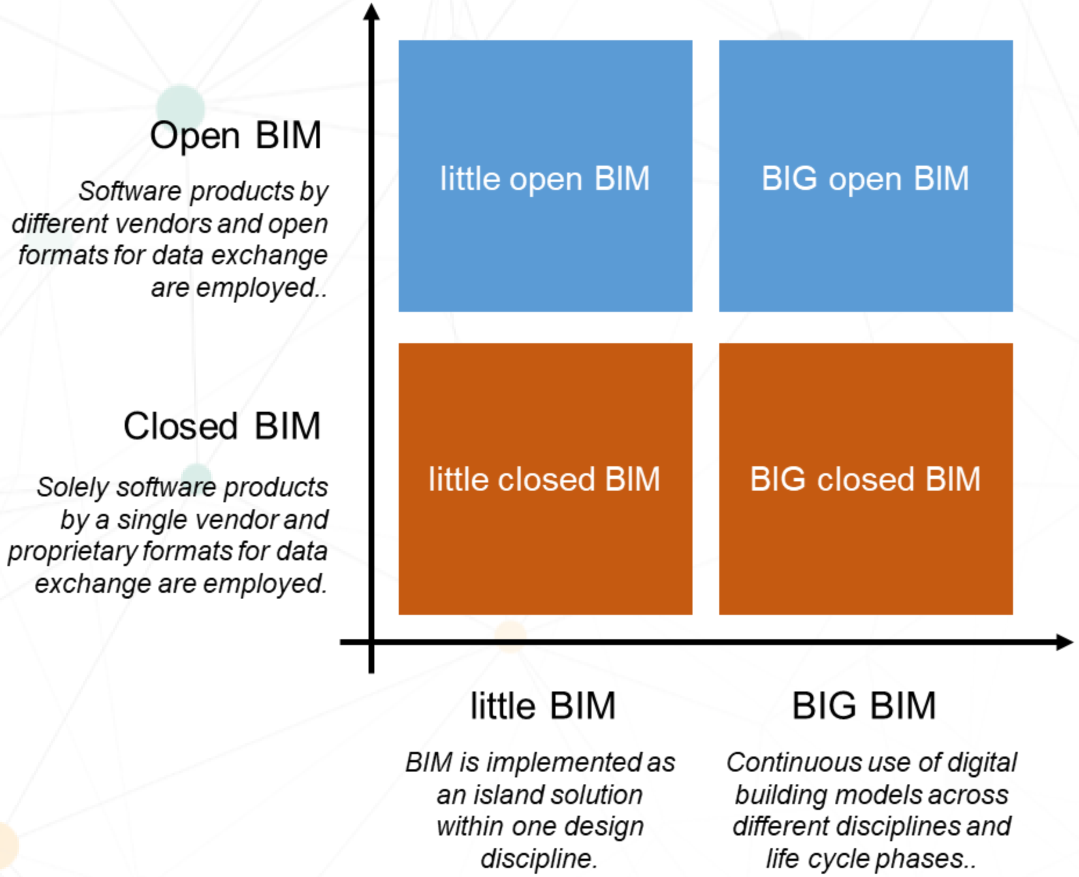
BIM Execution Plan (BEP)

BIM4Ren

A document used as a tool to provide a standardized workflow and general guidance for the strategic implementation of BIM for a project

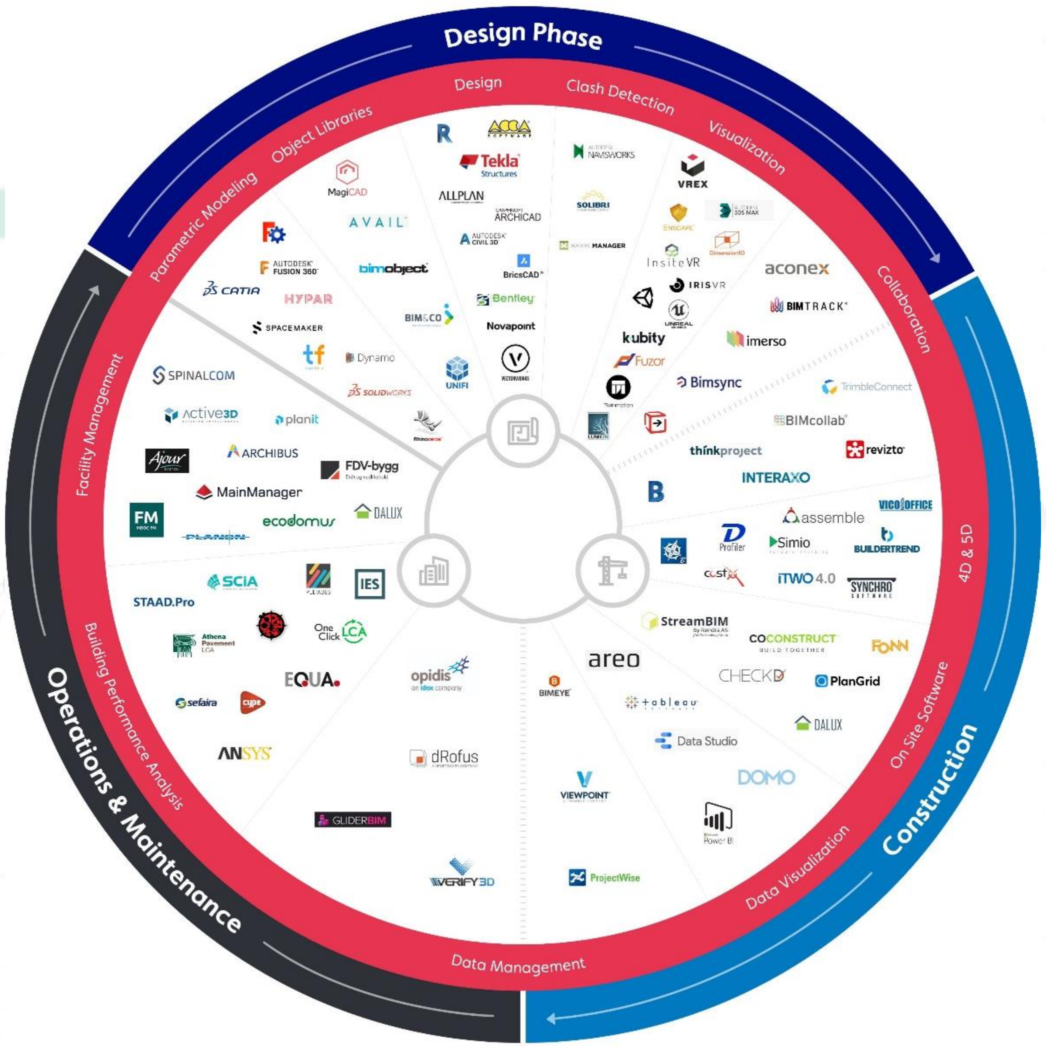
https://www.breakwithanarchitect.com/post/the-bim-execution-plan

