Unlocking BIM for Mechanical, Electrical, and Plumbing Designers

Pauli Keinonen

MagiCAD / Progman

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Pauli Keinonen

Technology Director

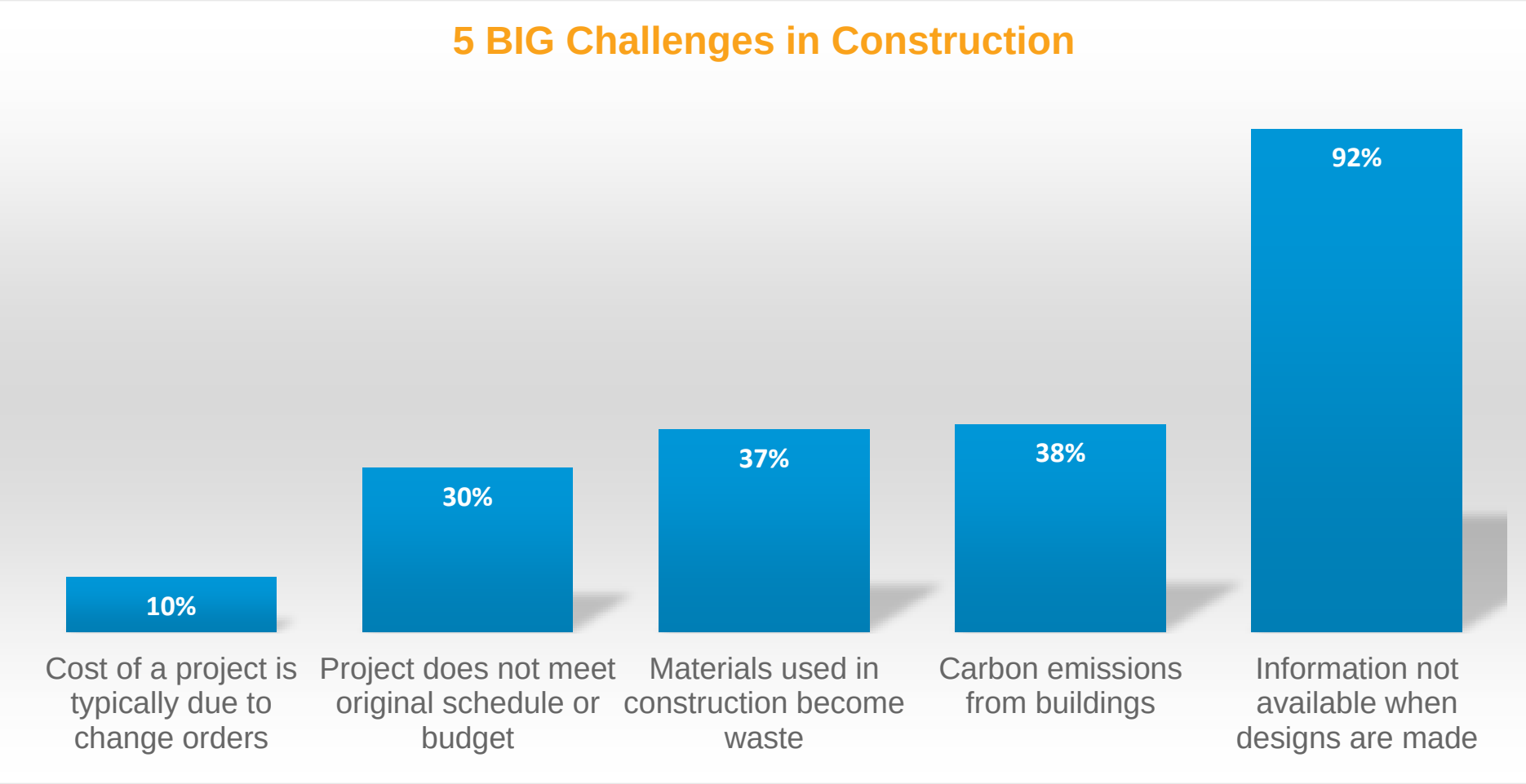
Pauli Keinonen is Technology Director at Progman and an experienced BIM and HVAC expert with 19 years of experience in the industry.

At Progman, Pauli is leading the team who develops MagiCAD - the number one BIM solution for powerful, faster and more efficient MEP design. MagiCAD is used in 70 countries. It handles engineering system calculations and enables efficient BIM workflow and collaboration.

Pauli understands both the global and local customer needs for BIM software. His team is involved in exploring Progman's new and existing markets, at the same time, providing extensive support for local design standards, symbols and languages.

Pauli is deeply committed to driving the use of Building Information Modelling and other technologies to streamline often redundant and outdated workflows. As such, he believes that BIM workflow isn’t just software, nor is it simply a 3D model. It contains not only the model elements but the vast amounts of information that make up the project, as well as the process of exchanging that information with other parties involved.

Construction market realities



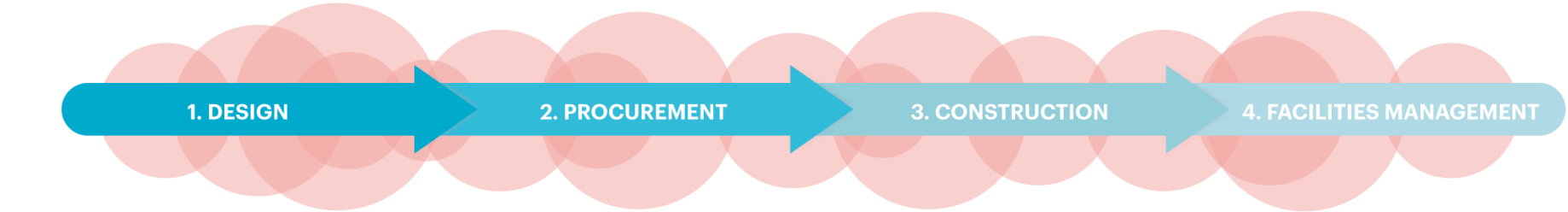
Source: https://cmaanet.org/files/files/Pubs/2015OwnersSurvey.pdf

WE LIVE IN AN AGE OF GREAT AUTOMATION.

EVERY BUSINESS PROCESS IS DIGITALIZED, EVERY DECISION IS DRIVEN BY DATA.

