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Growing Circle

DIGITISATION AND RENOVATION WAVE

Digitisation of the building sector, a key enabler for the renovation wave

SEP 7TH, 2022 NICE, FRANCE

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Introduction: Souheil Soubra, CSTB, Head of EU BIM task group

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Round table on current trends and future outlooks

Moderator: Antoine Dugué, NOBATEK/INEF4

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Round table on current trends and future outlooks

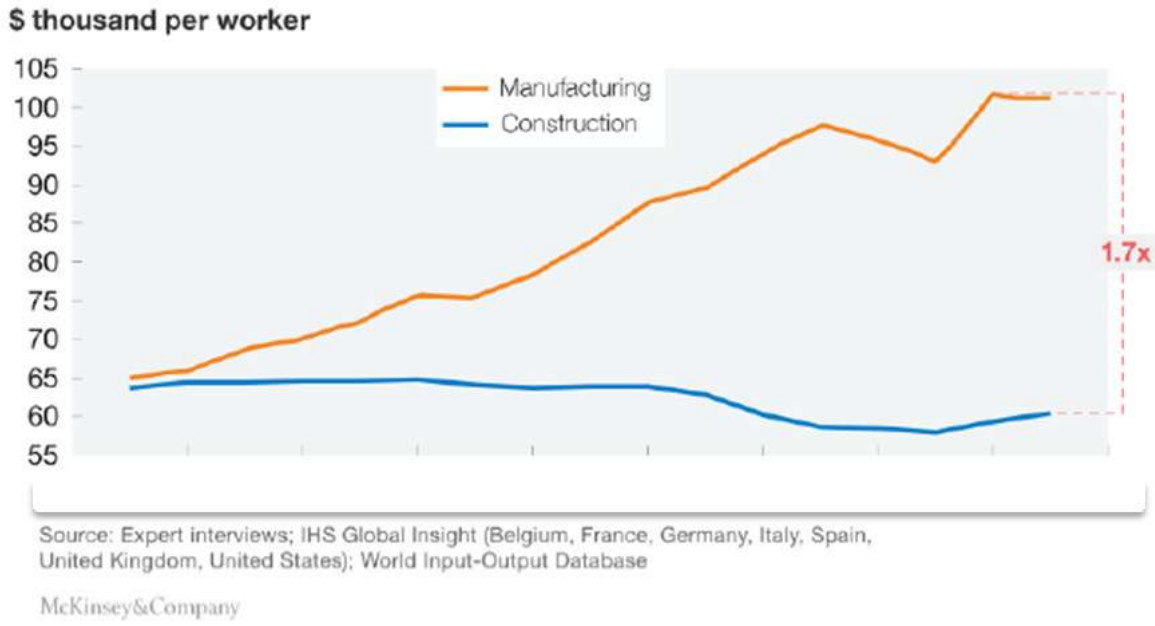
EU BIM TASKGROUP

Digital Construction and BIM in the EU

An important construction sector with a long record of poor performances…

- 1.3 trillion (1012) (EU) / 9 trillion (Worldwide)
- 8 % GDP
- 18 million direct jobs + indirect jobs
- 3.1 million organizations (95% SMEs)

Productivity in manufacturing has nearly doubled whereas in the construction sector it has remained flat (and in some areas has even dropped)

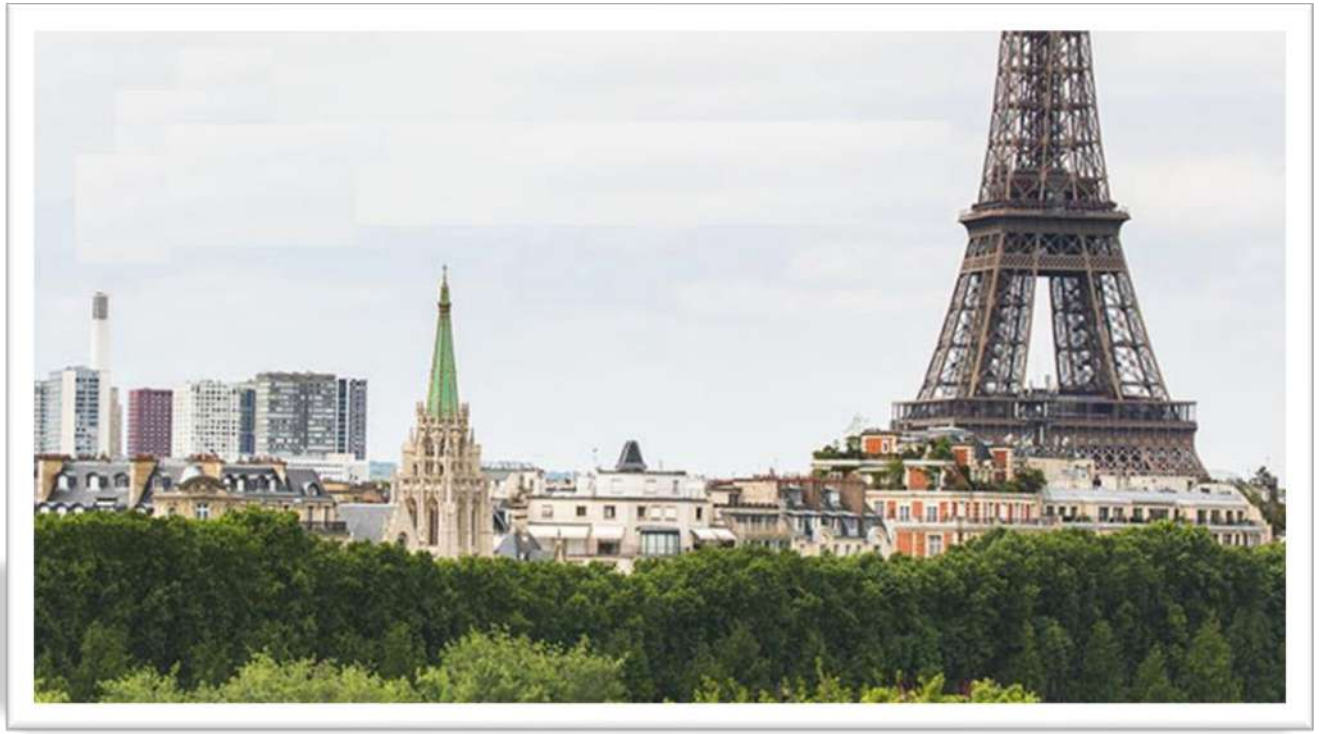


…but it‘s not only about productivity

The built environment (all human-made space in which people live, work, and recreate) strongly affects the economic, environmental and social development as a whole …

It needs to be:

- Healthy
- Comfortable
- Safe
- Affordable
- Flexible
- Sustainable
- …



Renovation, a major challenge

- Most (app. 75%) of those existing buildings are not energy-efficient (built without any energy performance requirement)
- Today, only 11% of the EU existing building stock undergoes some level of renovation each year. Across the EU, deep renovations that reduce energy consumption by at least 60% are carried out only in 0.2%
- At this pace, cutting carbon emissions from the building sector to net-zero would require centuries… It is time to act !!!

EU renovation wave strategy

To pursue this ambition, the Commission published on 14 October 2020 a new strategy to boost renovation

- It aims at doubling the rate of renovations and decarbonising the European Building stock.
- It also aims at contributing to the green and digital transition in Europe from the buildings and construction perspective.
- Three areas of action are also mentioned : the **digital building logbooks**, the **digital building permits**, and the use of **BIM for public procurement**.

Bringing together national efforts into a common and aligned European approach to develop a world-class digital construction sector

EU BIM TASKGROUP

WHAT IS THE **EU BIM TASK GROUP**?

European plateform of **public procurers and policy makers** who bring together the collective expertise and purchasing power for a **successful implementation of BIM** in Europe**.**

EU BIM TASKGROUP

ROLE OF THE EU BIM TASK GROUP

Demand side
1. Public authorities (and EC)
2. Public procurers

EUBIM TASKGROUP

Enablers
(CEN, ISO, bSI, OGC, …)

Supply side
Construction lifecycle sector

MEMBERS

- Austria
- Belgium
- Bulgaria
- Croatia
- Czechia
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Iceland
- Ireland
- Italy
- Latvia
- Lithuania
- Luxembourg
- Netherlands
- Norway
- Poland
- Portugal
- Slovakia
- Slovenia
- Spain
- Switzerland
- Sweden

Sponsorship
European Commission

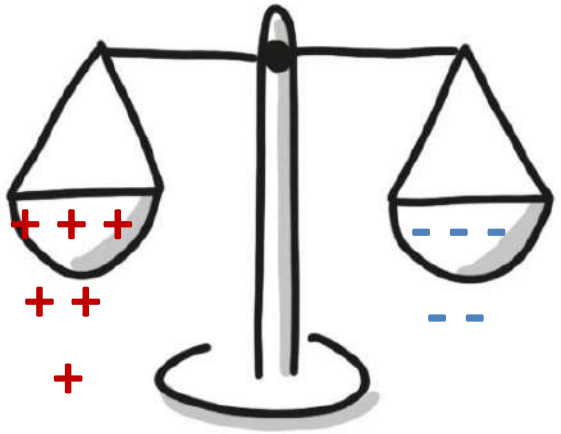
THE EU BIM HANDBOOK

The handbook provides a central reference point for the **introduction of BIM in the European public sector** and aims to equip Government and public sector construction clients with the knowledge for their BIM deployment journey.

Now available in **23 languages!**
www.eubim.eu/handbook-selection

Українською мовою

Cost-benefit analysis for the use of BIM



Cost-benefit analysis for the use of BIM in public projects

OBJ 1 - Cost-Benefit Model development

the development of a methodology and creation of a tool that measures the costs and benefits of using BIM in public construction projects, taking into account expenditures, revenues and non-monetary benefits

OBJ 2 – Model validation and case studies

the validation of the CBA-tool, demonstrating its relevance and practical applicability through six case studies representing various types of projects

OBJ 3 – Handbook creation

writing an informative and easy-to-use handbook addressed to EU public entities who want to use the tool and learn more about the methodology

EUBIM TASKGROUP

http://www.eubim.eu/cost-benefits/

2 – Model validation and case studies

Construction of a sport centre

Maintenance and renovation project of a road

New port construction project

Renovation project for a public building

Public administrative building construction

New residential building construction project

EUBIM TASKGROUP

RINA B1P GROUP

BIM in Public Procurement White paper

BIM is not obligatory, but it is suggested.
EU Directive for Public Procurement in 2014

For public works contracts and design contests, Member States may require the use of specific electronic tools, such as of building information electronic modelling tools or similar. In such cases the contracting authorities shall offer alternative means of access, as provided for in paragraph 5, until such time as those tools become generally available within the meaning of the second sentence of the first subparagraph of paragraph 1

https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0024

European Commission

EU BIM TASKGROUP

Accelerating the Green, Digital and Resilient Transition by Implementing Building Information Modelling in Public Procurement

EU BIM Task Group Position Paper

With the green, digital and resilient transition, the European Union has set ambitious goals for the construction industry. This means we need to develop and manage our built environment more holistically and with considerably less waste.

Building Information Modelling (BIM) methodology is one of the key tools for improving efficiency and achieving better value in the delivery of construction projects. Governments and public procurers across Europe and around the world are recognising the value of BIM[1] as a strategic enabler for cost, quality, and policy goals. This notion has also been echoed in the High Level Construction Forum (HLCF) meetings, an initiative started by the European Commission with the purpose to co-create the green, digital and resilient transition pathway for the EU construction industry ecosystem.

The EU Public Procurement Directive of 2014 encourages public entities to use BIM but a lot has changed since 2014 and the **time is ripe to set up more incentives for the better use and integration of built environment data in public procurements**. There is still a big gap between the standards and the way work is actually being done.

The use of BIM has significantly increased[2] and many countries in Europe have already set up national BIM mandates and programmes. Digitization is happening at an ever-increasing rate and the amount of data needed to make decisions has grown exponentially. Stakeholders require the whole spectrum of built environment data that integrates BIM with digital twins, big data, AR/VR, IoT, GIS etc.

The Government and public sector clients (public clients) represent the construction industry's single biggest client and therefore have a strong influence on the whole industry. The objective of European public clients represented in the EU BIM Task Group is to:

- Accelerate the EU green and digital transitions

[1] Calculating Costs and Benefits for the use of Building Information Modelling in Public tenders Methodology Handbook
[2] EU Construction Sector Observatory Report, page 38-39