Closed vs. Open BIM



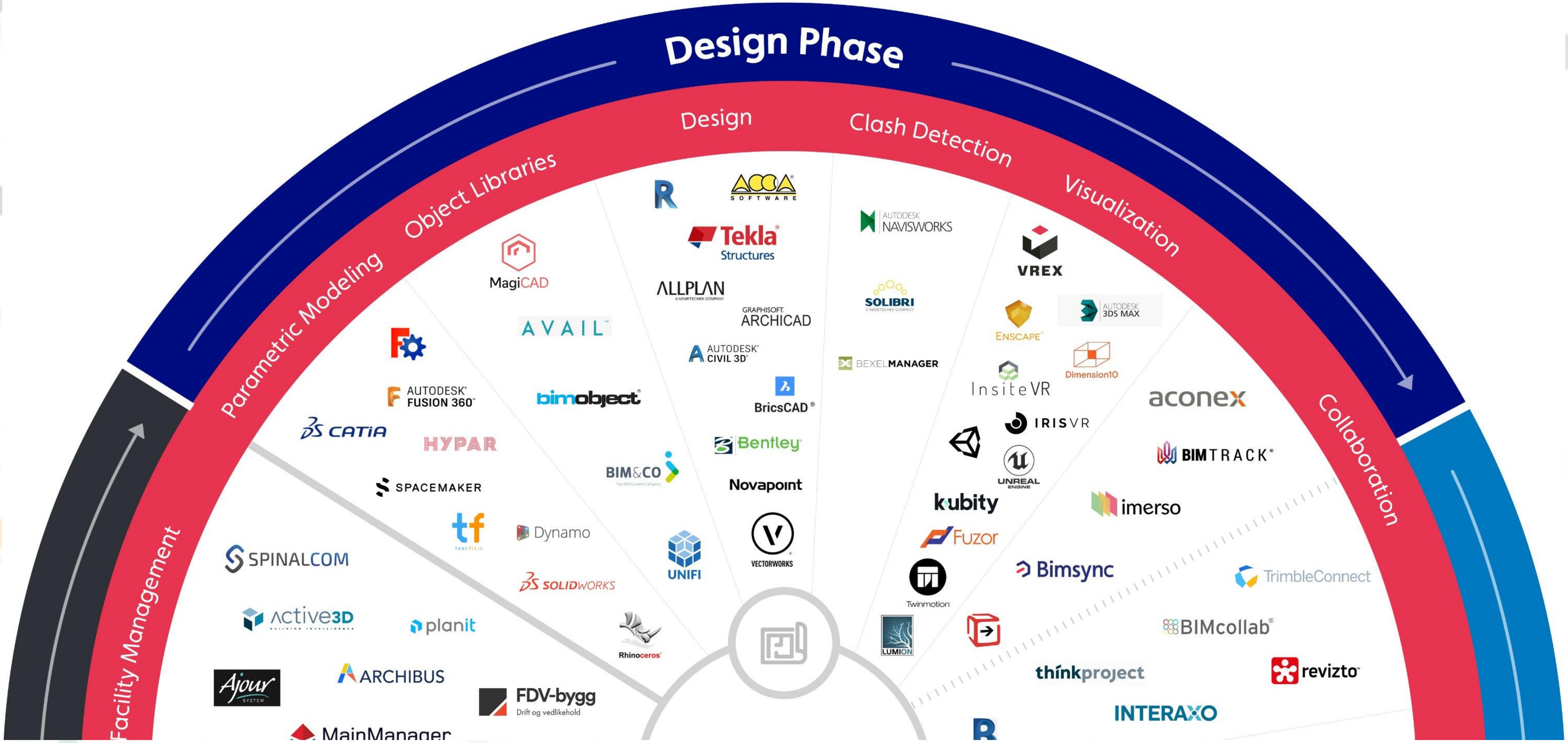
source: [Borrmann, König, Koch, Beetz, 2018]

BIM Software



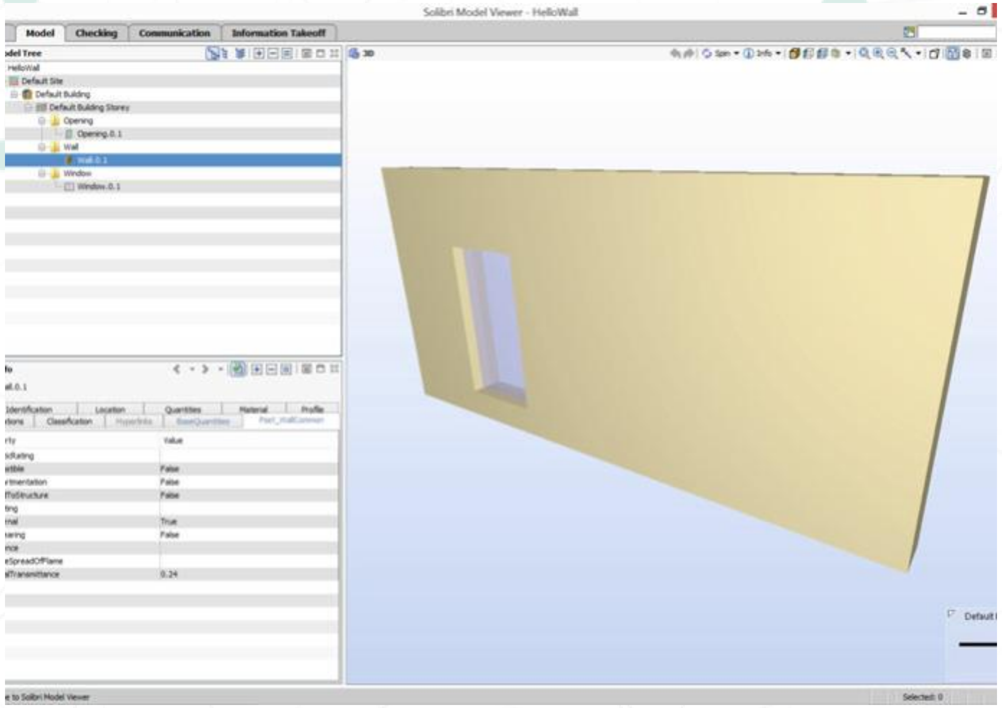
Source: [Catenda.no 2020]

BIM Software



Source: [Catenda.no 2020]

Industry Foundation Classes (IFC)



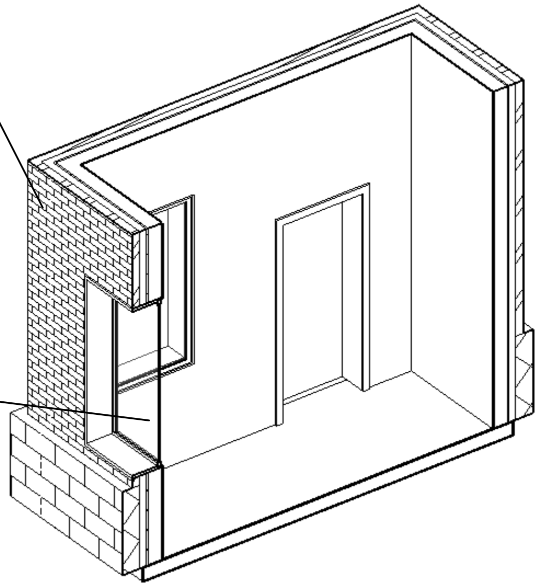

```
#51 = IFCPRODUCTDEFINITIONSHAPE($, $, (#79, #83));
#79 = IFCSHAPEREPRESENTATION(#20, 'Axis', 'Curve2D', (#80));
#80 = IFCPOLYLINE((#81, #82));
#81 = IFCCARTESIANPOINT((0., 1.500E-1));
#82 = IFCCARTESIANPOINT((5., 1.500E-1));
#83 = IFCSHAPEREPRESENTATION(#20, 'Body', 'SweptSolid', (#84));
#84 = IFCEXTRUDEDAREASOLID(#85, #92, #96, 2.300);
#85 = IFCARBITRARYCLOSEDPROFILEDEF(.AREA., $, #86);
```

Industry Foundation Classes (IFC)