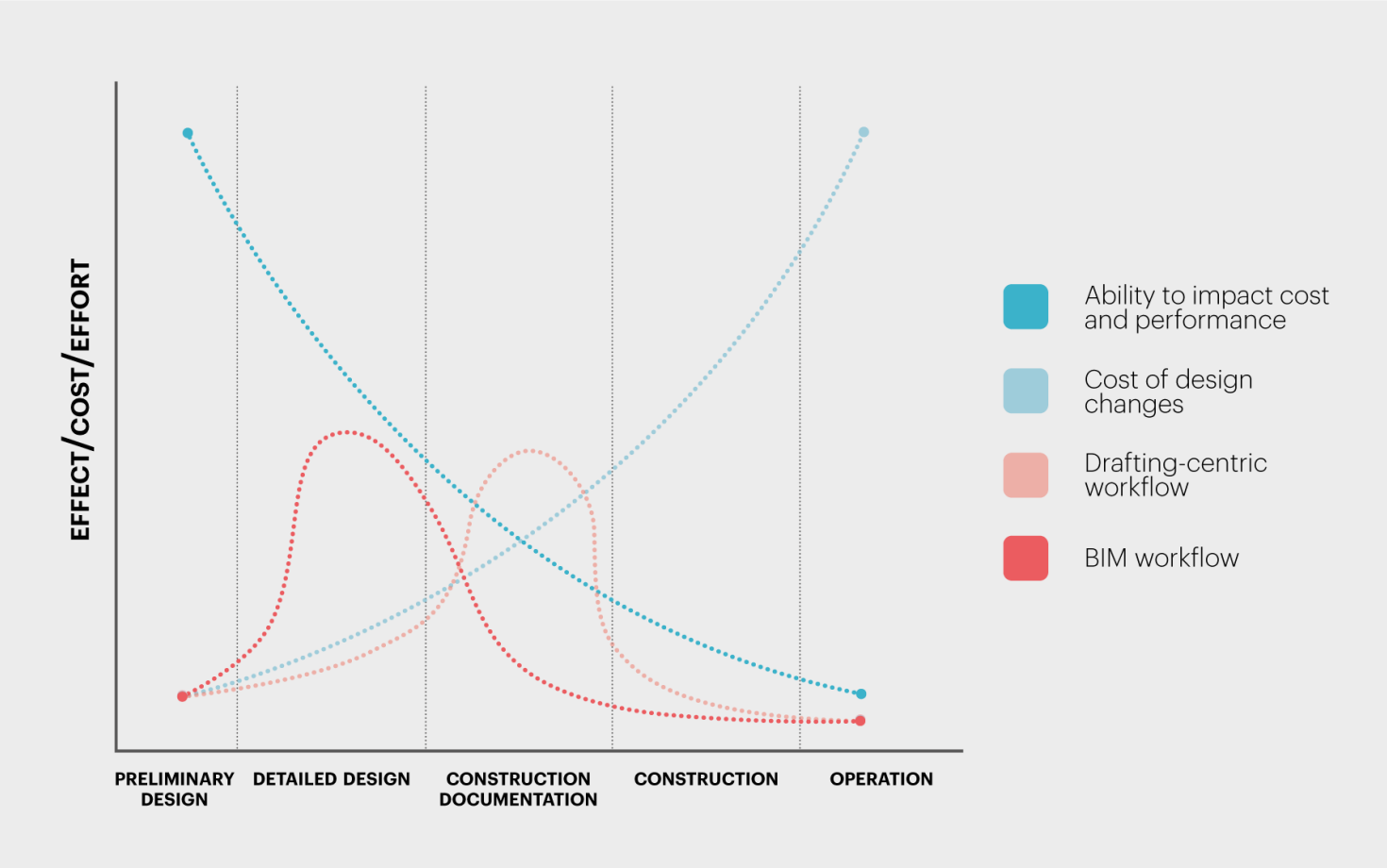
Even on the building site. Construction needs to step up productivity through digitalisation.

Four pillars of the BIM project




“GIVE ME SIX HOURS TO CHOP DOWN A TREE, AND I WILL SPEND THE FIRST **FOUR SHARPENING THE AXE.**”
Abraham Lincoln

Information flow with BIM



Lean Construction & BIM

LEAN CONSTRUCTION	INTERSECTION WITH BIM
Elimination of wastages (time, materials & effort)	Structural clash tests
	Design alternatives to select most suitable design
	Performance simulations for the most efficient energy solution
Customer Value (achieve requirements)	Vizualization of solution that ensure clear understanding of the model
	Analysis for best result
	Understanding between client and supplier by use of 3D models and walk throughs
Reduced Cycle Times	Automated generation of changes and material schedules and quantities
	Provide accurate information to Prefabrication
	Visualizing of work flow to check for process conflicts (teams and tasks)
Work Flow	Through making detail schedules of tasks and materails delivery times
Collboration	Ability to work concurrently on same design solution by different teams

Source: Allan Fred Onyango (https://www.diva-portal.org/smash/get/diva2:1048993/FULLTEXT01.pdf)

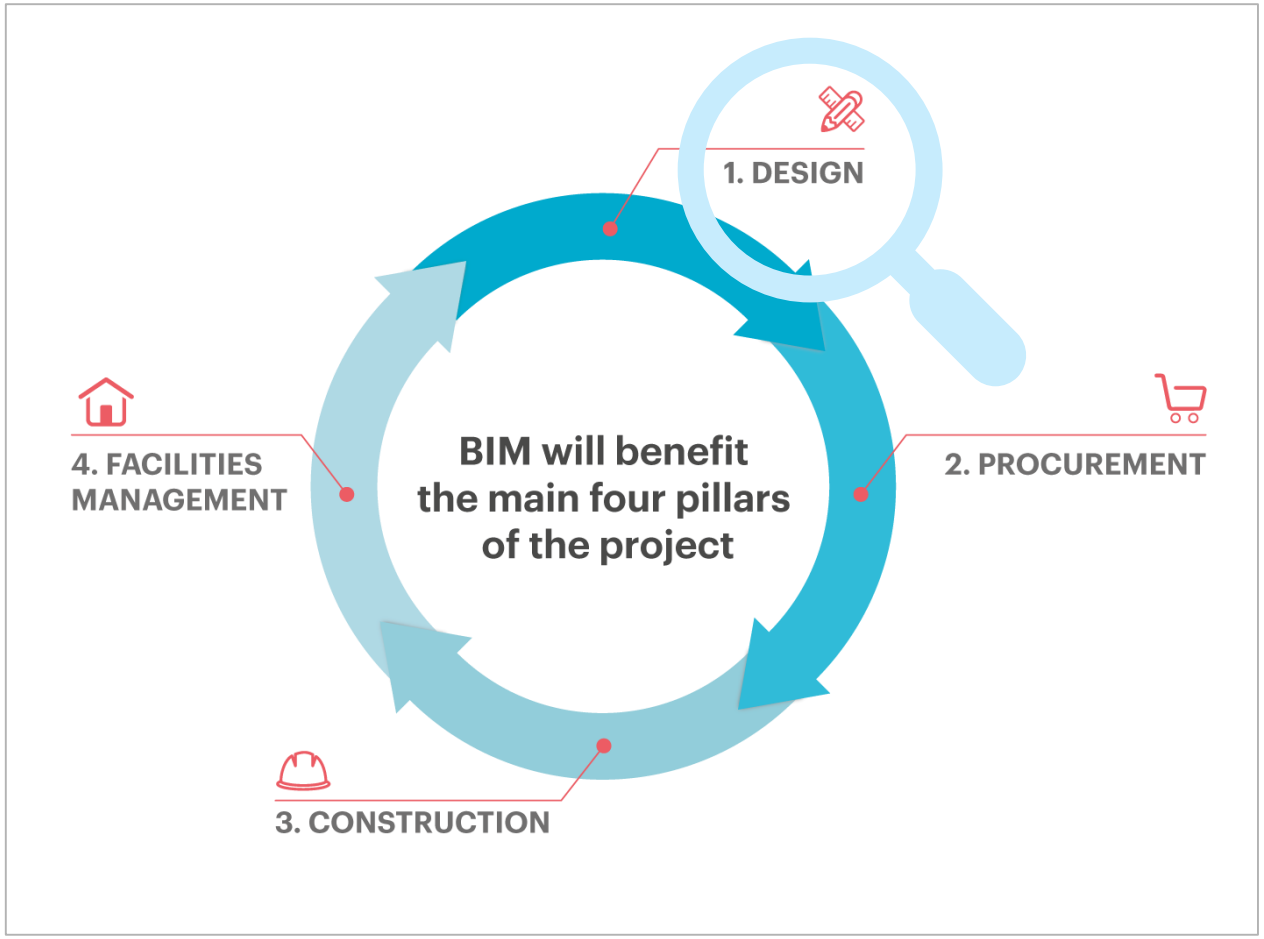
Why BIM is necessary?