DRAFT

EU BIM TASKGROUP

High Level Construction Forum

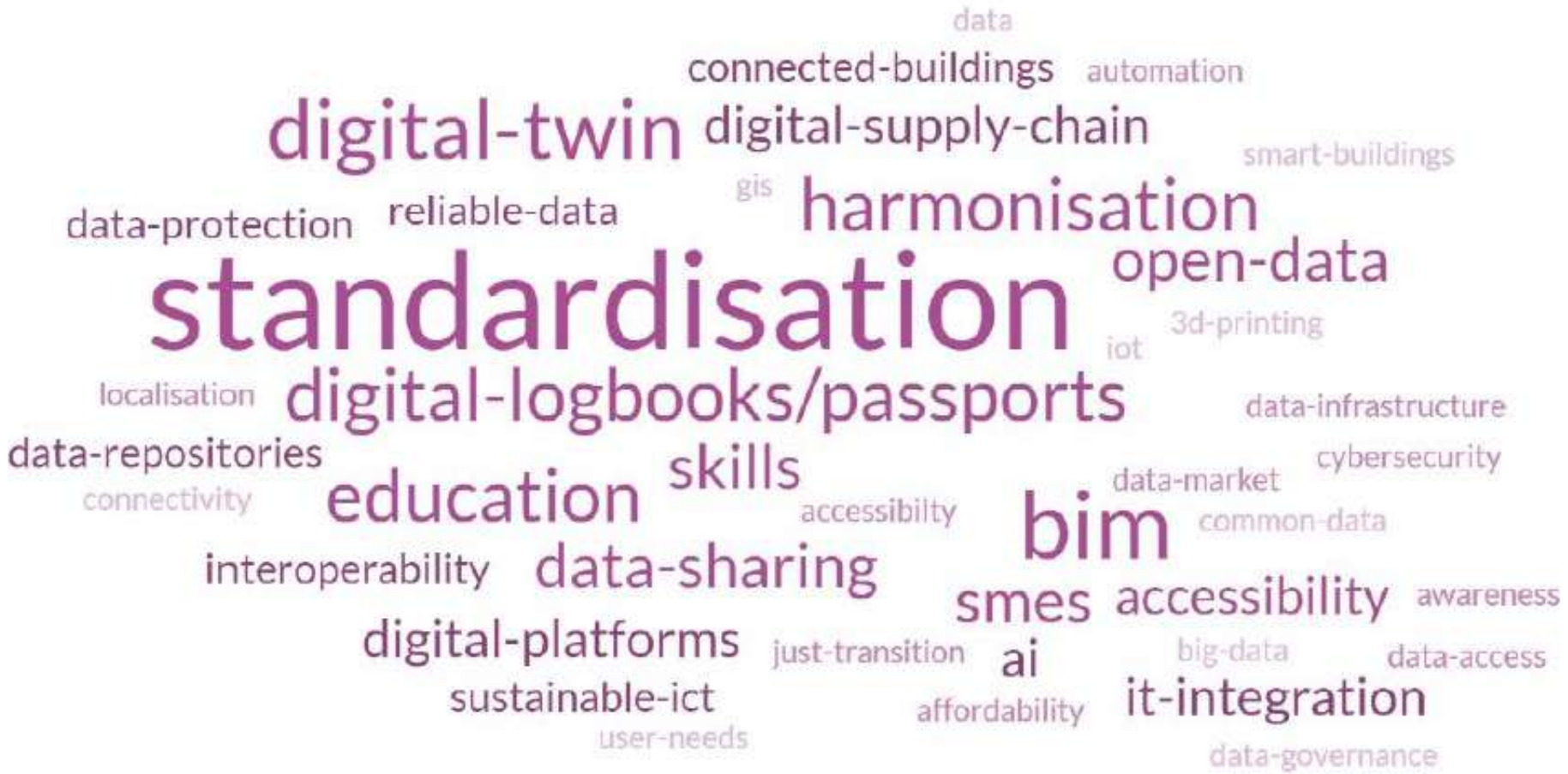
Aim: initiate the co-creation process of a transition pathway towards a green, digital and resilient construction ecosystem.

About 220 representatives from industry, EU countries, European Commission, social partners and other stakeholders joined to exchange on the main priorities and themes of the HLCF.

Digital session:

- Trust, collaboration and interoperability can allow better sharing of data and as a result support greening and resilience.
- Public demand through public procurement as a lever for innovation and standardisation (e.g. open BIM).
- The EU Data act can help level the playing field.

Keywords for a digital construction ecosystem



EU BIM TASKGROUP

Thank you for your attention

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Digitalization of an existing building stock

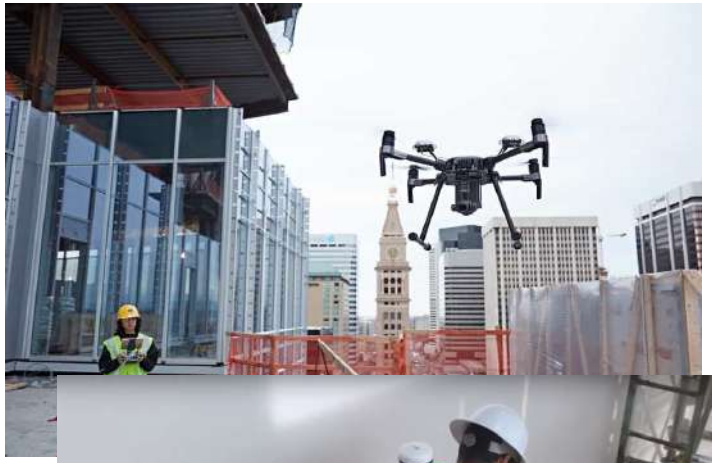
NOBATEK/INEF4
Pierre BOURREAU

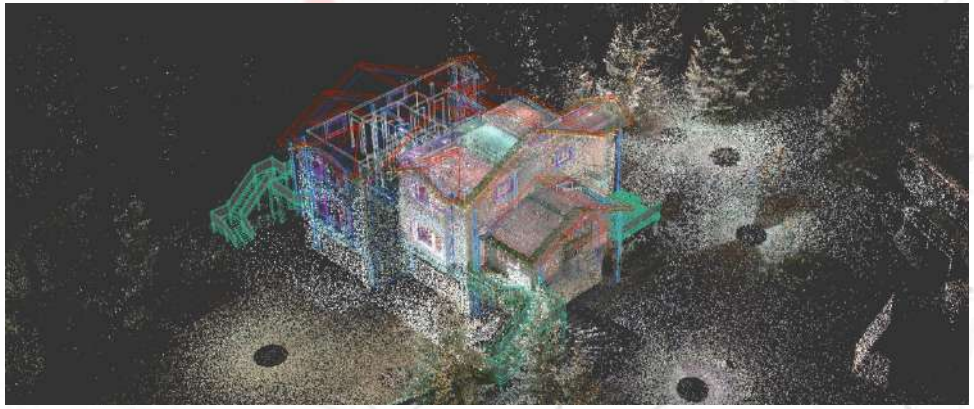
Sustainable Places 2022

Workshop ***'Digitization of the building sector, a key enabler for the renovation wave'***

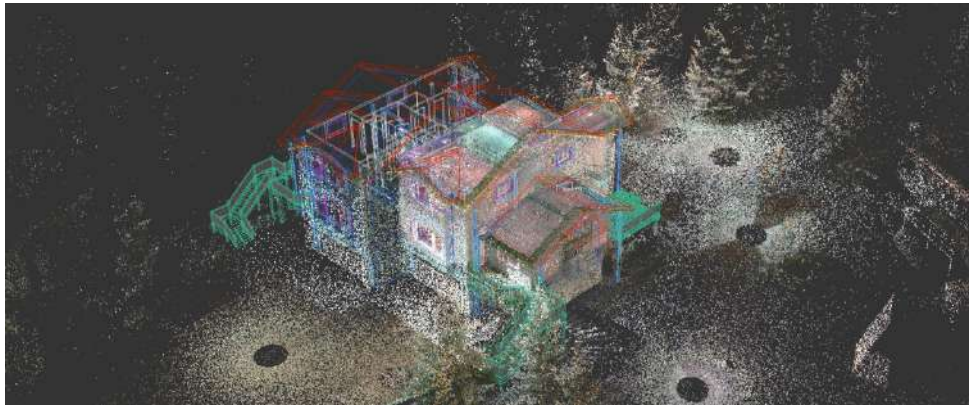
This project has received funding from the H2020 programme under Grant Agreement No. 820773

What you may think of…



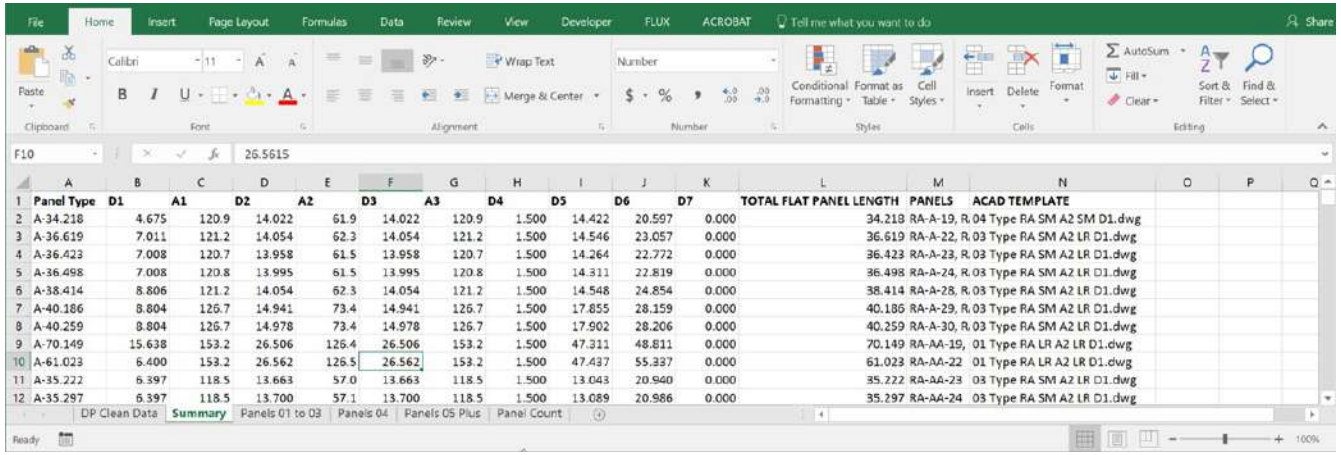


What can you do with it?



What (data) do you need?

What Level of Information? Detail?



Panel Type	D1	A1	D2	A2	D3	A3	D4	D5	D6	D7	TOTAL FLAT PANEL LENGTH	PANELS	ACAD TEMPLATE
A-34.218	4.675	120.9	14.022	61.9	14.022	120.9	1.500	14.422	20.597	0.000	34.218	RA-A-19, R	04 Type RA SM A2 SM D1.dwg
A-36.619	7.011	121.2	14.054	62.3	14.054	121.2	1.500	14.546	23.057	0.000	36.619	RA-A-22, R	03 Type RA SM A2 LR D1.dwg
A-36.423	7.008	120.7	13.958	61.5	13.958	120.7	1.500	14.264	22.772	0.000	36.423	RA-A-23, R	03 Type RA SM A2 LR D1.dwg
A-36.498	7.008	120.8	13.995	61.5	13.995	120.8	1.500	14.311	22.819	0.000	36.498	RA-A-24, R	03 Type RA SM A2 LR D1.dwg
A-38.414	8.806	121.2	14.054	62.3	14.054	121.2	1.500	14.548	24.854	0.000	38.414	RA-A-28, R	03 Type RA SM A2 LR D1.dwg
A-40.186	8.804	126.7	14.941	73.4	14.941	126.7	1.500	17.855	28.159	0.000	40.186	RA-A-29, R	03 Type RA SM A2 LR D1.dwg
A-40.259	8.804	126.7	14.978	73.4	14.978	126.7	1.500	17.902	28.206	0.000	40.259	RA-A-30, R	03 Type RA SM A2 LR D1.dwg
A-70.149	15.638	153.2	26.506	126.4	26.506	153.2	1.500	47.311	48.811	0.000	70.149	RA-AA-19,	01 Type RA LR A2 LR D1.dwg
A-61.023	6.400	153.2	26.562	126.5	26.562	153.2	1.500	47.437	55.337	0.000	61.023	RA-AA-22	01 Type RA LR A2 LR D1.dwg
A-35.222	6.397	118.5	13.663	57.0	13.663	118.5	1.500	13.043	20.940	0.000	35.222	RA-AA-23	03 Type RA SM A2 LR D1.dwg
A-35.297	6.397	118.5	13.700	57.1	13.700	118.5	1.500	13.089	20.986	0.000	35.297	RA-AA-24	03 Type RA SM A2 LR D1.dwg

- BIM is not only 3D
- BIM is not only of di

- The added-value is in the data
- BIM as a methodology

Energy audit report format

In the Energy Audit Report the main characteristics of the hospital energy consumption are summarized. In particular, the form reports the following characteristics:

- Building location
- Heating and Cooling Degree Days
- Area of the building (gross, net, heated, cooled)
- Preliminary building use
- Energy use and comparison among the hospitals
- Energy use breakdown
- Special loads (medical equipment, server room, lifts,)
- Energy bills report
- Building shell characteristics
- Lighting systems
- HVAC systems
- Domestic Hot Water system

The information of the hospitals will be collected during the audit and the report will be revised with the contribution of the partners that will conduct the energy audit.

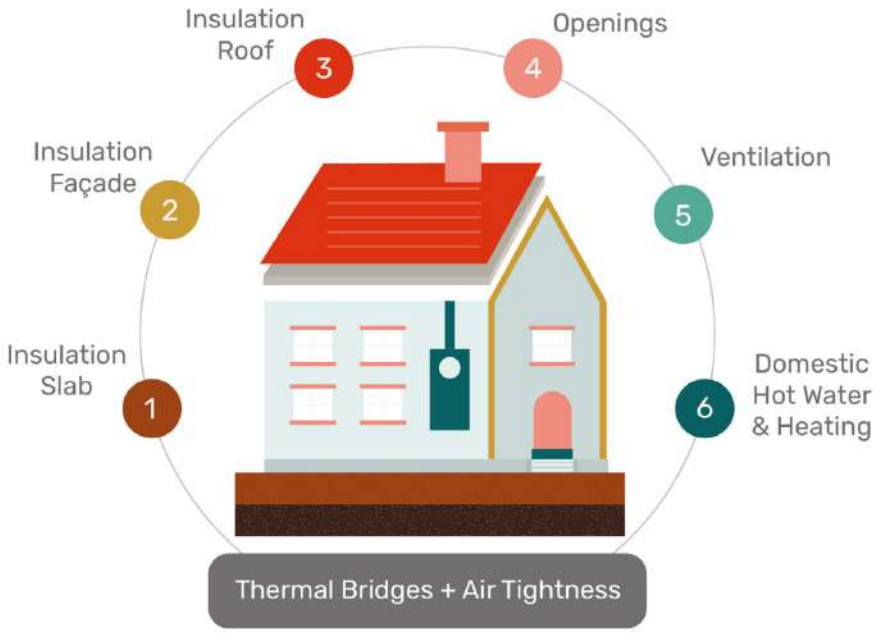
Workflow

For an energy renovation project based on BIM

STEP 1: Define the data you need

Typical energy renovation

What data do we need?



What?