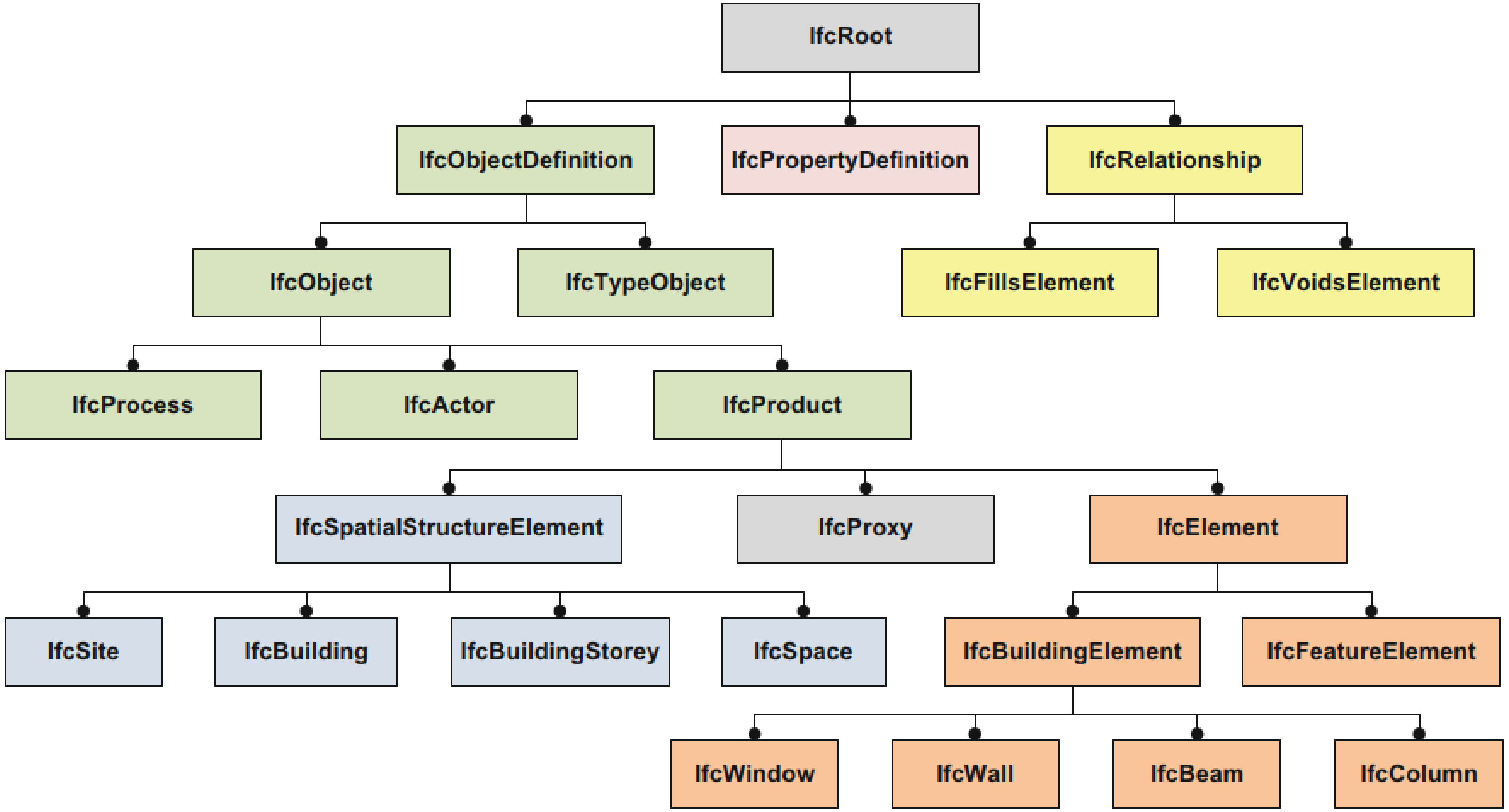
Wall NS332	
Geometric Properties	
- Length	15.33
- Width	0.40 m
- Height	3.70 m
Material Properties	
- Mass	120 kg/m3
Construction Type	
- Insulation	No
- Load Bearing	Yes

Is placed in

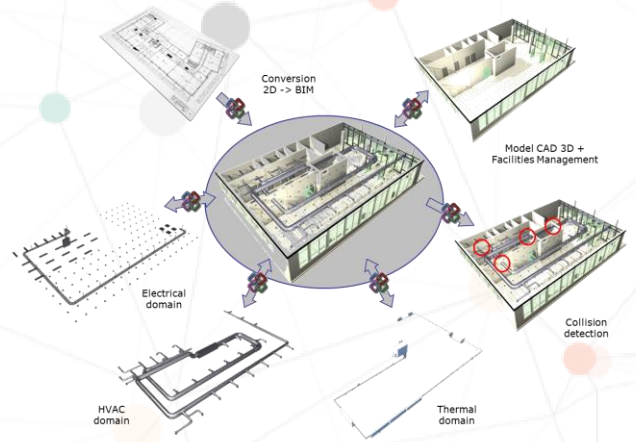
Window W2234	
Geometric Properties	
- Length	1.5 m
- Width	1.22 m
- Height	2.00 m
Material Properties	
- Mass	20 kg/m3
- Conductivity	0.84 J/s
Product	
- Manufacturer	Window Corp Inc.
- Price	2,500 EUR / piece
…	...



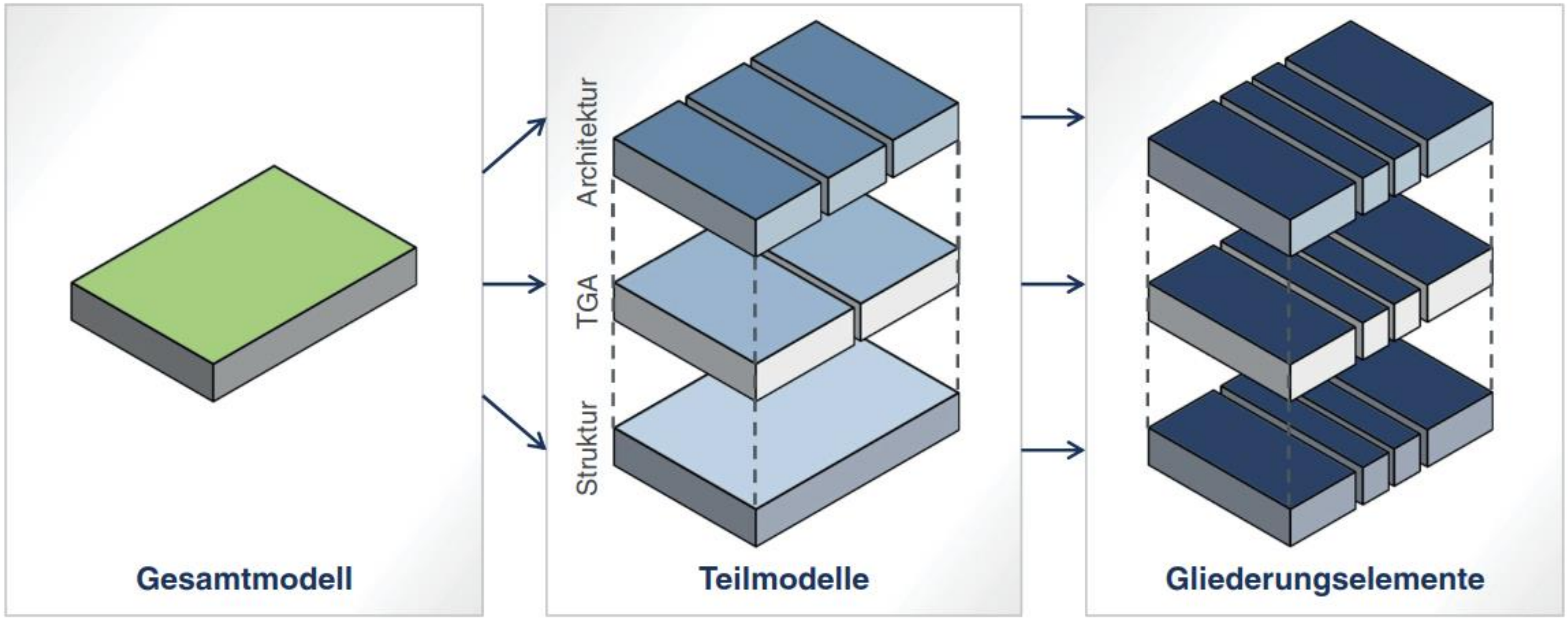
Industry Foundation Classes (IFC)