	BUILT ASSETS		SECTORS	
	Delivery Phase	Use Phase	Construction	Digital
Economical	**10% savings on time delivery** ****	**Lower maintenance costs** ****	Improve sector competitiveness Grow export capability **	Grow digital services industry Digital single market
Environmental	**Less site waste**	**Optimise operational energy use** **Assess whole life-cycle analysis** *	Resource efficiency Circular economy *	Data infrastructure resource efficiency
Social	Higher standard of health and safety Improved public consultation and engagement	Improve social outcomes (e.g. patient care, pupil learning) *	Cleaner and safer jobs in construction Attract next generation to the sector	Data security Attract digital talent to construction

KEY: * = Targeted benefit of the surveyed public sector BIM programmes

Source: Handbook for the introduction of Building Information Modelling by the European Public Sector 2017

1. BIM in design



A good design adapts as it gathers input from all stakeholders

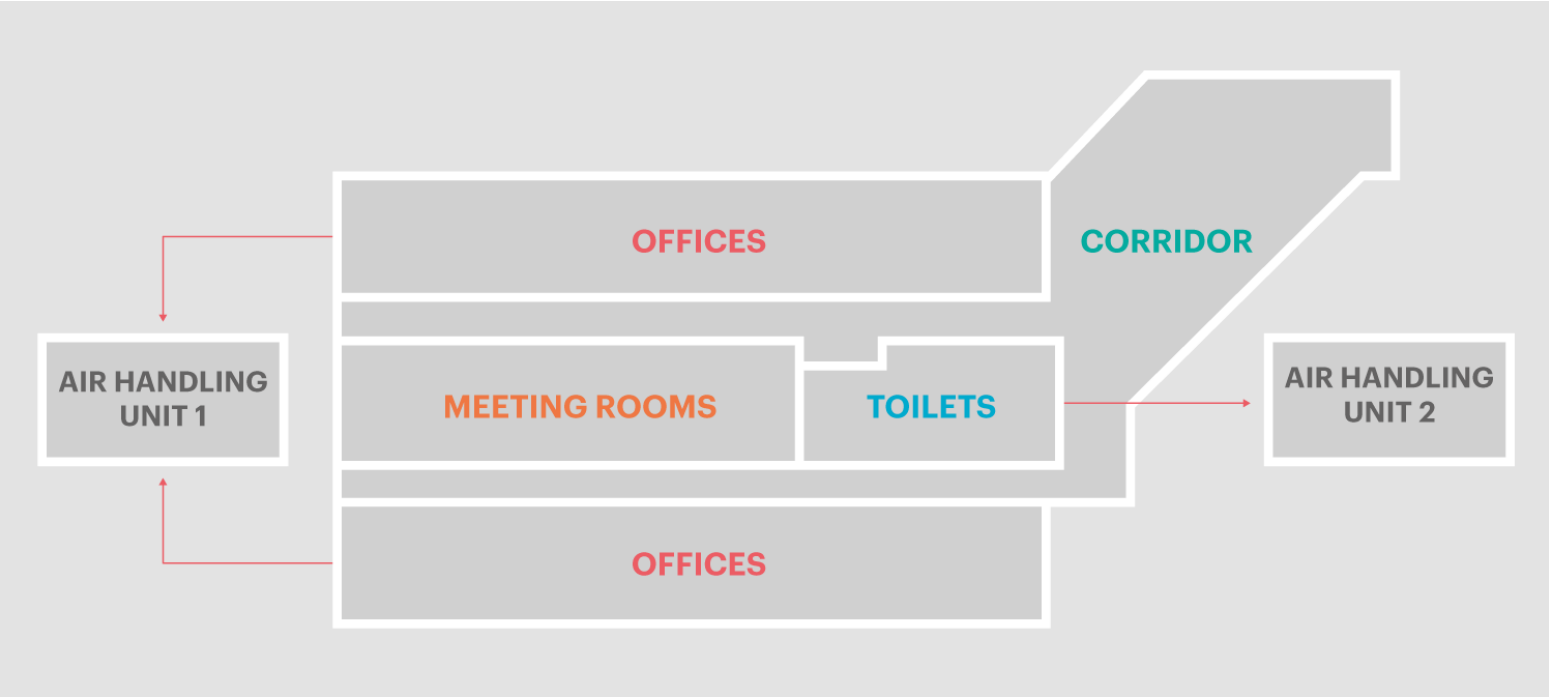
- Optimal design demands
  - Contribution from all stakeholders
  - A meaningful collaboration method
  - Willingness to reach common goals - BIM enables all three

92% of the designers confirm that not all *information* is available when designs are made

1. BIM in design

Buildings are responsible for 38 of carbon emissions and the consumption of 40% of the world's energy