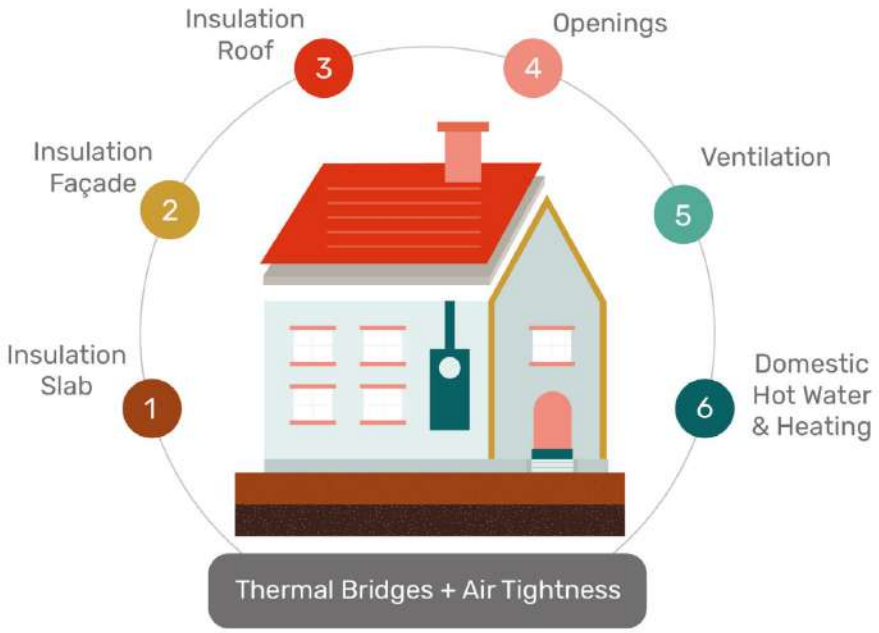
- Guarantee energy performance
- Estimate the cost
- Estimate carbon impact
- Estimate reusability

How?

- Energy simulation
- Cost analysis
- Life cycle analysis
- Reusability audit

Typical energy renovation

What data do we need?



How?

- Energy simulation
- Cost analysis
- Life cycle analysis
- Reusability audit

Which data?

- Envelope, insulation, thermal resistance, window glazing…
- Material cost, BoQ, manpower…
- BoQ, carbon value…
- Material passport, damage status…

Workflow

For an energy renovation project based on BIM

STEP 1: Define the data you need

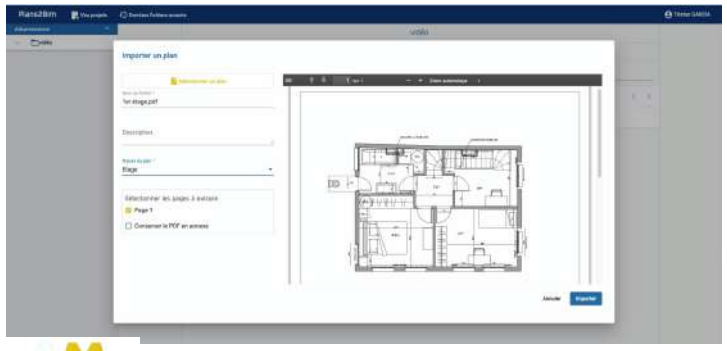
STEP 2: Choose the tools to create your model

Need geometry?

Offsite

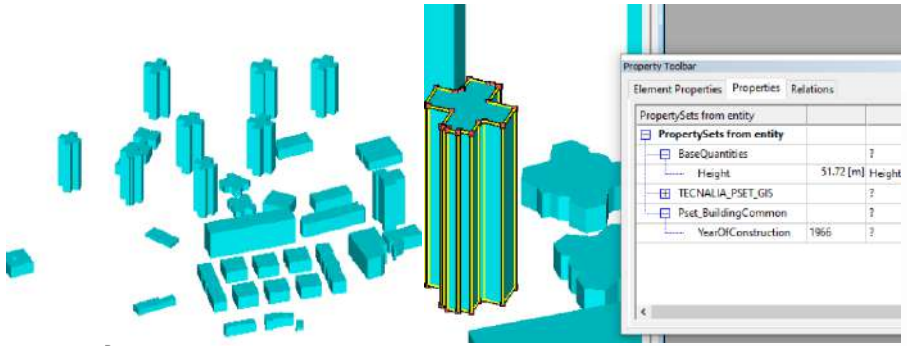
Onsite

2D Layouts



wisebim

GIS



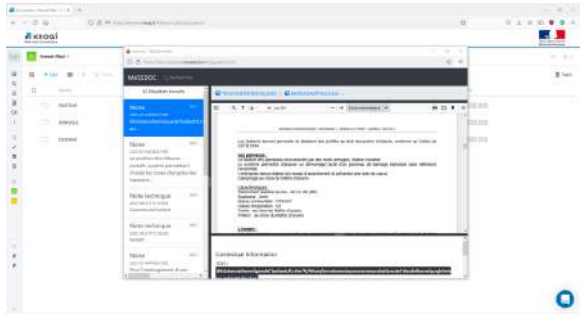
tecnalia

Easy scanning

Technical data (fill the geometry)

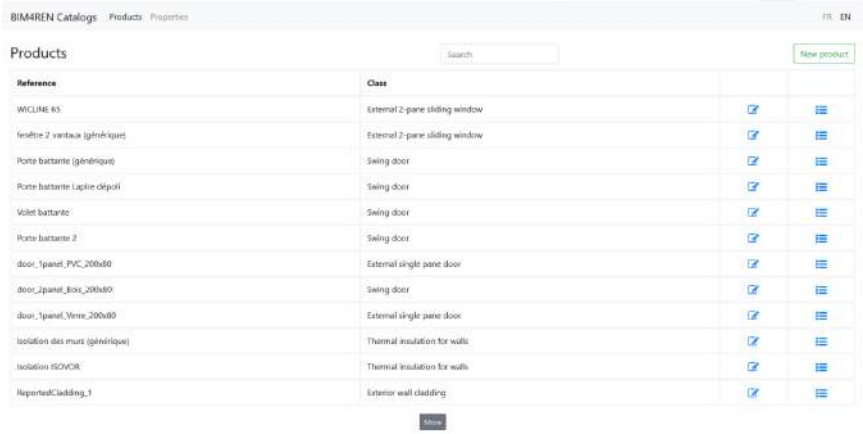
Existing building

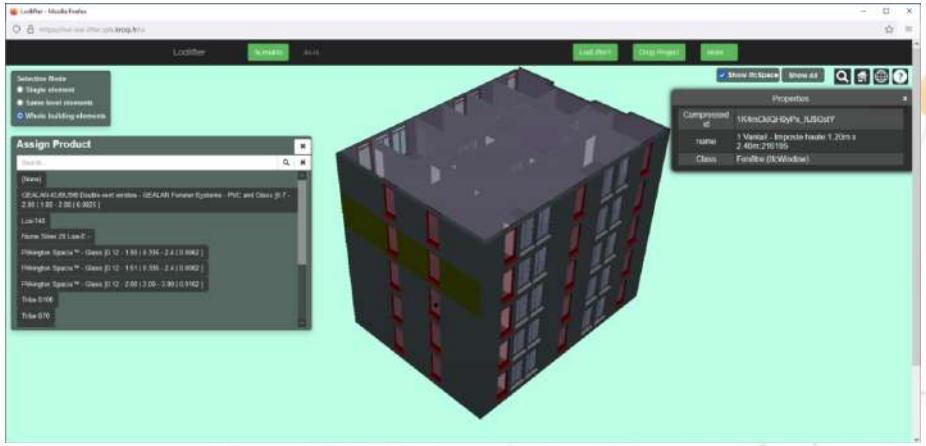
List products installed



Get technical information

To-be





Conclusions on BIM based digitilization of building

For the users

- Your needs are your driver
- Choose wisely! The model you create needs to answer your needs. But going too far may lead to chaos.
- Do it right ! Find the right tools

For the developers

- Listen to the clients needs
- Make it simple, direct ! → easier to market
- Plenty of tools exist… but opportunities (AI on images, text…) and ensure interoperability

For all

- Do not wait for things to happen: test and be actors

Thank you for your attention

NOBATEK/INEF4
Pierre BOURREAU

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

http://bim4ren.eu/

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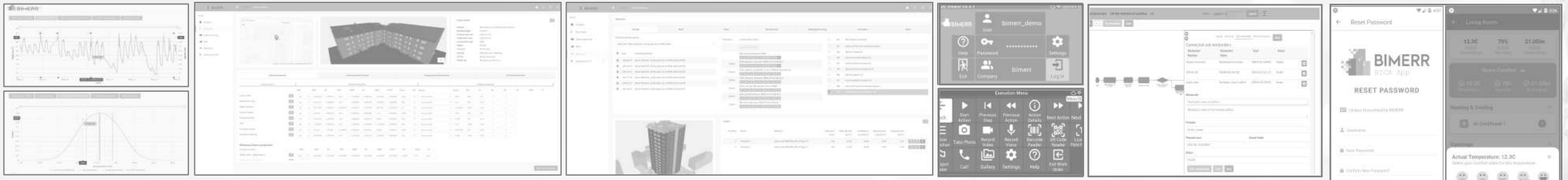