Model Based Collaboration

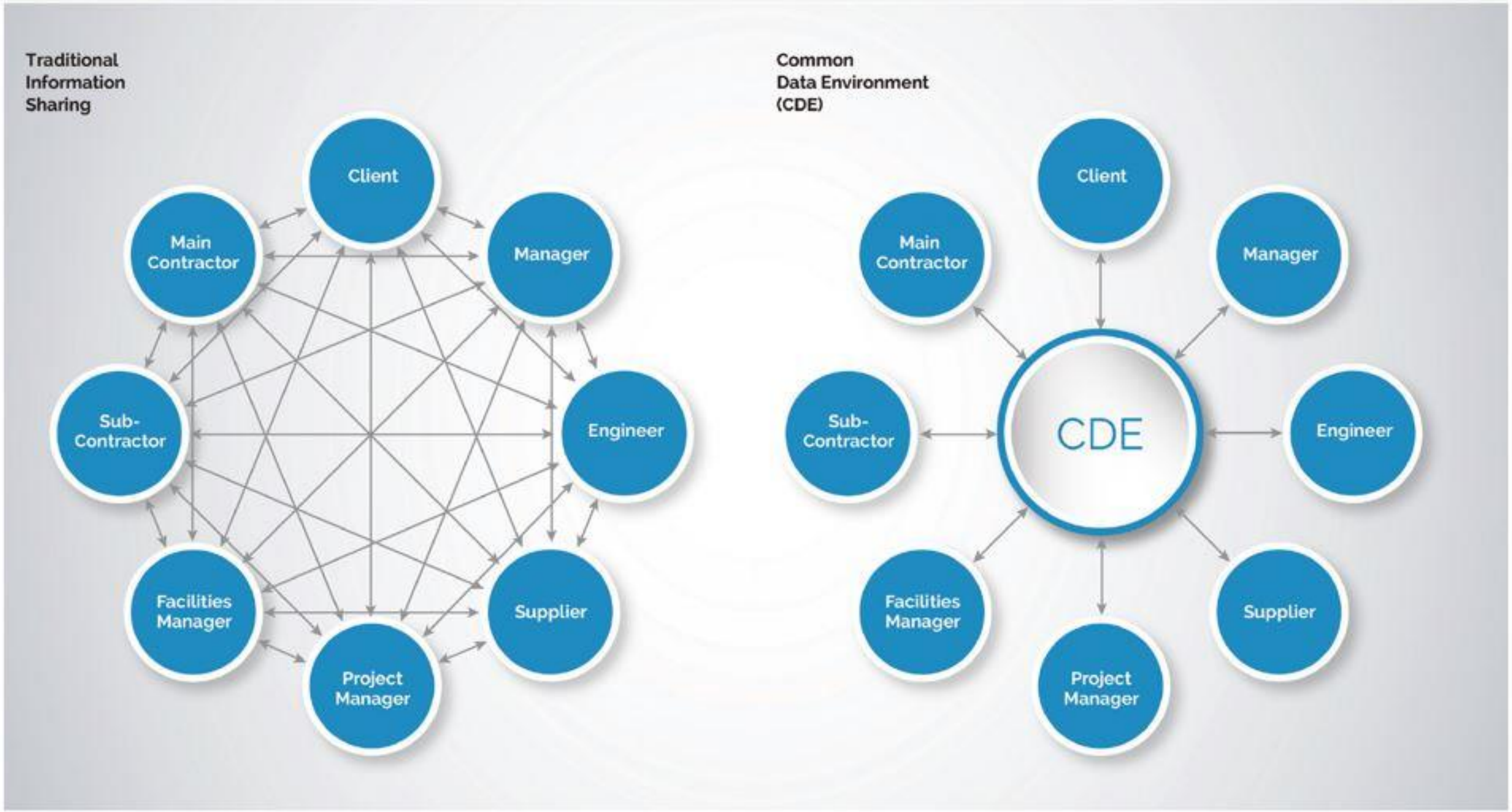


Source: German IAI for building Services



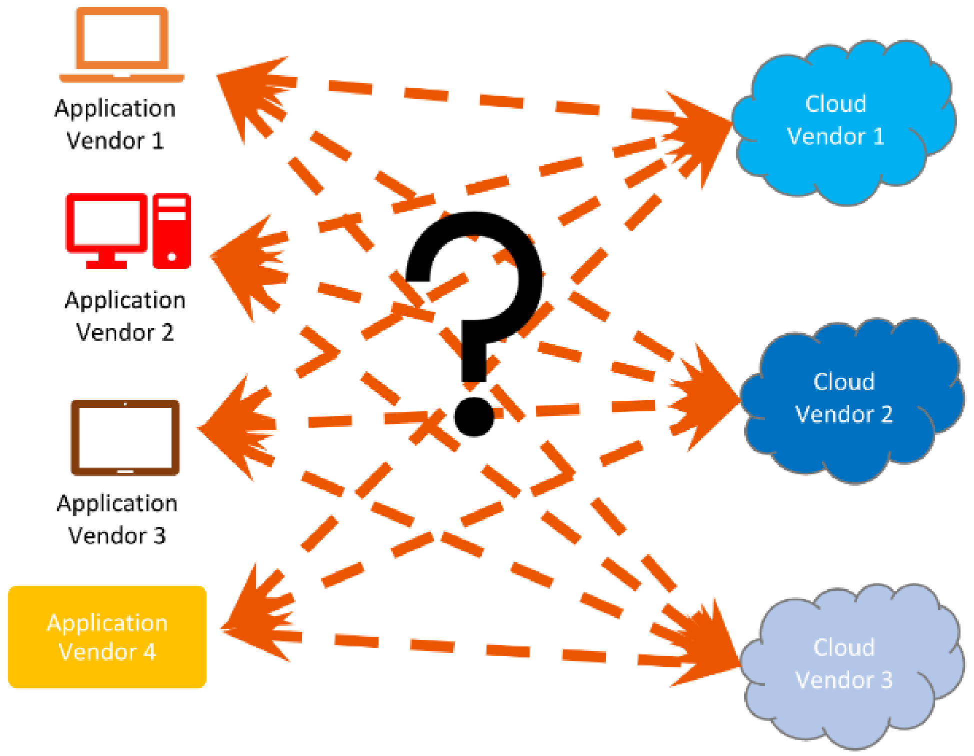
source: [Borrmann, König, Koch, Beetz, 2018]