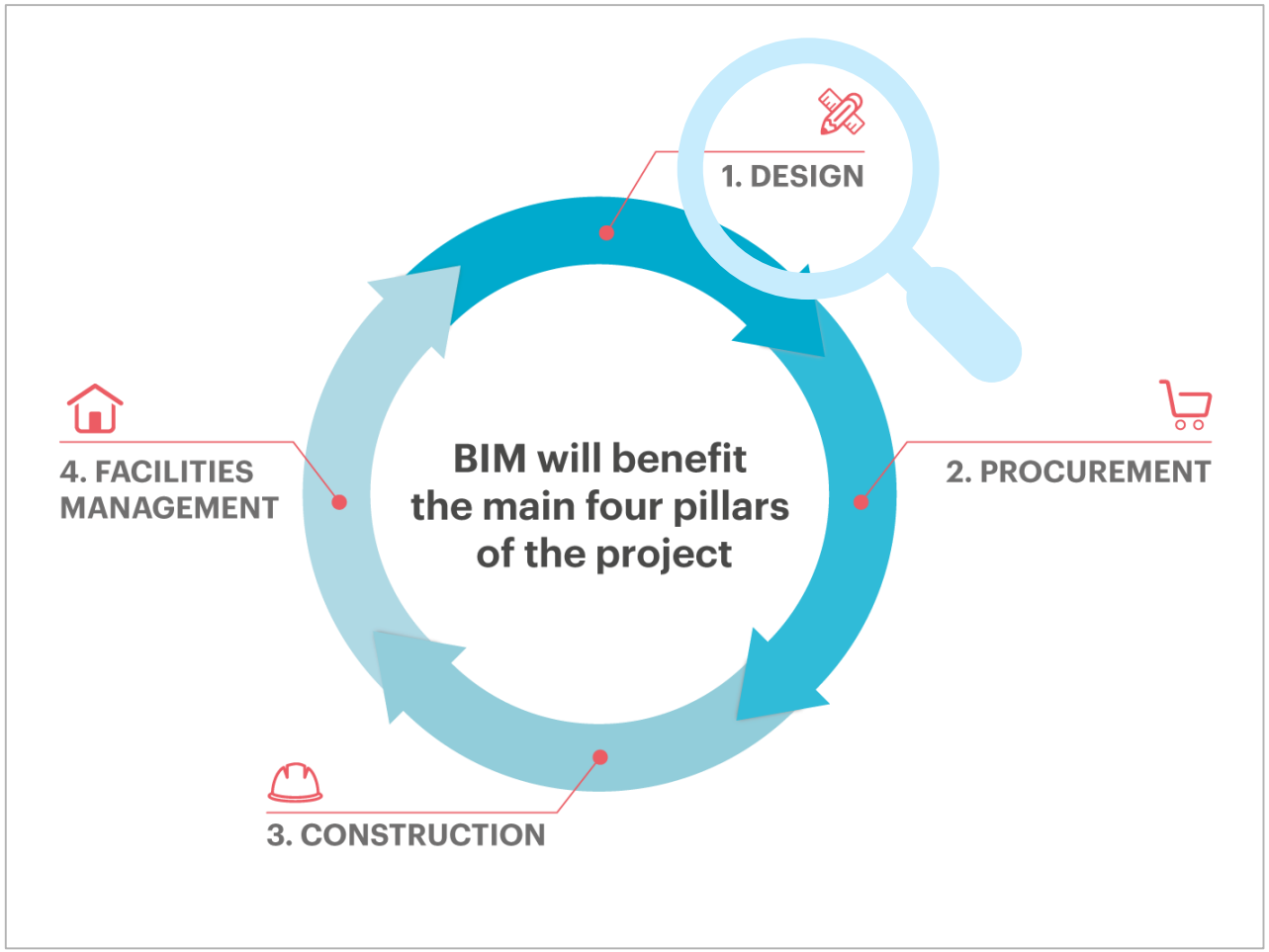
Energy analyses



- BIM model provides information for initial energy analyses
- Predictions of the consumption of energy can be determined
- The model can be revised to lower energy consumption or to determine where fixes are needed
- Estimated energy analysis can be validated

Source: https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings

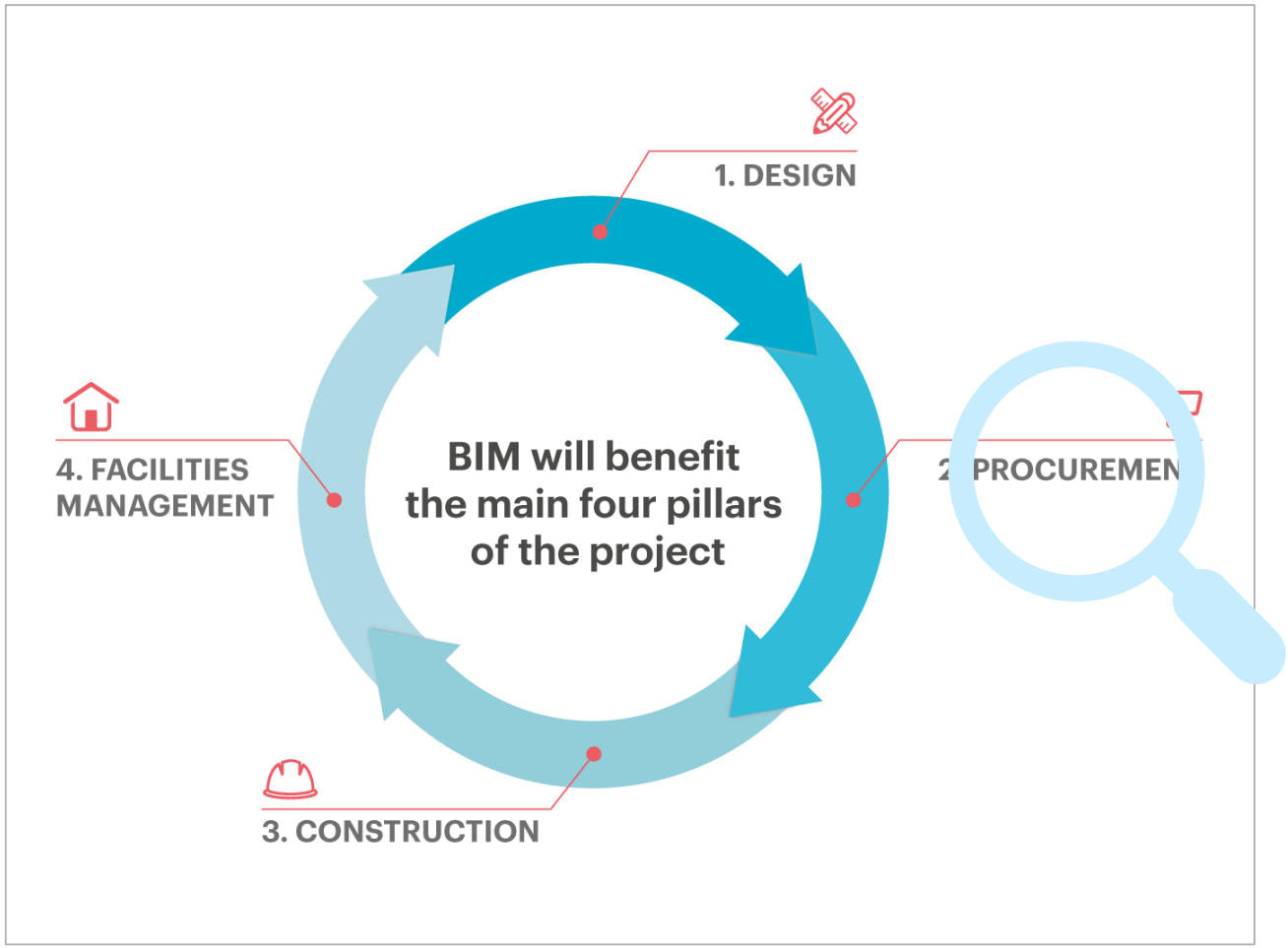
1. BIM in design



- **Selection of products**
  - Entered into the BIM model complete with the manufacturer's technical data
- **Calculations**
  - Using true objects and their manufacturer's technical specification data
  - Data-rich model can ensure the completion of exact network dimensioning, ventilation system balancing simulations, and exact sound calculations