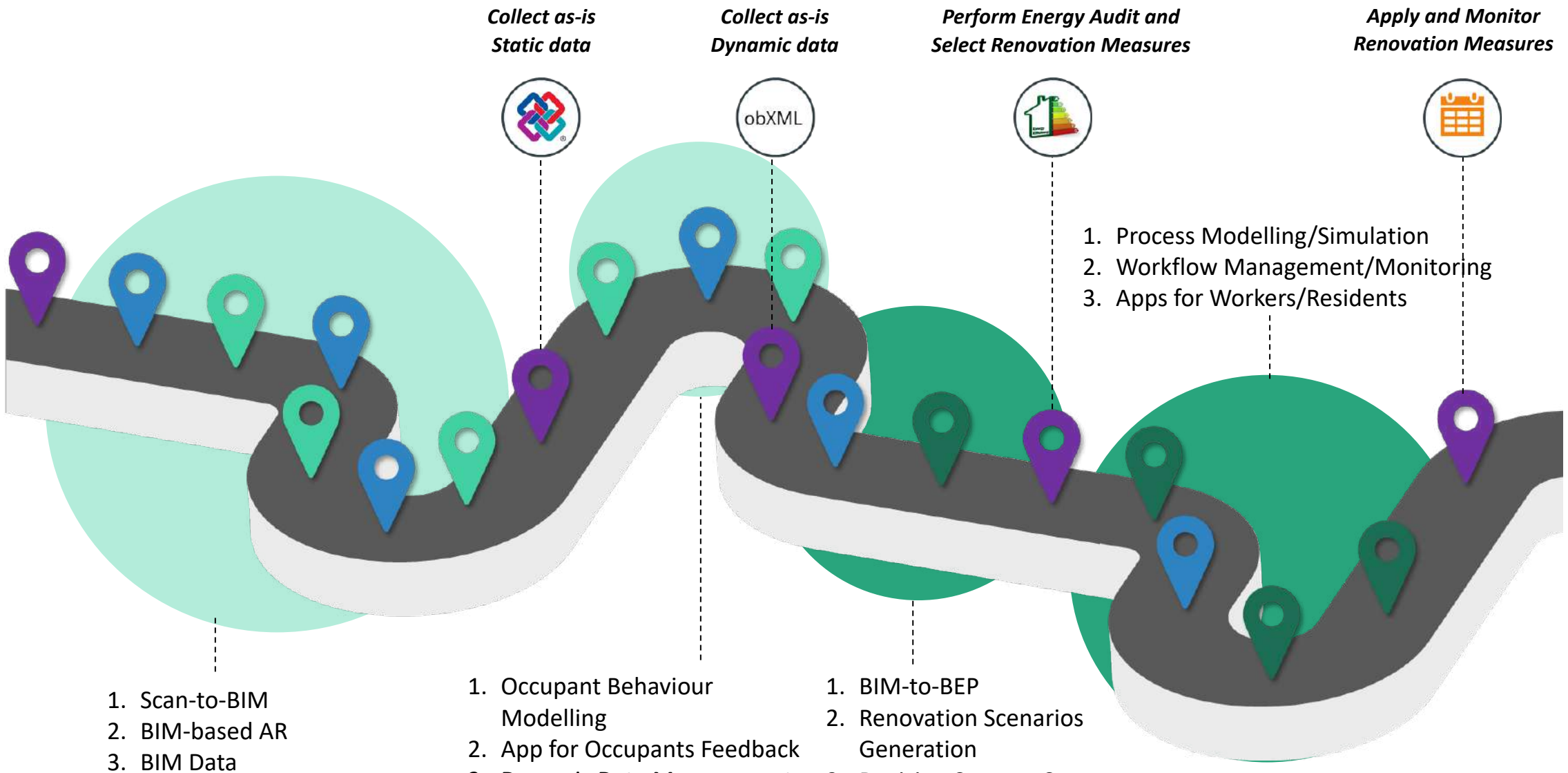
Lessons learnt

from BIM-based decision support tools

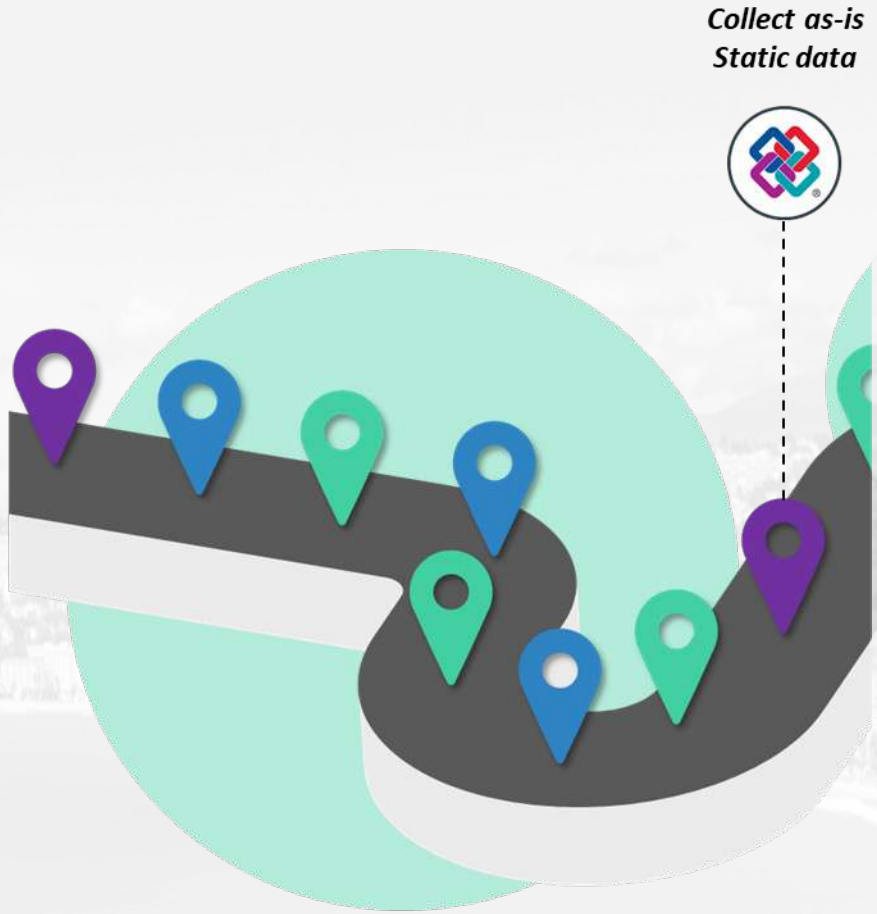
Giorgos Giannakis

HYPERTECH energy labs

Building Renovation: Digitisation in 3 Phases



As-is Data Collection Phase – Lessons Learnt



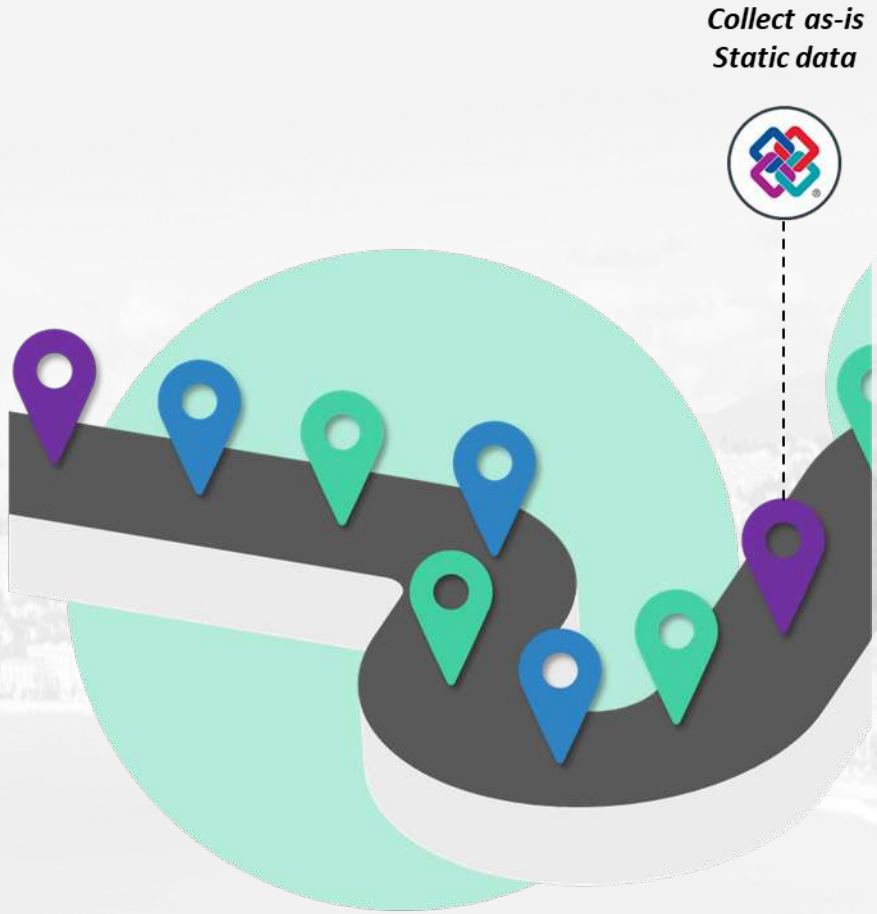
Scan-to-BIM

- ✓ Developers: Low quality of input data affects the quality of Scan-to-BIM results.
- ✓ Users: Compliance with open format files enables interoperability; Reading and editing the output files in commercial BIM tools (e.g. REVIT) is required.

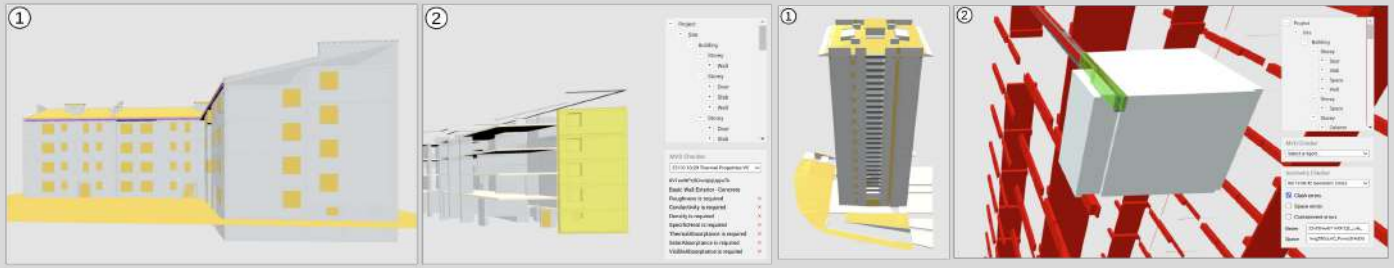
BIM enhancement with Augmented Reality

- ✓ Developers: Real-time IFC editing is a challenging task; A stable connection is required; Accurate representation of BIM geometry improves the UX.
- ✓ Users: High potential to improve communication and feedback on site; high hardware cost may hamper its replicability; initial training is required for all new users to get familiar with Smart Glasses.

As-is Data Collection Phase – Lessons Learnt

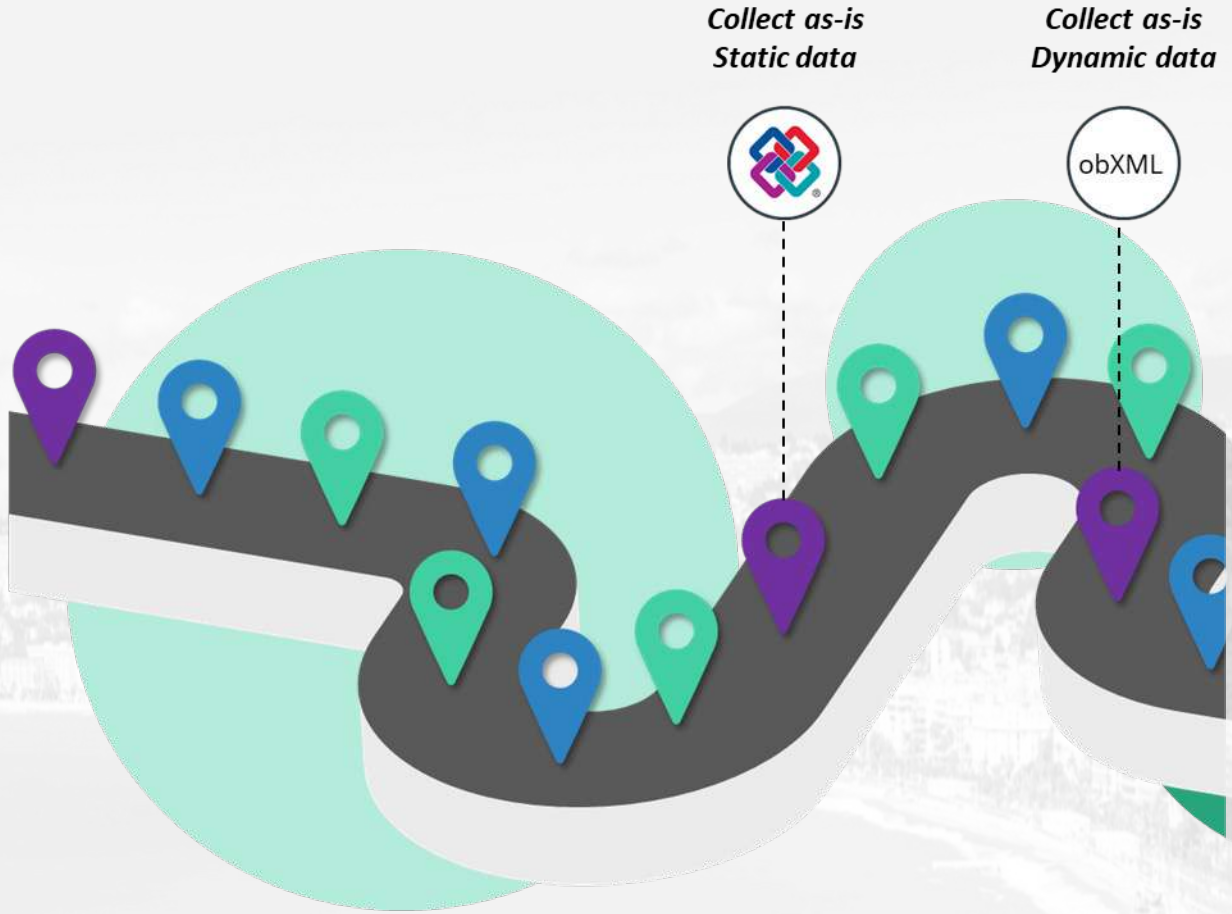


BIM Management Platform

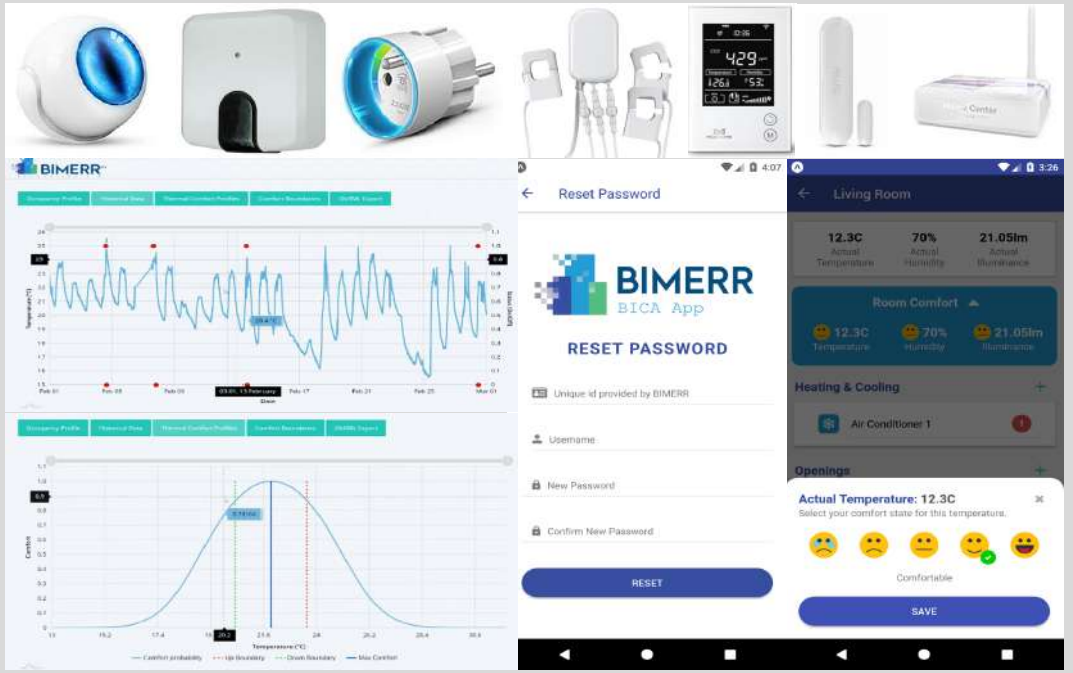


- ✓ Developers: Creating an error-free BIM model is a challenging task; Automating the data compliance, completeness and correctness checks reduces significantly the detection and correction of errors or missing information; A viewer for visualising the checks results streamlines the error correction process.
- ✓ Users: BIM file optimisation, BIM file, MVD checking, clash-error detection, and visualisation of BIM geometry are helpful features; a BIM Management Platform should provide open APIs to seamlessly query BIM data that satisfy specific criteria.

As-is Data Collection Phase – Lessons Learnt



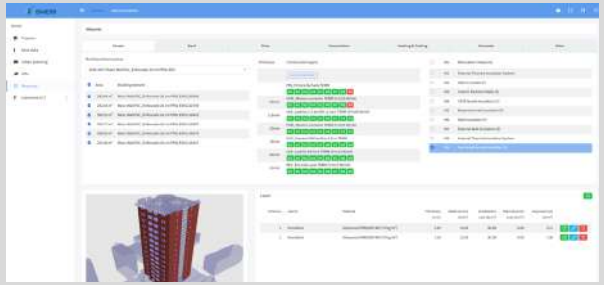
From IoT data to ML-based Profiling of Assets Usage



- ✓ Developers: IoT equipment commissioning, and maintenance are non-trivial tasks; higher IoT data granularity -> improved occupant behaviour modelling results.
- ✓ Users: main enabler to reduce the gap between measured and simulated performance; profiling data in a UI -> a nice to have feature; Receiving feedback from residents without the need for a physical conversation adds significant value.