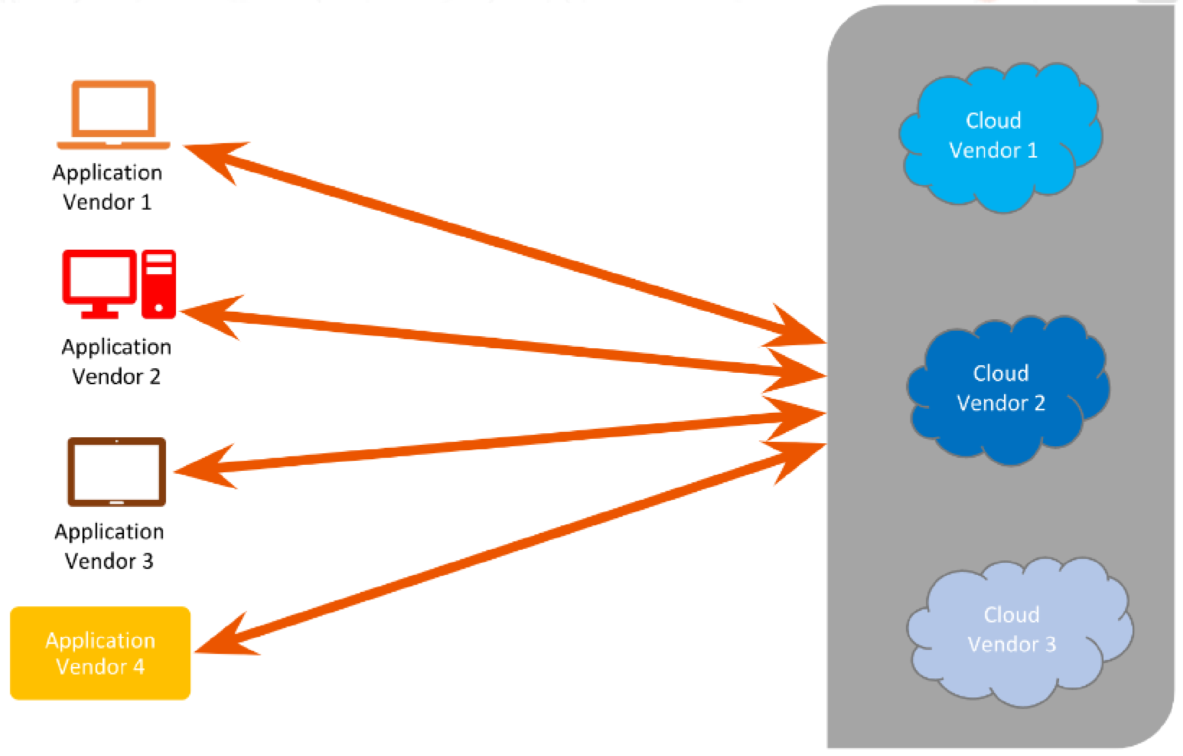
Common Data Environments (CDEs)



Source: [BIM portal, Scottish future trust (https://bimportal.scottishfuturestrust.org.uk/level2/stage/1/task/2/determine-the-info-management-cde-strategy)]

Common Data Environments (CDEs)





Source: [openCDE Update BSI Virtual Summit (https://github.com/buildingSMART/OpenCDE-API/)]

CDE Providers

AUTODESK® BIM 360™

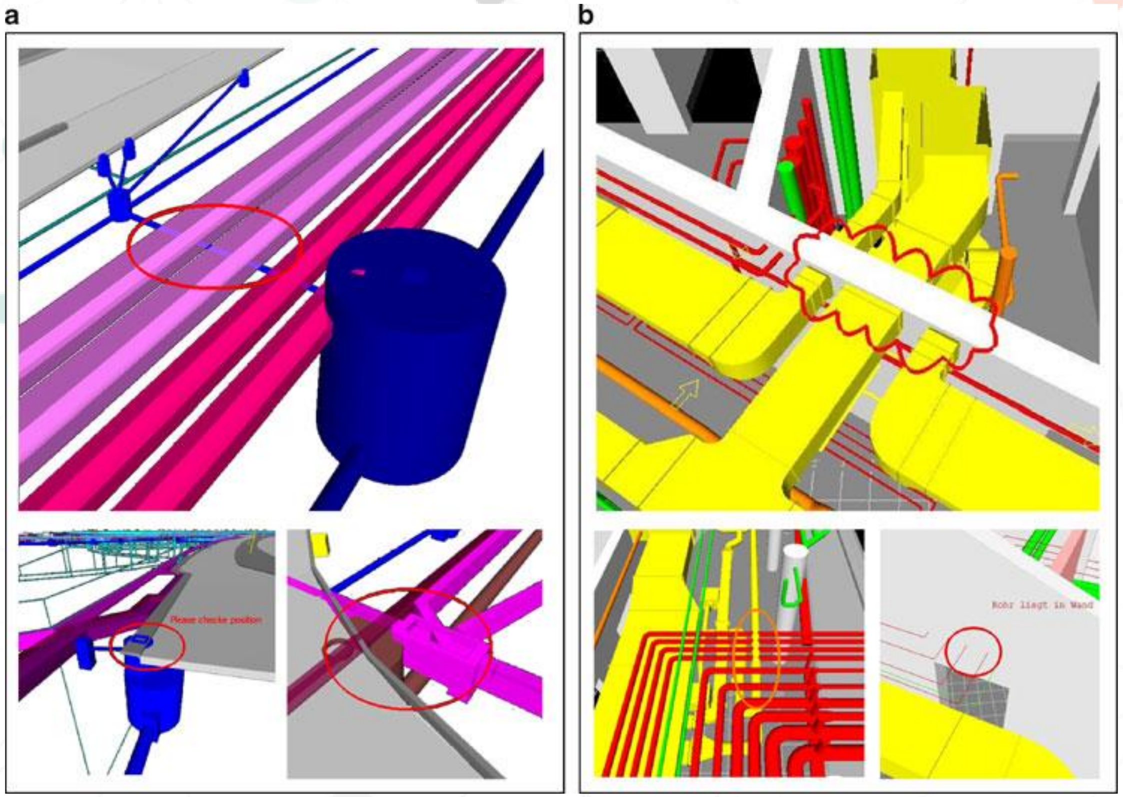
ORACLE Aconex

thinkproject

Trimble Connect

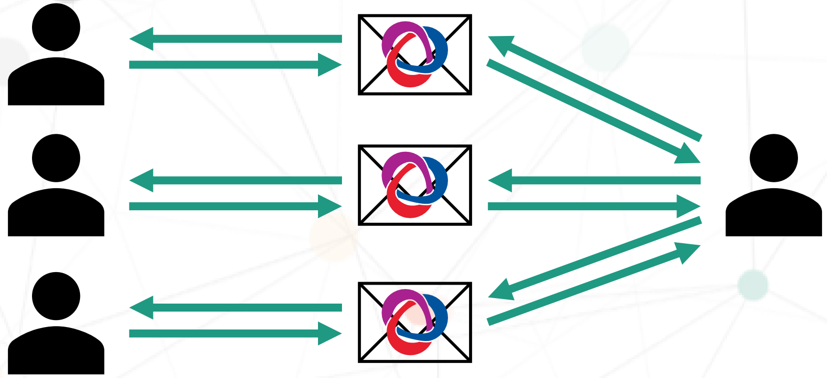
...