10% of the cost of a project is typically due to change orders

2. BIM in Procurement

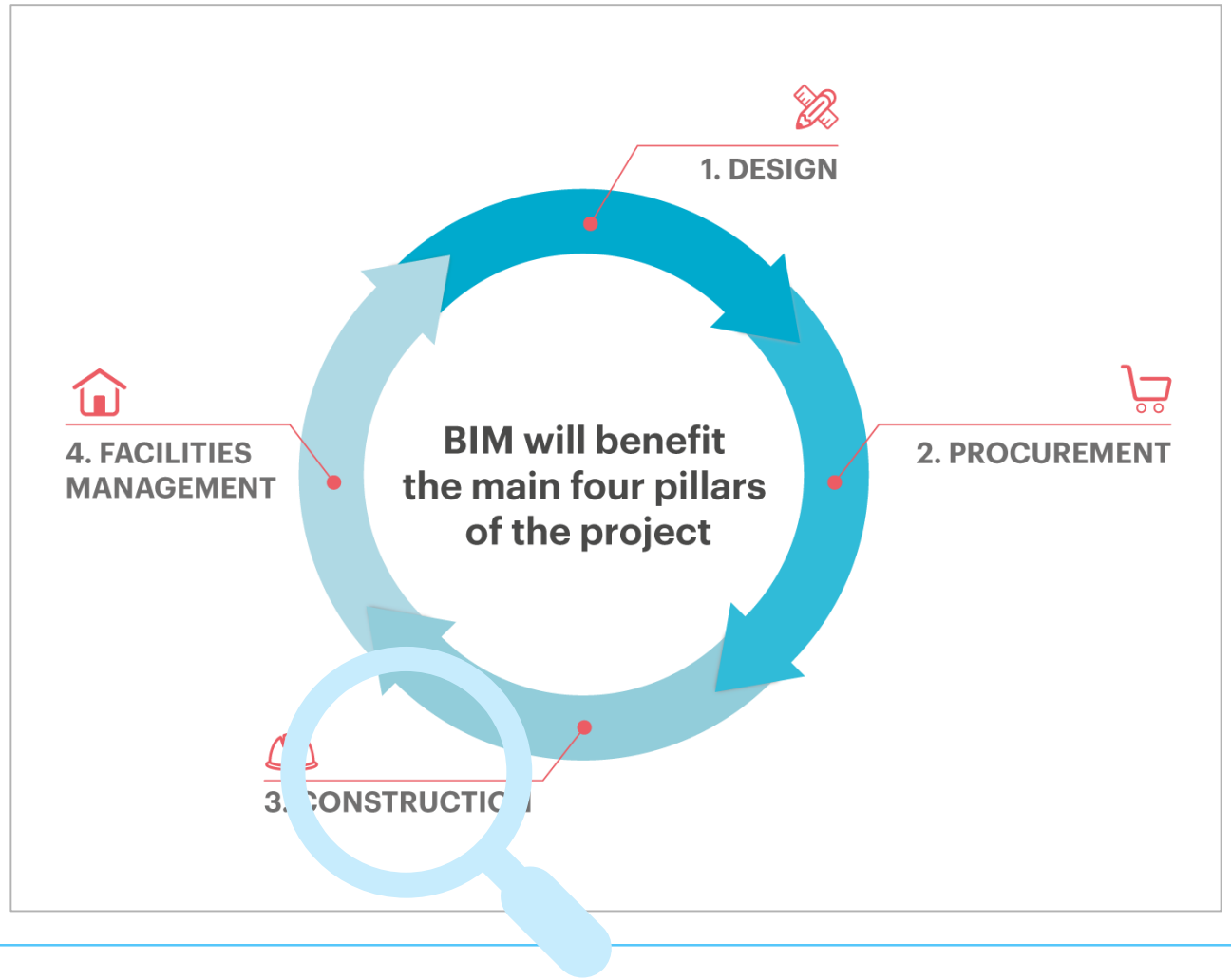


BIM can dramatically impact on reducing material waste

- Quantity take-off based on the 3D BIM model is far more accurate than before
- Prefabrication
- The result - less wastage of energy, resources, and travel time