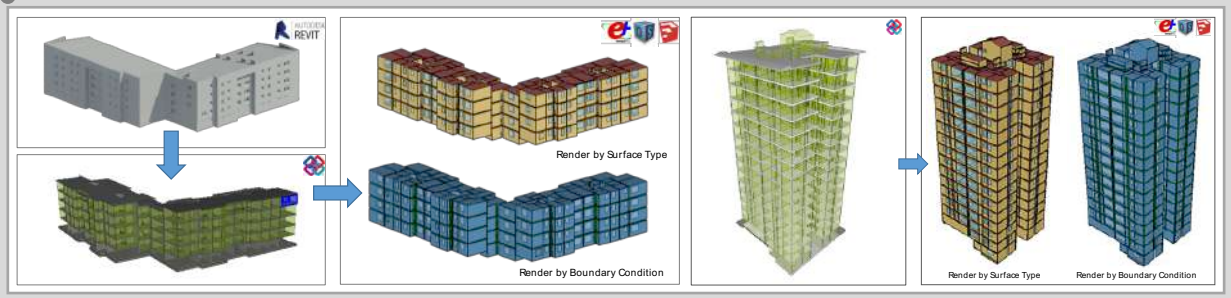
Design Phase – Lessons Learnt

BIM-based Renovation Decision Support

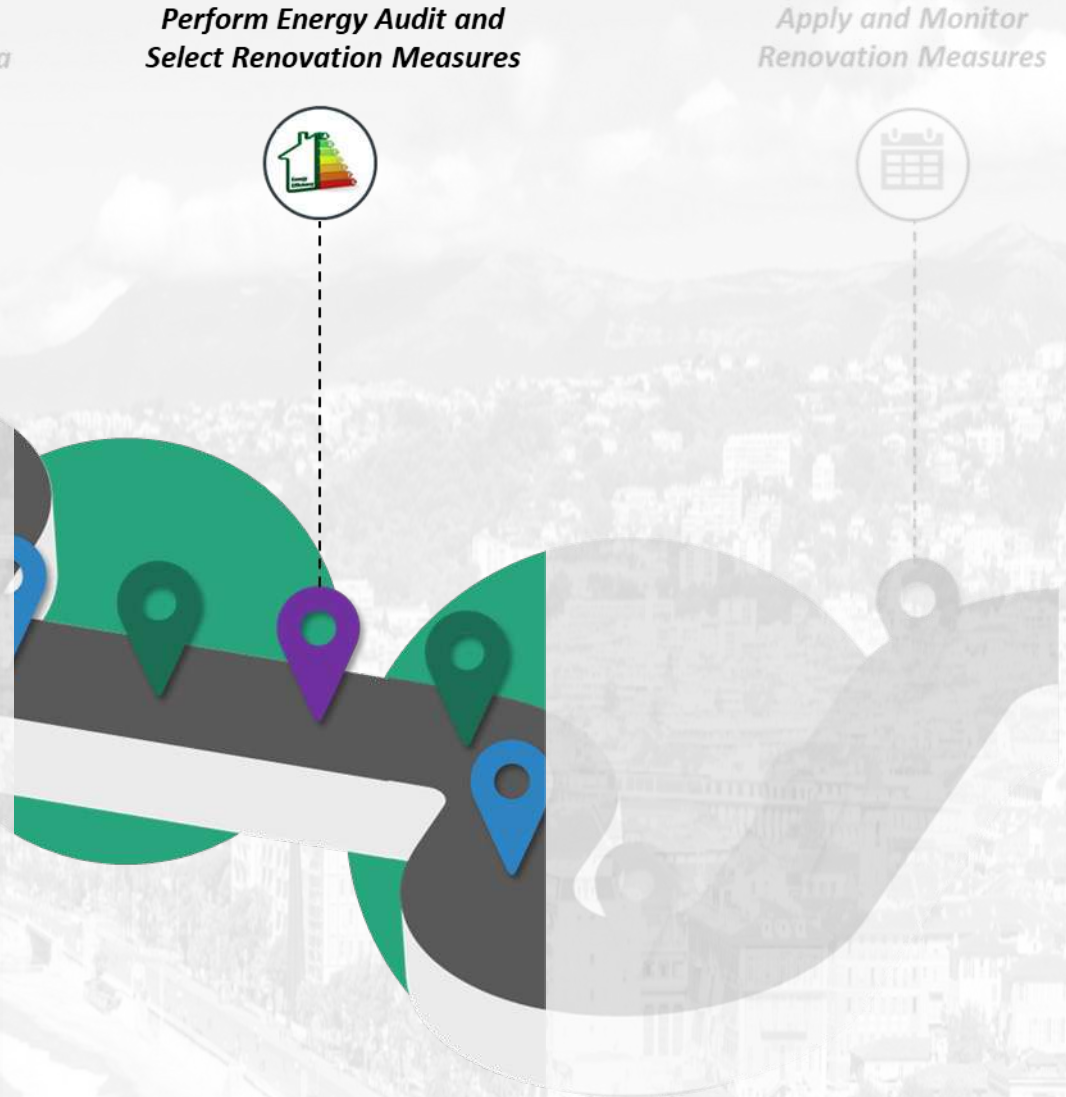


- ✓ Developers: A rich material and components database is the key; The know how renovations measures could be combined is a must; Calibration of the models should always be considered (IPMVP – Option D).
- ✓ Users: Great commercial potential; Improved accuracy of BEP estimation and significant reduction of the time required for the Energy Audit.

Building Performance Simulation

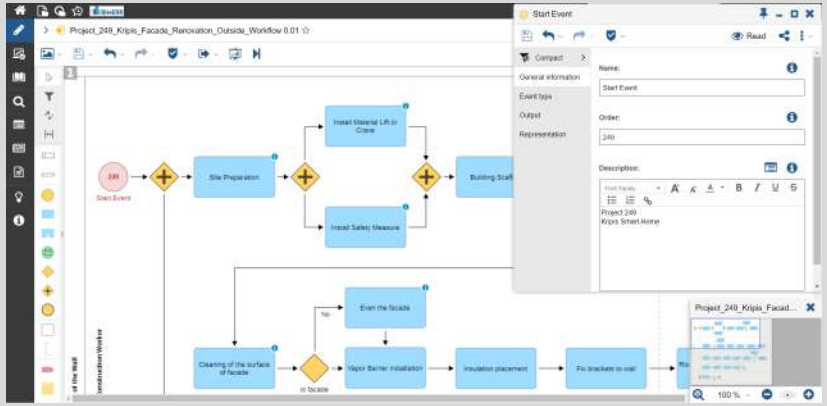


- ✓ Developers: Significant expertise on BIM & physics-based BEPs domain is required; Psets definition formalises the way BEPs data are captured and makes the automated BIM-to-BEP transformation less error-prone.



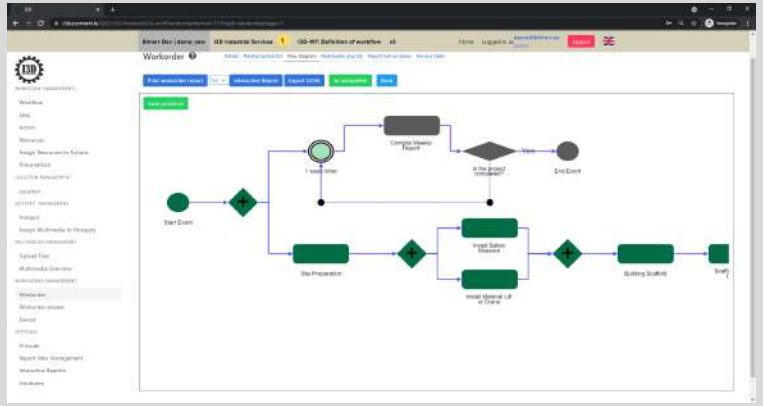
Planning & Construction Phase: Lessons Learnt

Process Modelling and Simulation



- ✓ Developers: Reuse of Renovation Process Model templates reduces the time required for the BPMN preparation for a renovation project.
- ✓ Users: Added value in large renovation projects.

Workflow Management & Monitoring

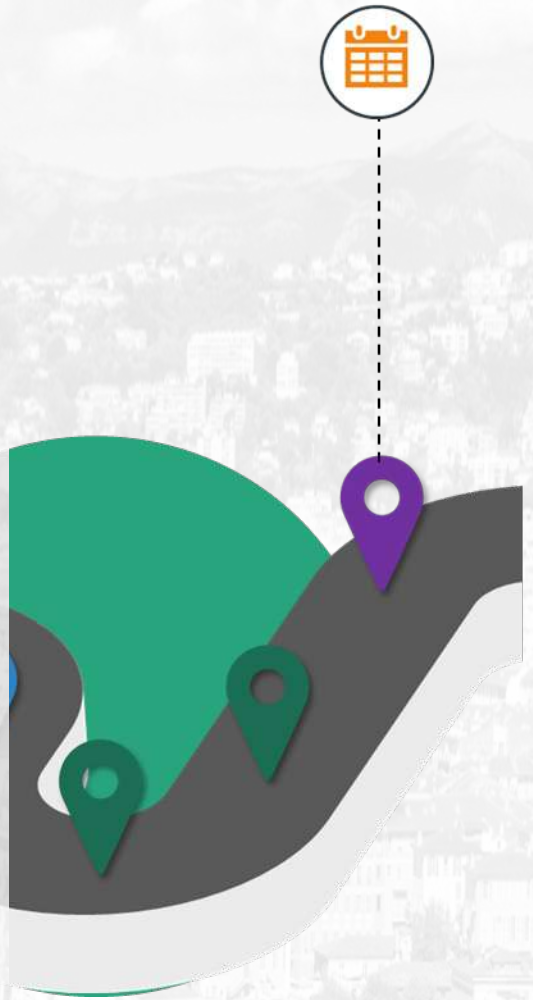


- ✓ Developers: Make the BIM-based Workflow M&M services compatible with existing tools.
- ✓ Users: AEC industry seems not to be not-ready to replace its as-usual practices.

Workers and Residents Support

- ✓ Users: Apps for workers -> Mobile apps instead of Smart Glasses; Apps for residents -> Notifying residents about upcoming renovation works near their apartments is important

Apply and Monitor Renovation Measures



Thank you!

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Giorgos Giannakis

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BIMERR Technical Manager

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 820621 Call identifier: LC-EEB-02-2018

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Growing Circle

DIGITISATION AND RENOVATION WAVE

Introduction: Souheil Soubra, CSTB, Head of EU BIM task group

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Round table on current trends and future outlooks

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Data: One of the pillars of digital continuity for Circular Economy

Sustainable Places 2022

Workshop: *'Digitisation of the building sector, a key enabler for the renovation wave'*

Pedro Mêda
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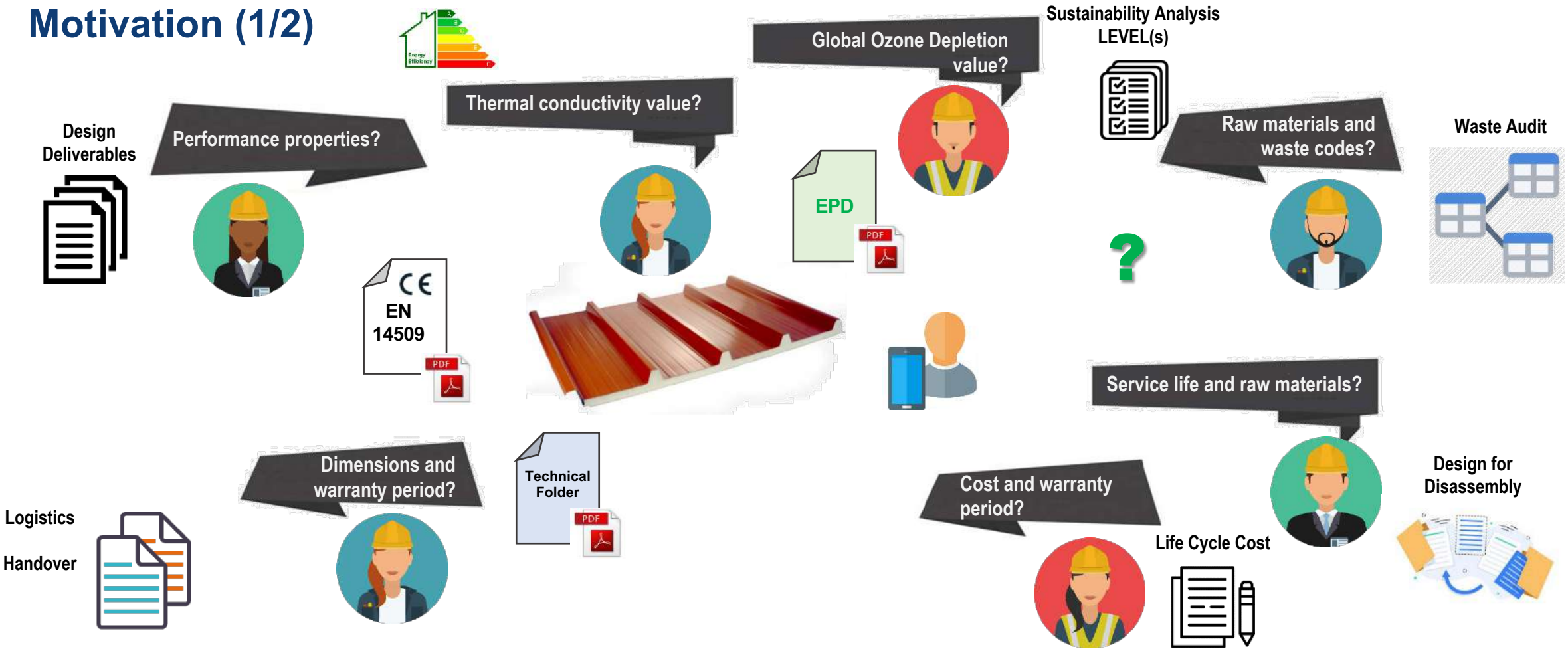
Motivation (1/2)



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Motivation (2/2)

Regulatory framework Internationalisation

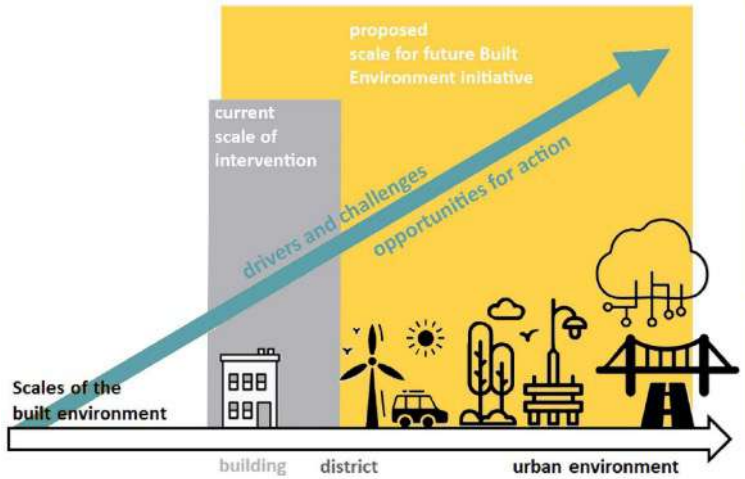
Skills

DataTemplates
with
relevant and trustworthy information

Digital Building Logbook
Product Passports
Product documentation
Digital Twin

Resource efficiency

Innovation



From product information to digital logbooks

From Smart Buildings to Smart cities

From BIM to Digital Twins

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Actions

Awareness –> Knowledge

Raise awareness among agents, through training/dissemination for the (fundamental ... core ... essential ...) role of Data Templates – and related concepts like: Product Passports, Digital Building Logbook, Digital Twin and likewise