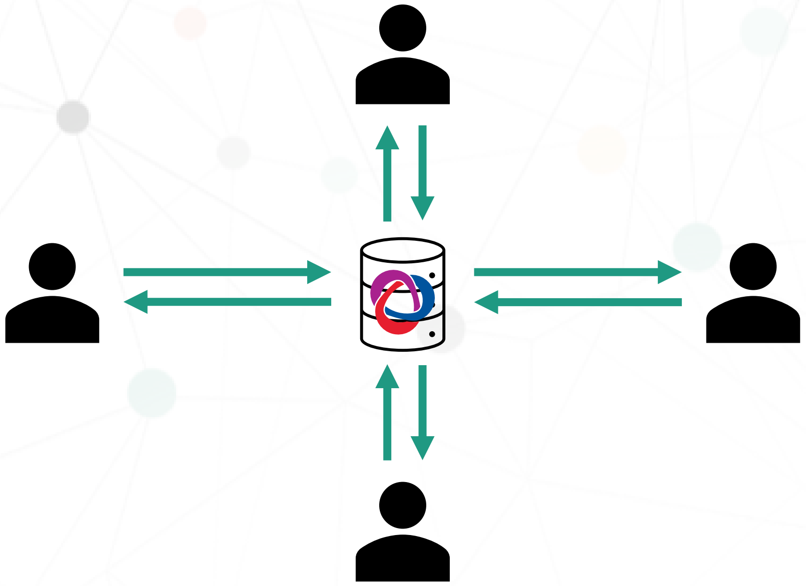
BIM Collaboration Format (BCF)



Source: [Borrmann, König, Koch, Beetz 2015]

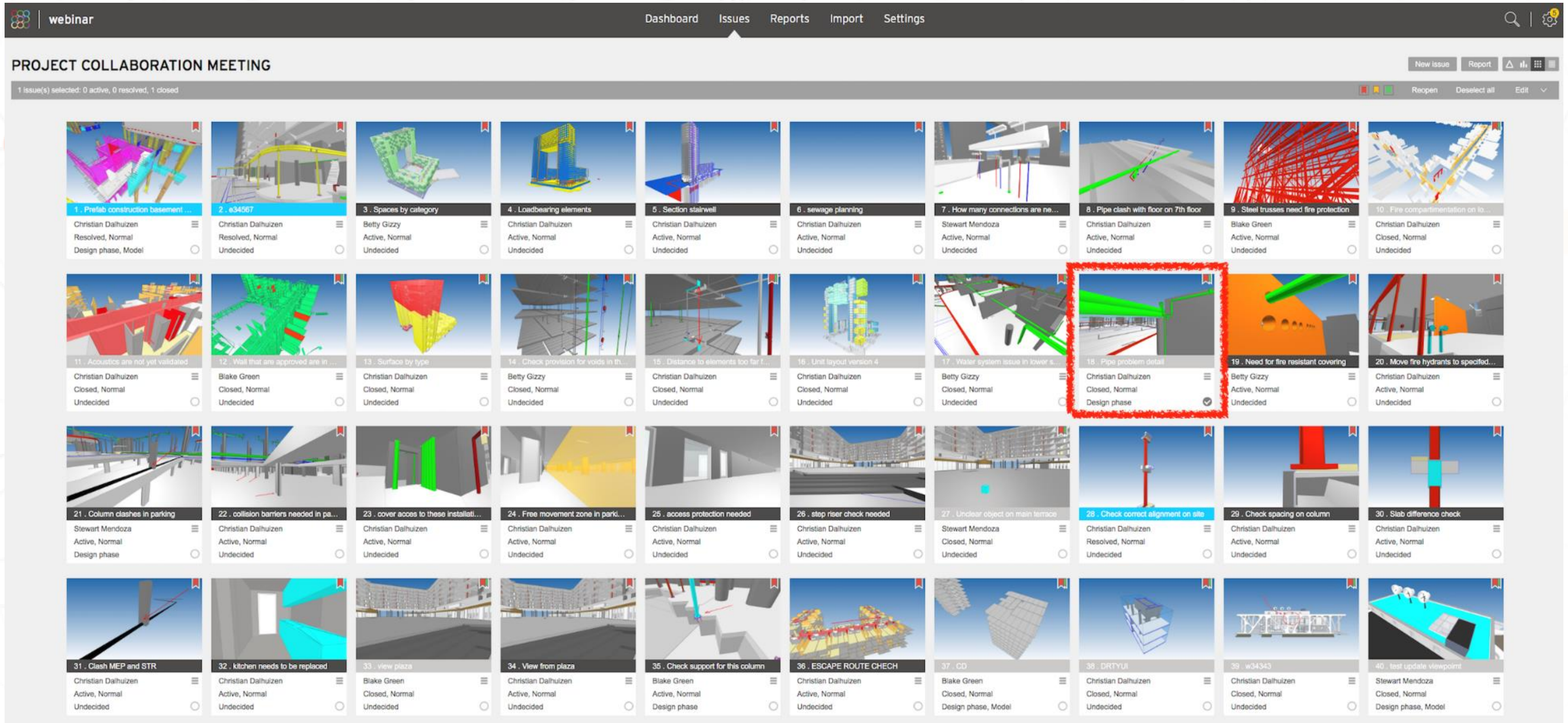
BIM Collaboration Format (BCF)





Source: [Borrmann, König, Koch, Beetz 2015]

BIM Collaboration Format (BCF)



Source: [Borrmann, König, Koch, Beetz 2015]

BIM4Ren CONCEPT

Data Management

Data- driven design

Data collection

WHAT IS THE EXISTING DATA ?

Year?

Local regulation?

Cost € ?

Energy performance?

Geometry?

Stakeholders expectations?

Type of occupants ?

Renovation potential ?

State of the existing infrastructure ?

Stakeholders involved in the renovation

H2020 G.A. 820773

BIM4Ren CONCEPT

Digital inputs

Data Management

Data collection

WHAT IS THE EXISTING DATA ?

1. To create the BIM model
2. To organize, consolidate, secure
3. To exploit the BIM model

Data- driven design

Stakeholders involved in the renovation

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BIM4Ren CONCEPT

Digital inputs

Data Management

Exploit BIM

Data collection

Data- driven design

WHAT IS THE EXISTING DATA ?

1. To create the BIM model
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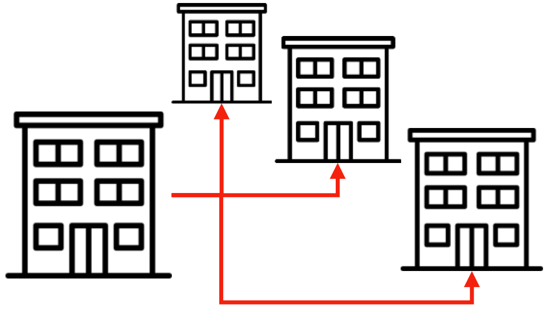
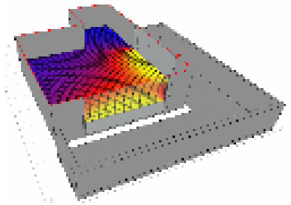
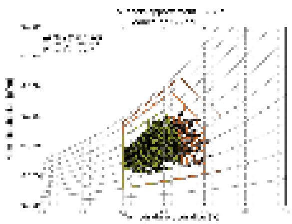
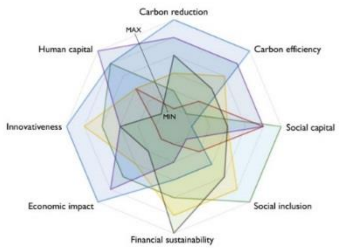