37% of materials used in construction become *waste*

3. BIM in construction

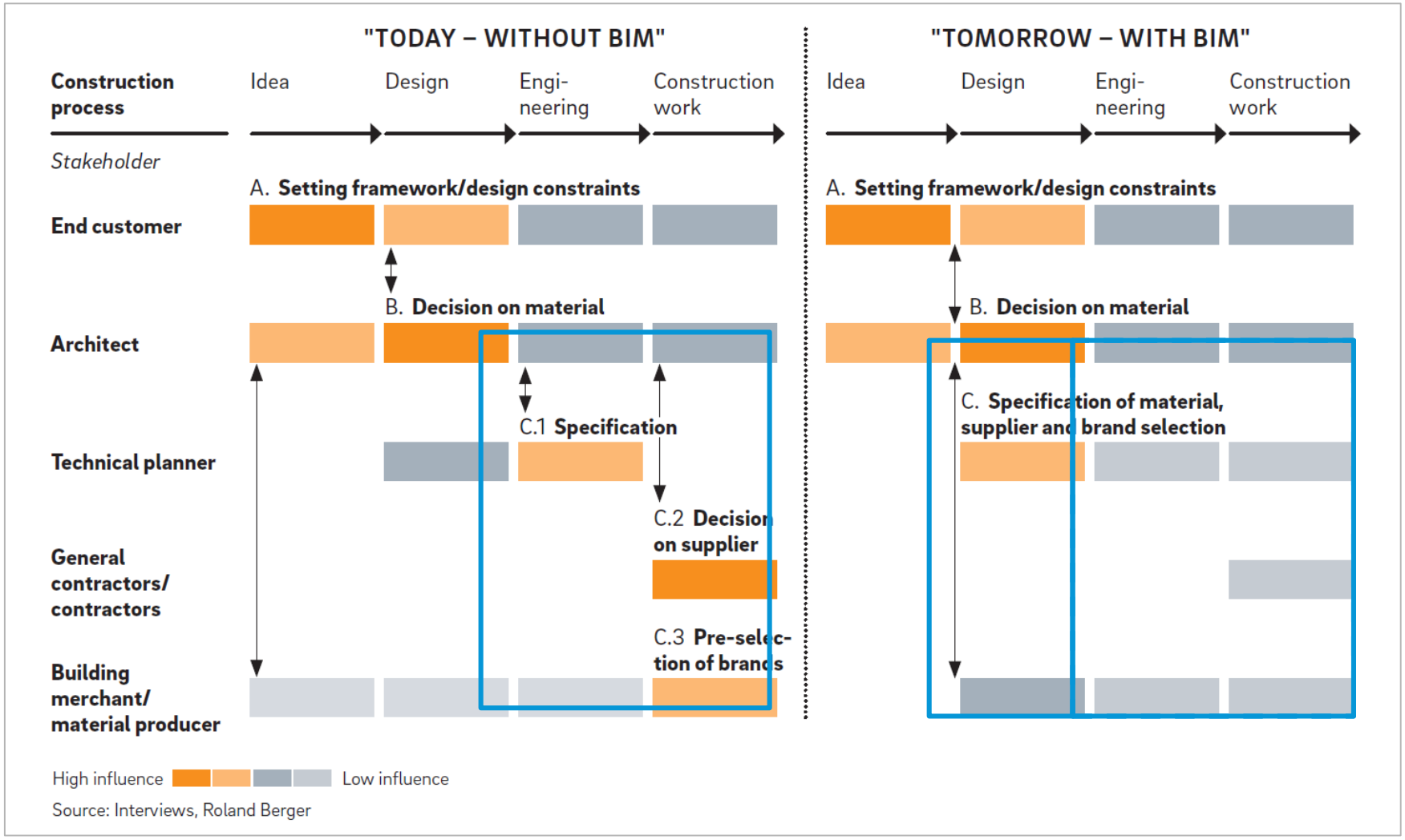


Scheduling with BIM

- Enables linking the 3D model with time or schedule related information
- Provides precise & useful construction project information for teams
- Benefits are both tangible and intangible:
  - Risk mitigation due to improved team coordination and communication
  - Conflict detection
  - Improved material delivery time and cost savings
  - Avoids errors or delays in scheduling

Only 30% of large construction projects finish on time, within budget

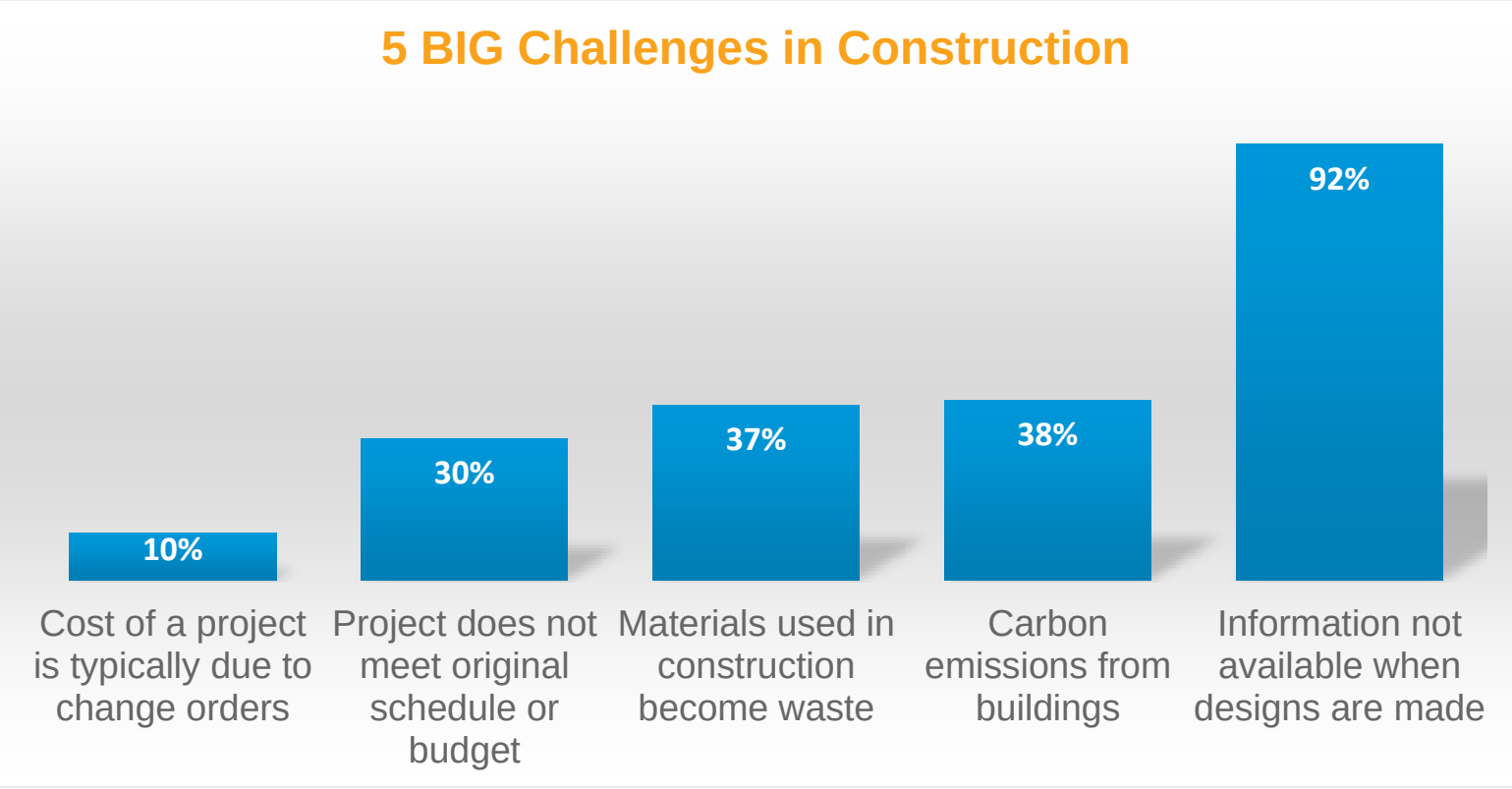
Stakeholders' influence will change



More focus on design

The importance of design increases as a source of the working building

- Improved and more detailed design
- Fewer change request due to simulations in digital model
- Simulated and optimized energy consumption
- Prefabrication & tact planning based on design
- More exact time schedules
- Collaboration between stakeholders
- Sharing of the same goal



Main themes of BIM in MEP design

The benefits for the industry are realized by better enabling of

Digital Engineering:
more accurate technical designs

- Use real products with real technical data
- Apply *calculations and data driven design*
- Enable *collaboration and data sharing* throughout the building life cycle

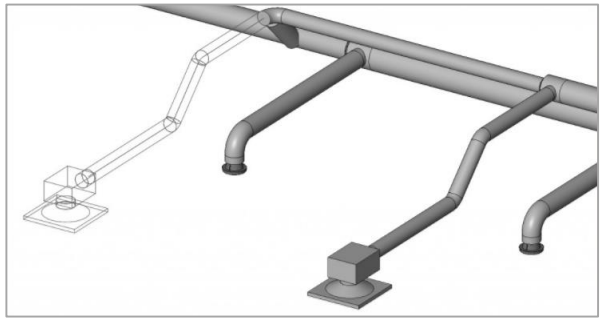
Intelligent BIM:
bringing together the engineer, the manufacturer, the constructor and the building owner