Knowledge –> Courses

Developing courses – to achieve competency to identify/use/adapt Data Templates

Evidence –> Research

Exploring concepts for reliable information exchange by use of concepts like; Data Templates – and related concepts like: Product Passports, Digital Building Logbook, Digital Twin and likewise

Practical Research –> Digital solutions / Templates

Evidence through practical implementation **Data Templates** **in specific case studies** by aligning with outcomes towards sustainability and circularity **– Proof of concept**. **Explore solutions** for increased use of information in **BIM**-based solutions

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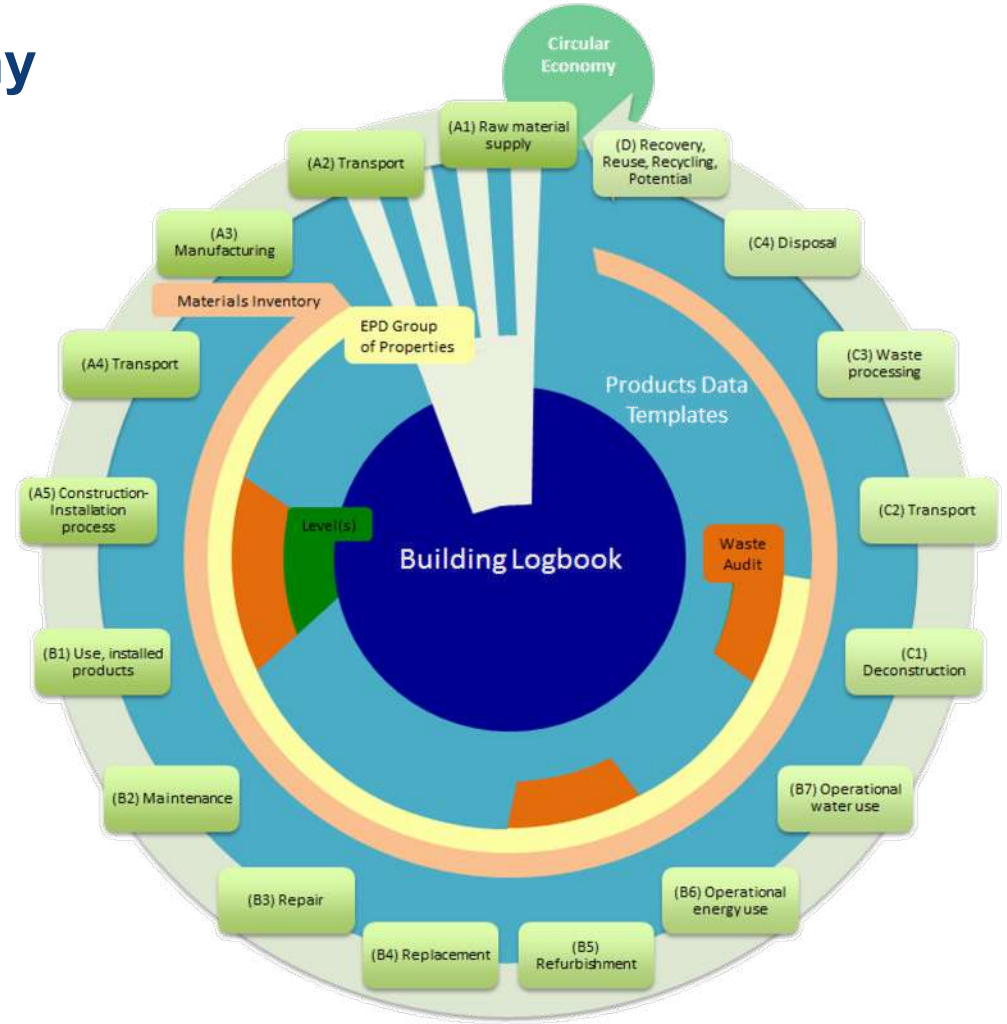
Information Circularity to foster Circular Economy

Research outcome

Circular Construction Life Cycle Information Flow Conceptual Framework



Source:

Mêda, P. et all., "Enabling circular construction information flows using Data Templates – Conceptual approach for Waste Audit", EC3_2021 - European Conference on Computing in Construction

https://ec-3.org/publications/conferences/2021/paper/?id=208

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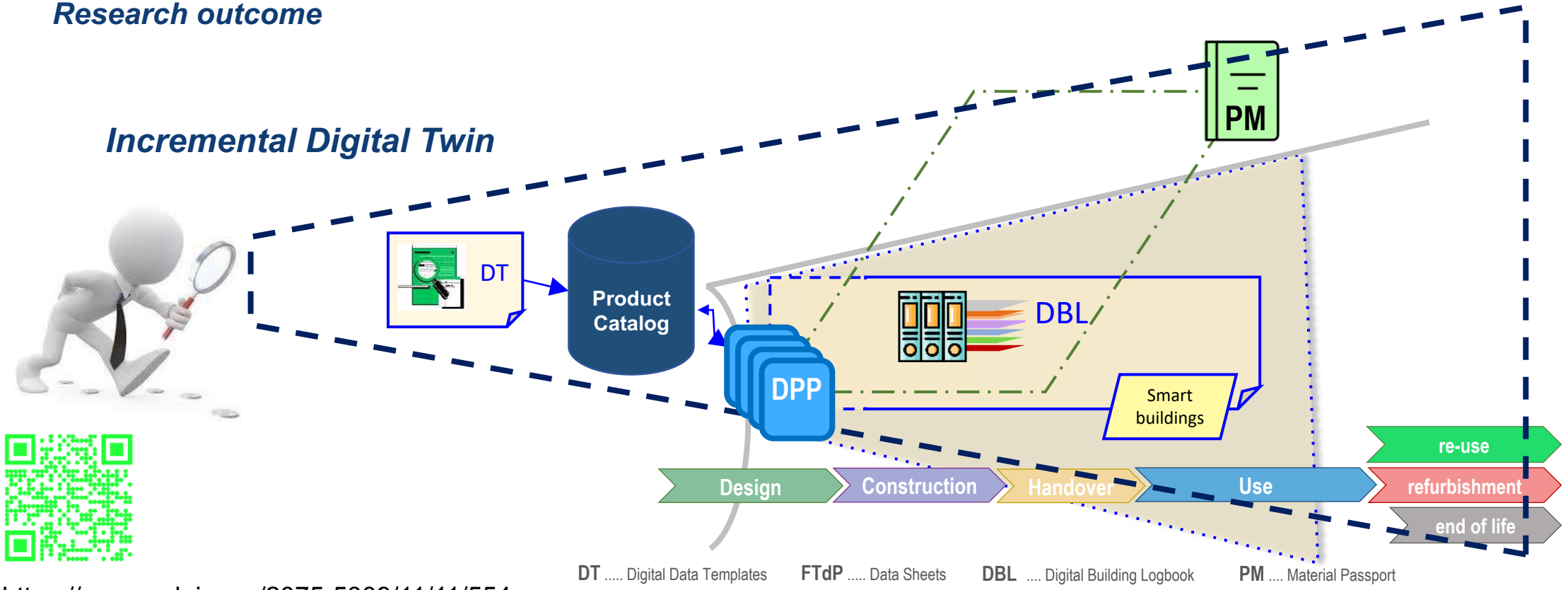
Digital continuity/traceability

Research outcome

Incremental Digital Twin



https://www.mdpi.com/2075-5309/11/11/554

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Case Studies

Data Templates
(in Portuguese)

#05 Data for Sustainability

#02 Data Gaps and AM

#01 Data Templates evaluation

#00 Cost and Characterization

#04 Design for Disassembly

#06 Re-use/Recycling potential Rates

#03 Waste Audits

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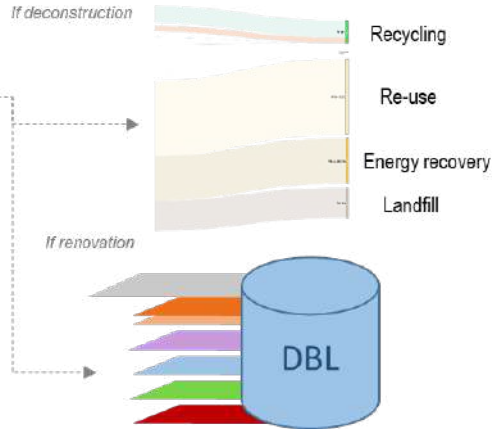
Crandle to Crandle digital continuity (1/3)

#03 – Waste Audits

This case study focused on delivering Waste Audits for future projects integrated with the early phases of design.

Aimed to structure new formats, using Data Templates, to foster products circularity, by using the same data and the same structures of their initial characterization.

As well, digital technologies to streamline the waste audit and to glue it as part of the diagnosis for design are evaluated and tested.



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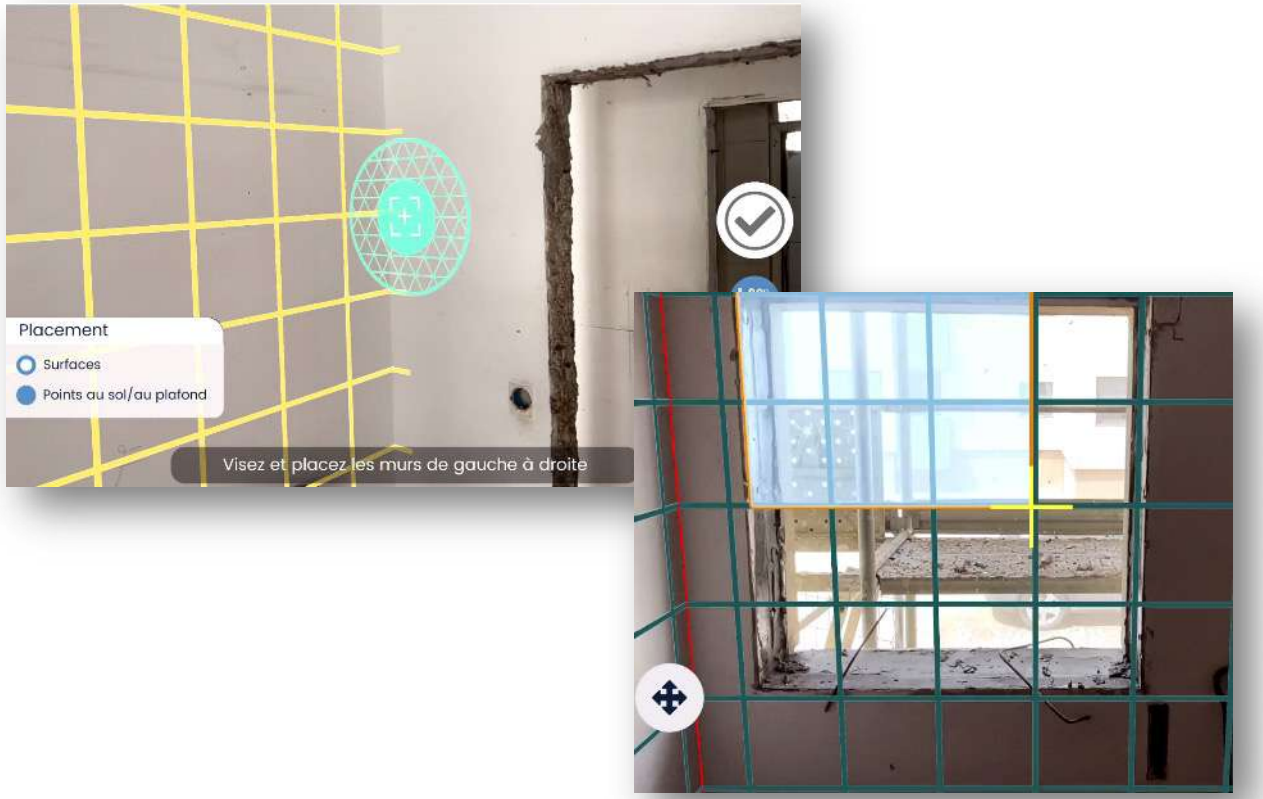
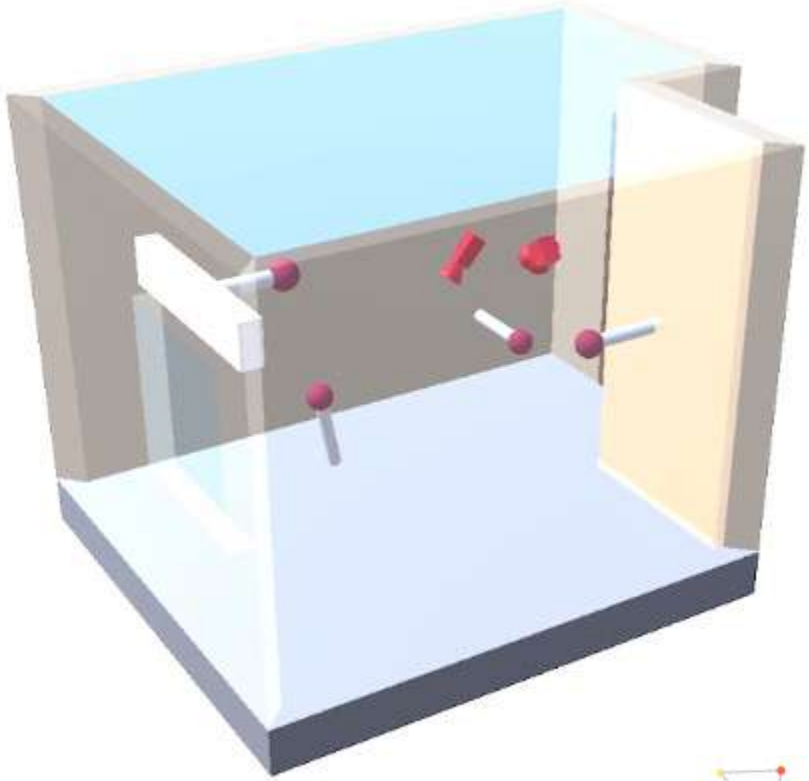
Crandle to Crandle digital continuity (2/3)