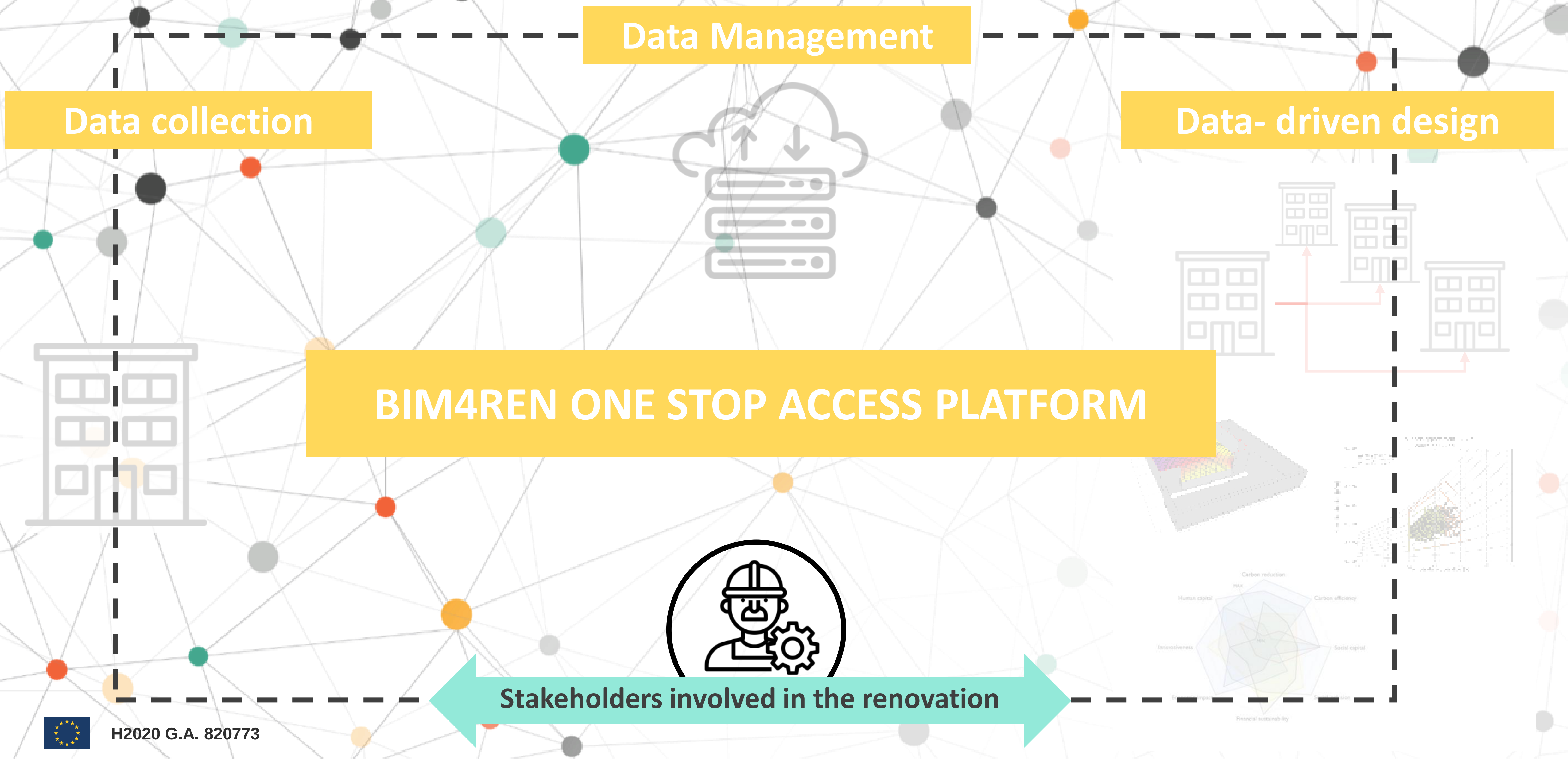




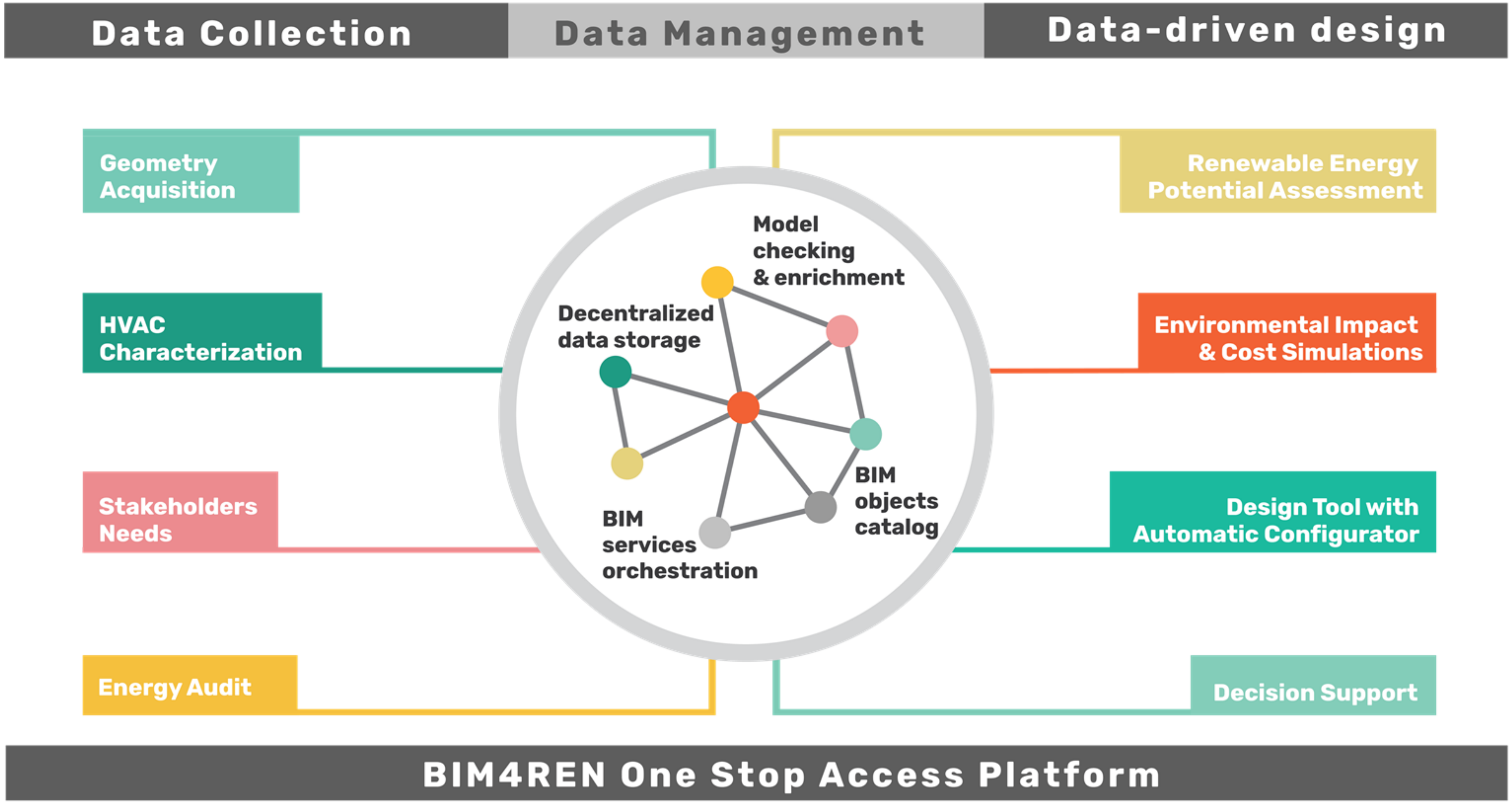


Stakeholders involved in the renovation

BIM4Ren CONCEPT



BIM4Ren CONCEPT



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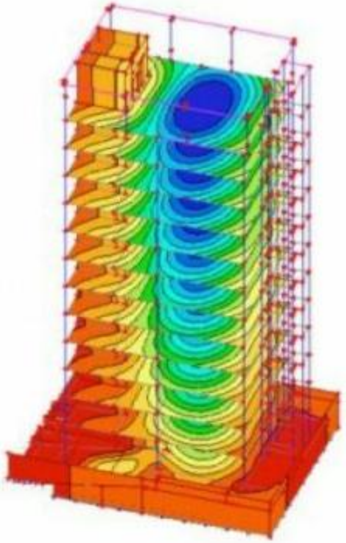
Potentials of BIM: BIM2BEM