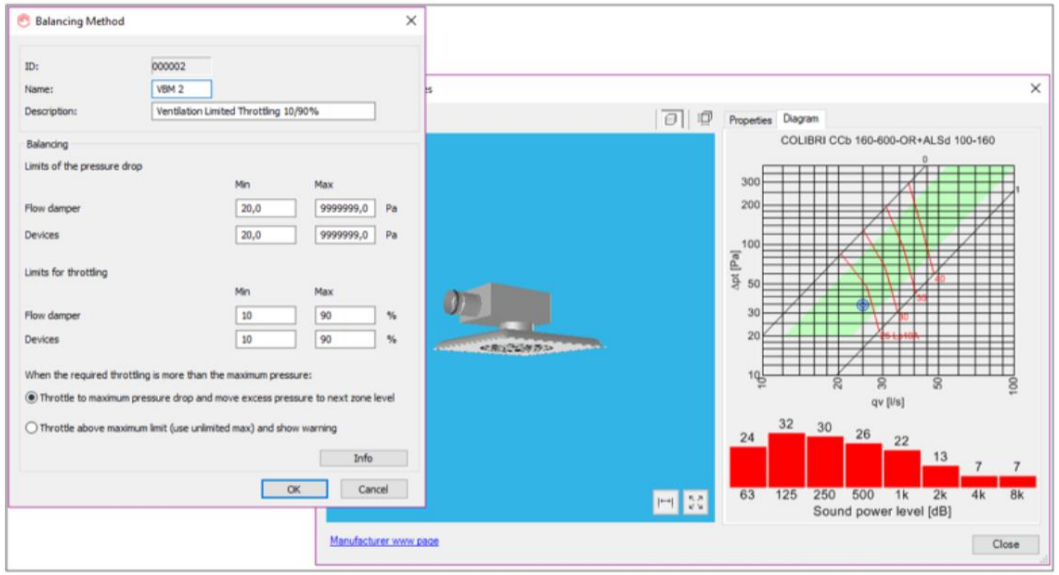
- Enable better designs by making more data available: *Product data, engineering data and operational data*
- Provide data-rich objects, smart tools and design automation for better results

MEP DESIGN & BIM

1. COORDINATION
2. COLLABORATION
3. CALCULATION
4. CONTENT

Coordination in MEP design

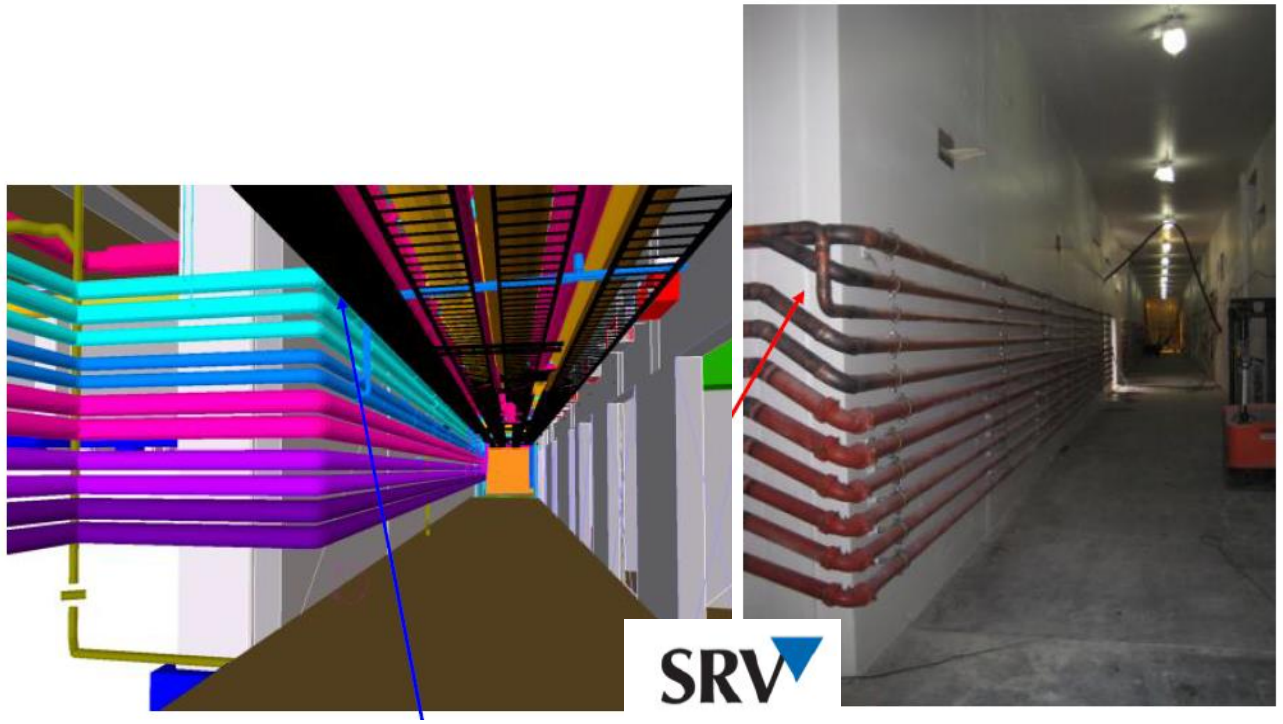




3D design of one discipline

- more accurate design of systems
- coordination inside a discipline

Coordination in MEP design



3D design & visual coordination of disciplines

- collision checking, coordination
- between disciplines, stakeholders

Coordination in MEP design - **Provision for Builder's work openings**

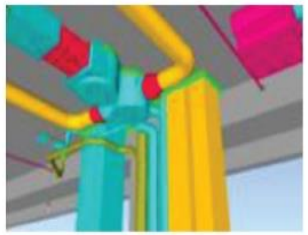
5. Structural model is delivered back to MEP designer

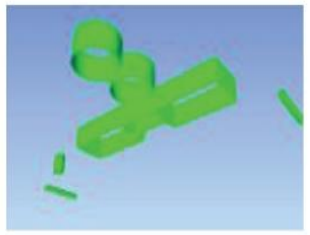
1. MEP designer makes provision for builder's work openings in MagiCAD

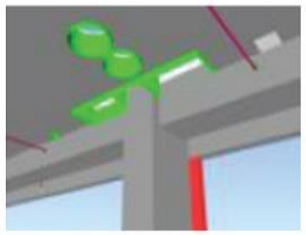
2. Objects are delivered to structural designer in IFC format

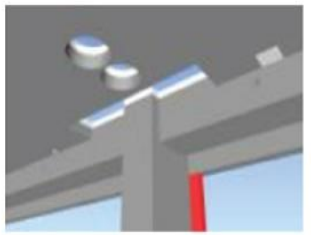
3. Structural designer approves or rejects demands. Report is generated