#03 – Digital technologies and integration with the design



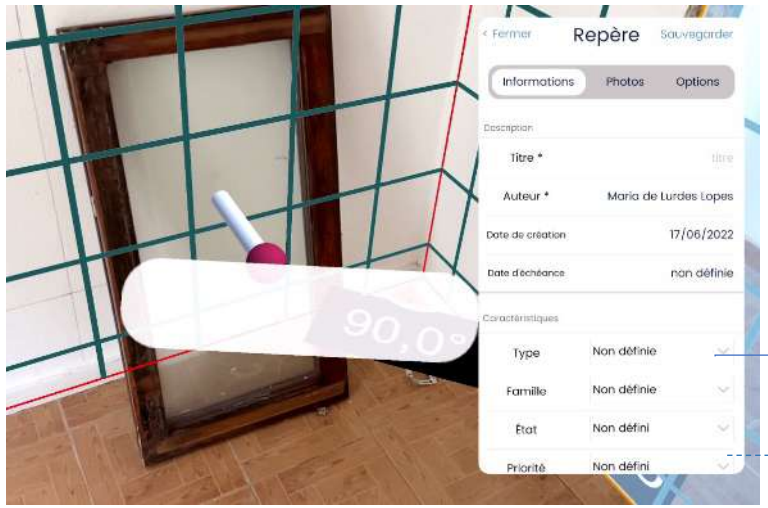


In collaboration with: BIM4Ren

Crandle to Crandle digital continuity (3/3)

***#03 – Data that enables circularity** (properties for new products, for desconstruction, for other processes…)*

DPP



Type of material	Material identification	Waste code (EWC and EURAL)	Location	Quantity	Unit	Possible outlets[1]	Recommended outlet[2]	Precautions to take during the deconstruction phase[3]	Pictures and notes

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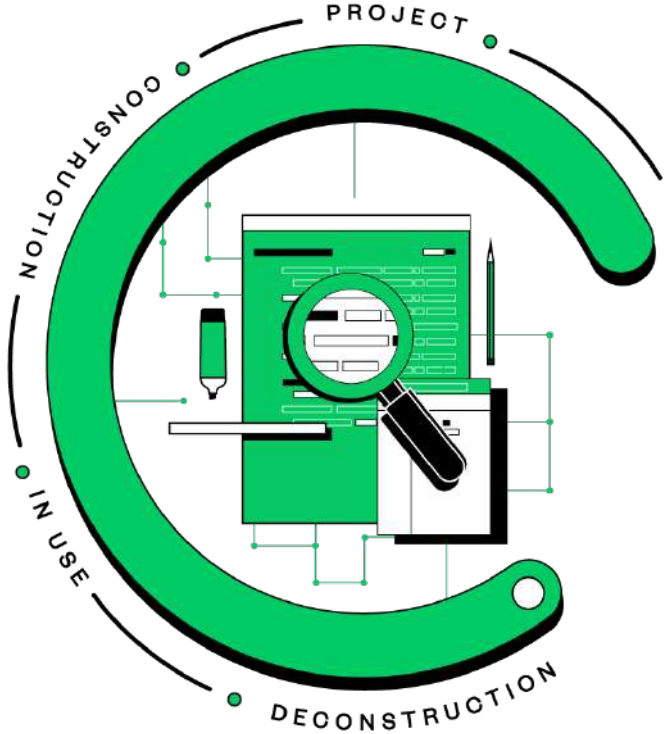
Achievements/Challenges

- **Need:** Clarification on the concepts that appear every day as buzz words in the Construction Industry.
- **Solution:** Develop conceptual frameworks evidencing the alignment and overlap of concepts in data and in processes.
- **Objective:** Provide awareness on how digitalization and circular economy share actions and work together for the benefit of the industry.
- **Goal:** Prove the added value of Data Templates as key elements of a Data continuity strategy with outcomes for Circular Economy
- **Implementation:** Set a roadmap of actions that will work as EU Green Deal Goals enablers.



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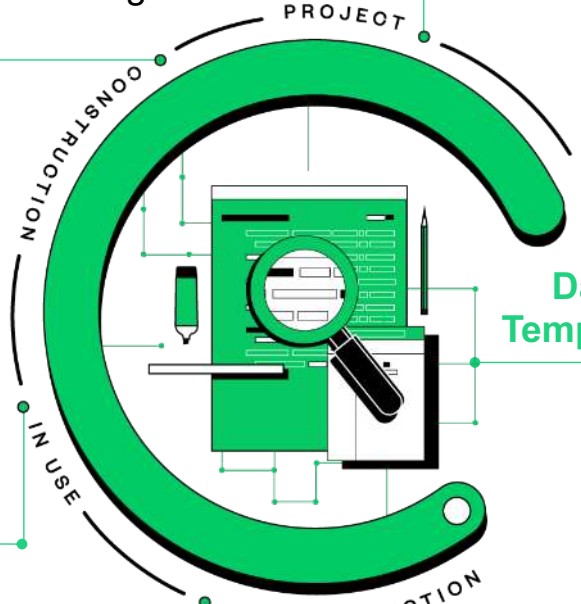
Achievements/Challenges

- Performance requirements
- Environmental Characteristics
- Construction Products Regulation

- Bill of quantities
- BIM
- Construction Costs

Data



Data Templates

- Data traceability
- Performance Data
- Logistics Data

- EW Codes
- Waste Directive

Digital Product Passports

- Level(s)
- Design for Disassembly
- Waste Audit
- Green Procurement
- Asset Management

Digital Data

Virtual

Physical

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Thank you for your attention

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Round table on current trends and future outlooks

Platforms for EeB Renovation
BIM-Speed project pitch

Timo Hartmann
timo.hartmann@tu-berlin.de

Technische Universität Berlin

Why is it so hard to scale deep renovation efforts?

≠

P2ENDURE

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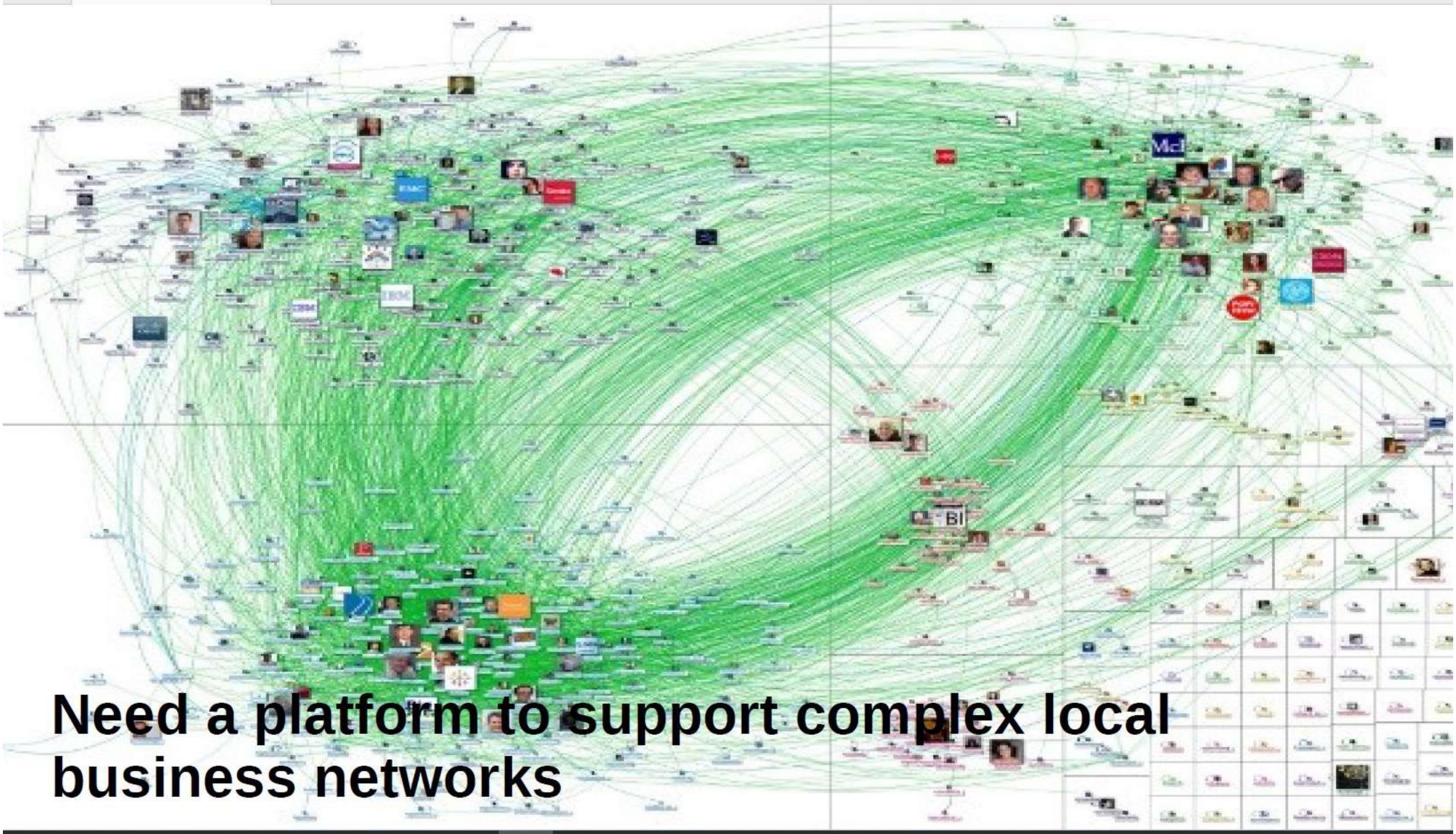
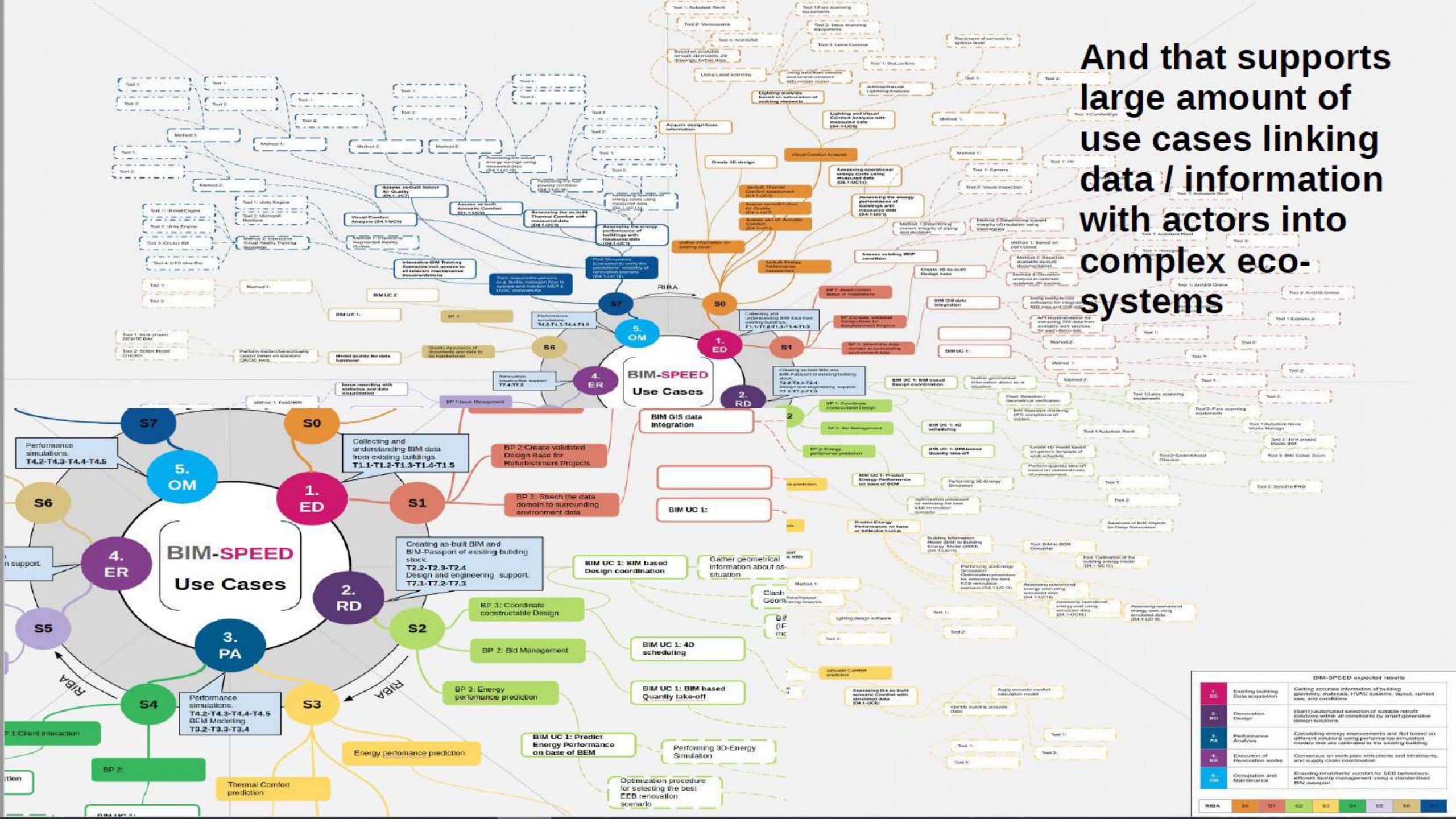
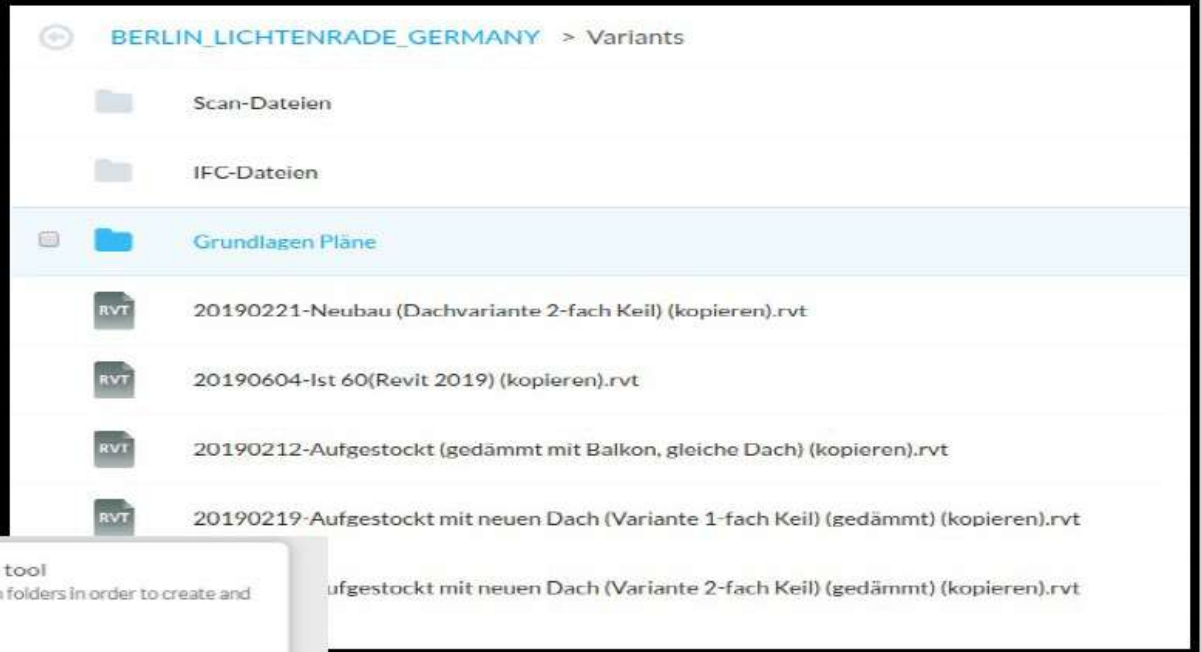