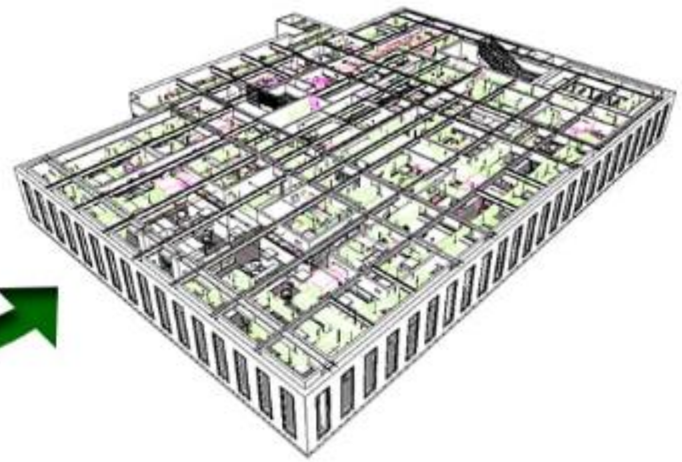
https://www.archlinexp.com/blog/professional-articles/choosing-the-right-tool-for-interior-design-2

Potentials of BIM: BIM-as-is & BIM-to-be

Point Cloud (from scans)

As-is model (from point clouds)

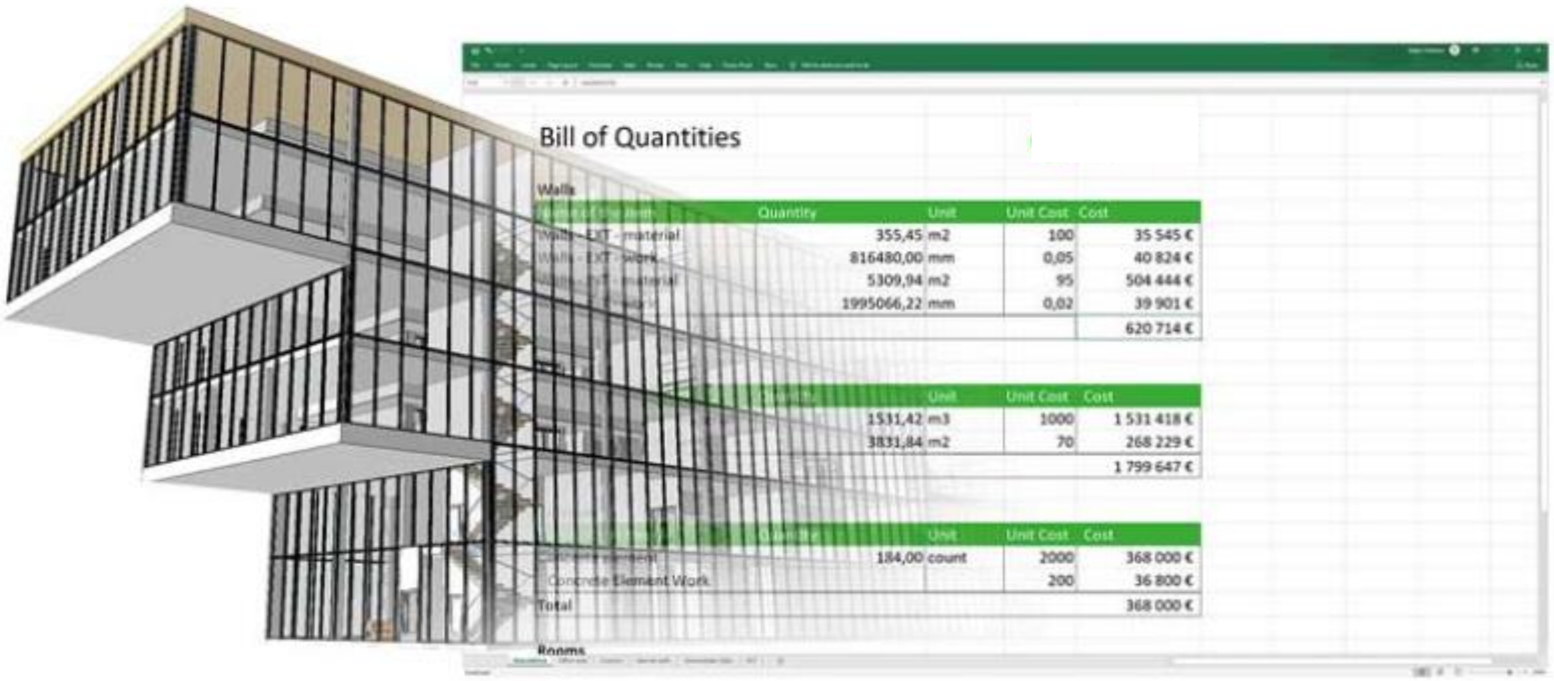
BIM to-be model (with renovation completed)



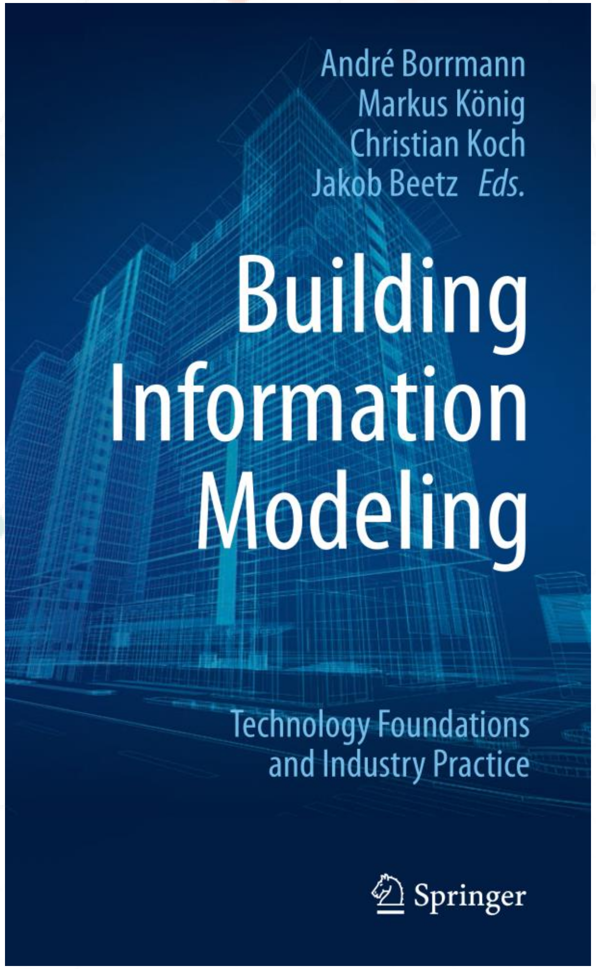
https://www.tejjy.com/our-services/bim-3d-model/scan-to-bim/

Potentials of BIM: Bill of Materials

- Extract information



Literature


André Borrmann
Markus König
Christian Koch
Jakob Beetz Eds.
Building Information Modeling
Technology Foundations and Industry Practice
Springer

TRAINING

Thank you for your attention

This project has received funding from the H2020 programme under Grant Agreement No. 820773

http://bim4ren.eu/

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