Need a platform to support complex local business networks

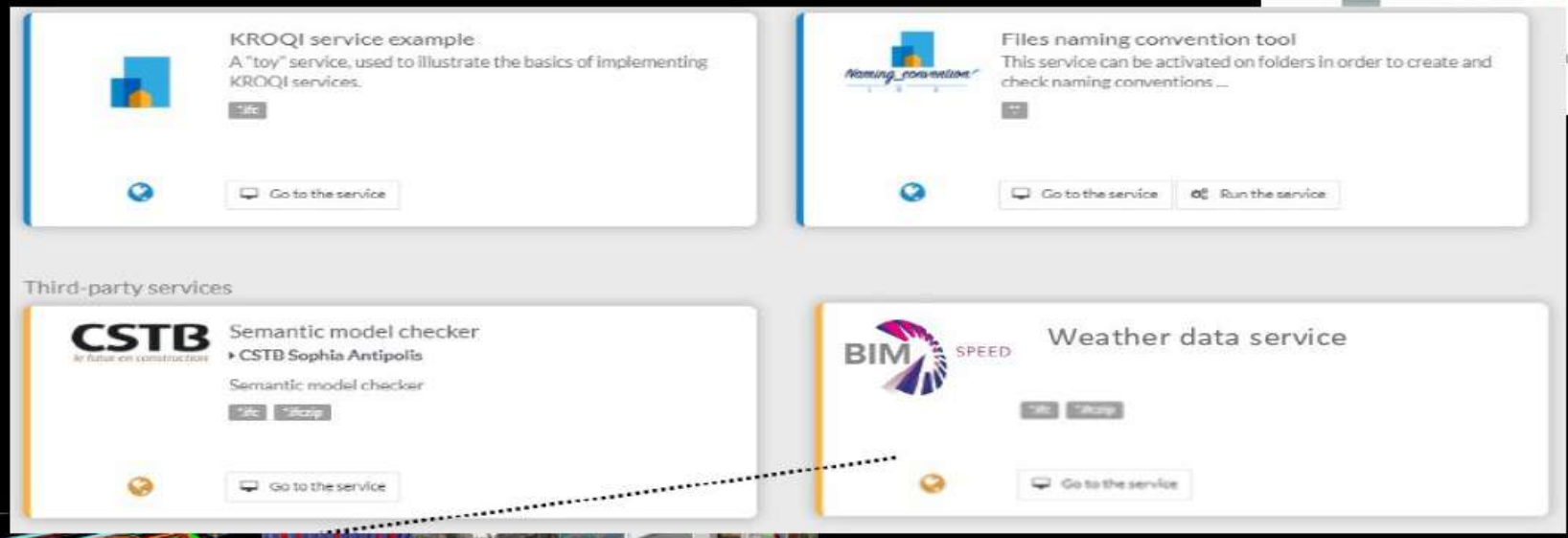


And that supports large amount of use cases linking data / information with actors into complex eco-systems

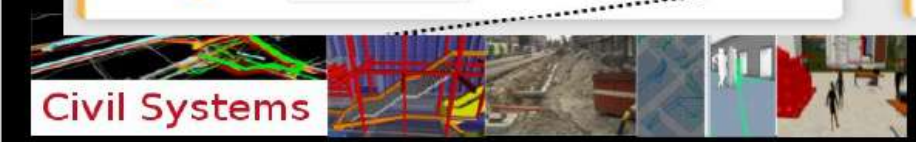
BIM- SPEED will provide all stakeholders in the housing renovation market with holistic solutions:

1. **An affordable cloud-base BIM platform**
2. **A set of inter-operable BIM tools**
3. **Validation and standardised procedures for implementing renovation solutions with guaranteed energy performance and inhabitants' comfort**





https://bimspeed.kroqi.fr/login/#/



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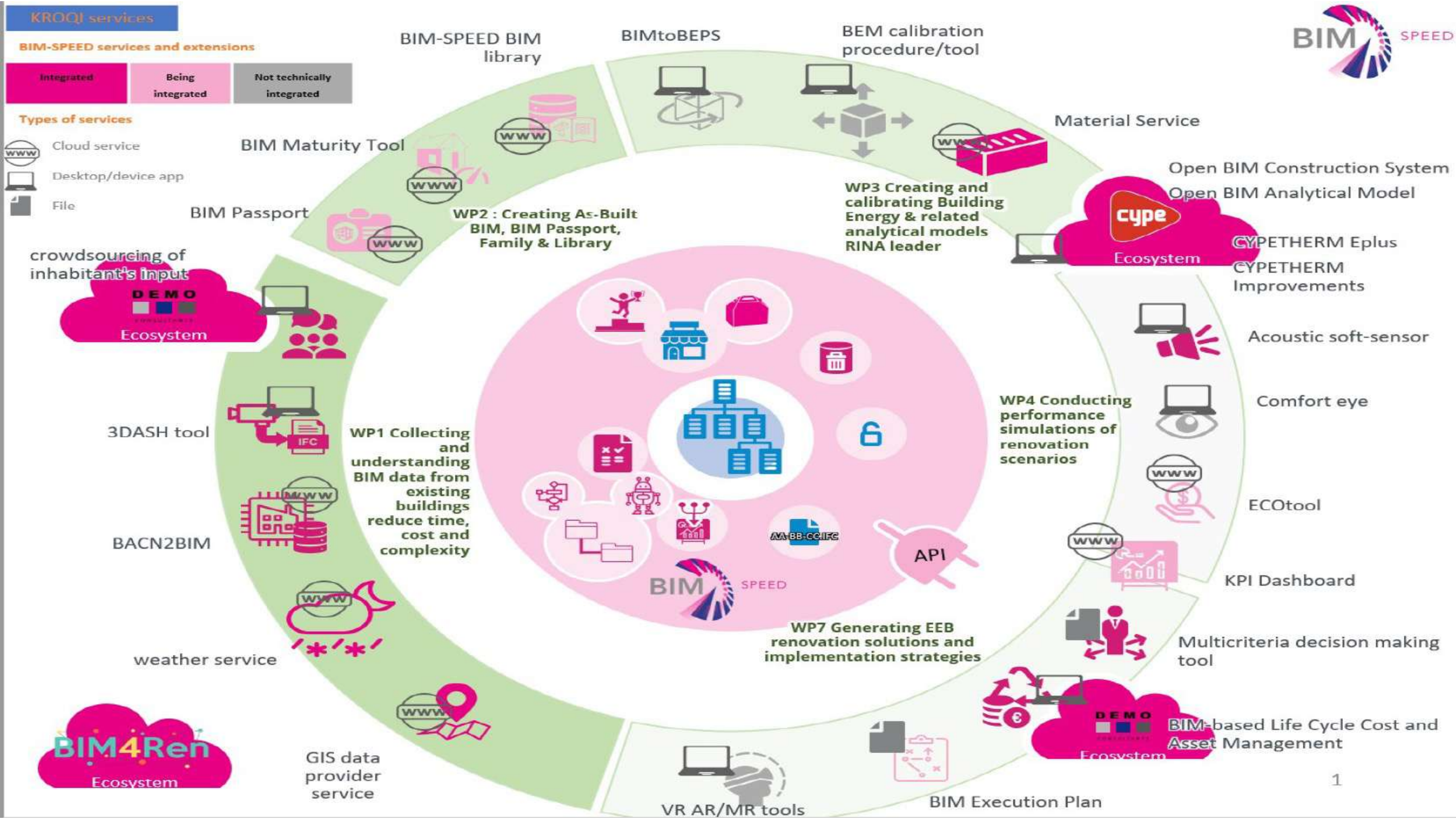
DEWALT
AIR FORCE
Ford
FUSION
21


KROQI services
BIM-SPEED services and extensions
Integrated
Being integrated
Not technically integrated
Types of services
Cloud service
Desktop/device app
File
BIM-SPEED BIM library
BIMtoBEPS
BEM calibration procedure/tool
Material Service
BIM Maturity Tool
BIM Passport
WP2 : Creating As-Built BIM, BIM Passport, Family & Library
WP3 Creating and calibrating Building Energy & related analytical models RINA leader
Open BIM Construction System
Open BIM Analytical Model
cype
Ecosystem
CYPETHERM Eplus
CYPETHERM Improvements
crowdsourcing of inhabitant's input
DEMO
Ecosystem
Acoustic soft-sensor
3DASH tool
IFC
WP1 Collecting and understanding BIM data from existing buildings reduce time, cost and complexity
WP4 Conducting performance simulations of renovation scenarios
Comfort eye
BACN2BIM
ECOtool
API
KPI Dashboard
BIM SPEED
AA-BB-CC.IFC
Multicriteria decision making tool
weather service
WP7 Generating EEB renovation solutions and implementation strategies
BIM4Ren
Ecosystem
GIS data provider service
BIM-based Life Cycle Cost and Asset Management
VR AR/MR tools
BIM Execution Plan
1

GİZAL GARAJ
MoTeC
Nitto
OS GIKEN
UÇANOK

BIM Speed HVAC DL inference

BIM SPEED

[TECHNOLOGY CENTRE] CARTIF

Model Folder

Resnet101

Backend

OPENCV

Target

CPU

Confidence: 0,15

NMS: 0,5

Size: 700 X 700

Inference

Save Results

Remove

Image number: 33

Image Validation (22).jpg

Inference (ms): 6688,55

Id	Class	Confidence
0	Boiler	1,000
1	Radiator	0,258

Resnet101

OPENCV

CPU

Confidence: 0,15

NMS: 0,50

Size: 700 X 700

CAIXA
CAIXA

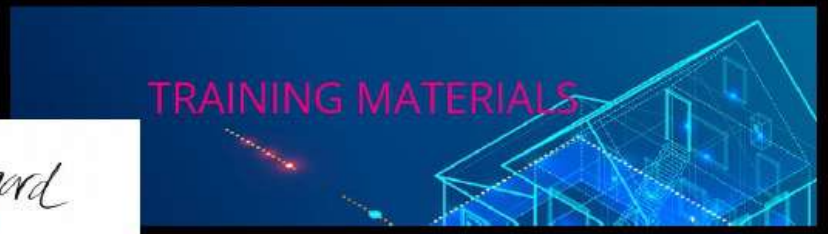
How can we establish the eco-system that is reqired around the platform:

12 demonstration projects (building renovation)
10+ illustrative apps and services integrated in the platform

UCM
® a service by buildingSMART International

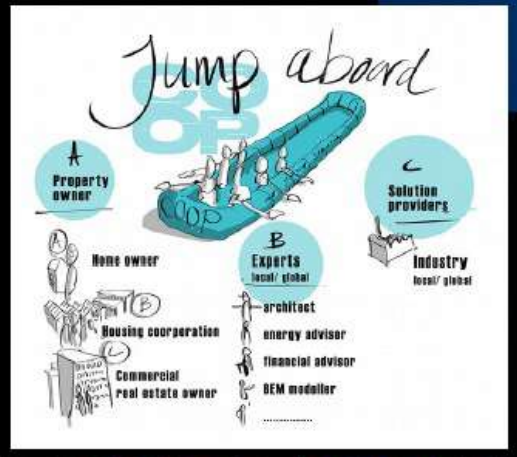
Formalization of 20+ BIM-Speed use cases for BIM for renovation

https://ucm.buildingsmart.org/



Detailed training material

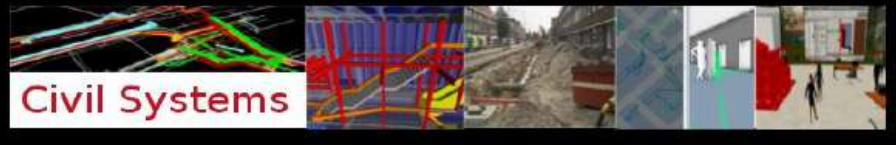
https://www.bim-speed.eu/en/training-materials



COMPETITION

BIM-Speed competition

https://www.bim-speed.eu/en/competition



But this will not be enough …

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What is the required scope – renovation, all projects, infra?

What are business drivers, requirements and needs?

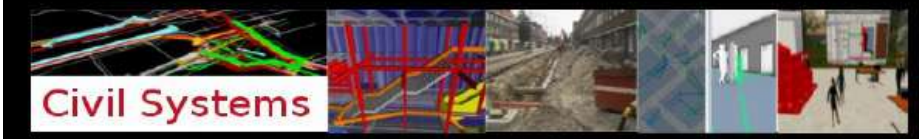
What does it take to establish a European cloud platform and eco-system for building renovation?

Who will provide, manage, maintain, market, finance it?

Do we need an EU solution or are we Okay with international offers?

AUTODESK® BIM 360™ DOCS

AUTODESK® FORGE



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Moderator: Antoine Dugué, NOBATEK/INEF4

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ROUND TABLE

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DIGITISATION AND RENOVATION WAVE

Digitisation of the building sector, a key enabler for the renovation wave

SEP 7TH, 2022 NICE, FRANCE

Thank you !

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