4. Structural designer creates holes where demand was approves





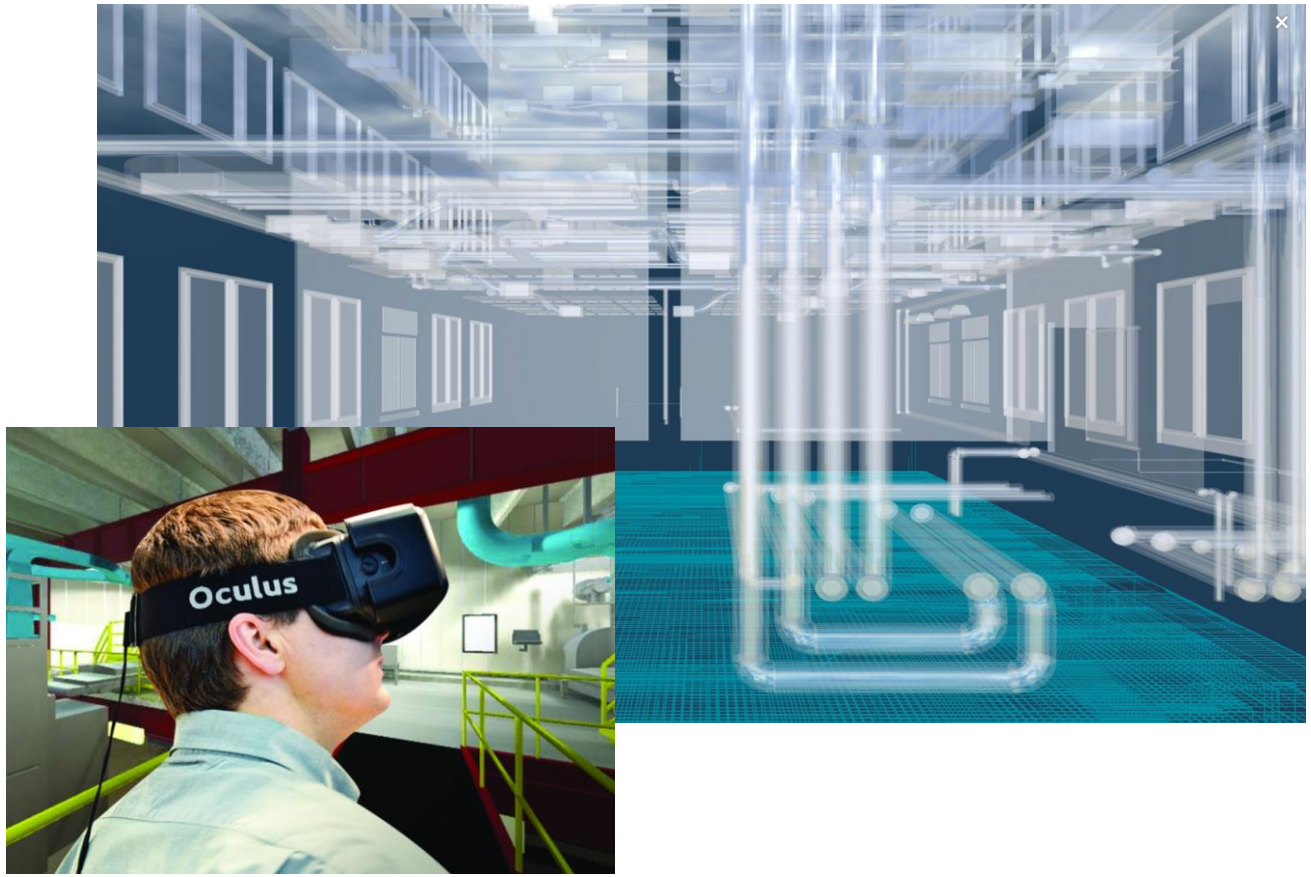




Information sharing based coordination

- Digitalization of one specific process
- E.g. Provision for builder's work opening process between MEP and structural designer

Coordination in MEP design



Virtual Reality, VR

- Visualization of coordination

MEP DESIGN & BIM

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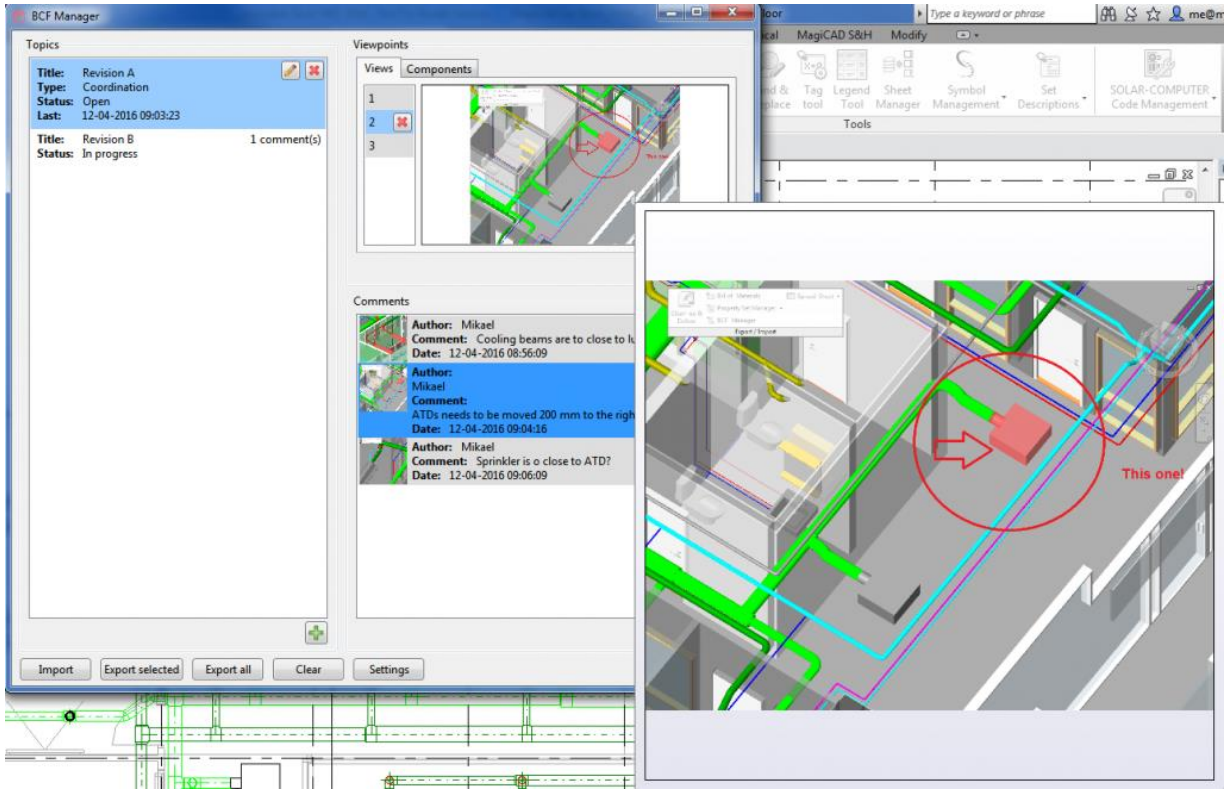
Collaboration in MEP design



Communication tools

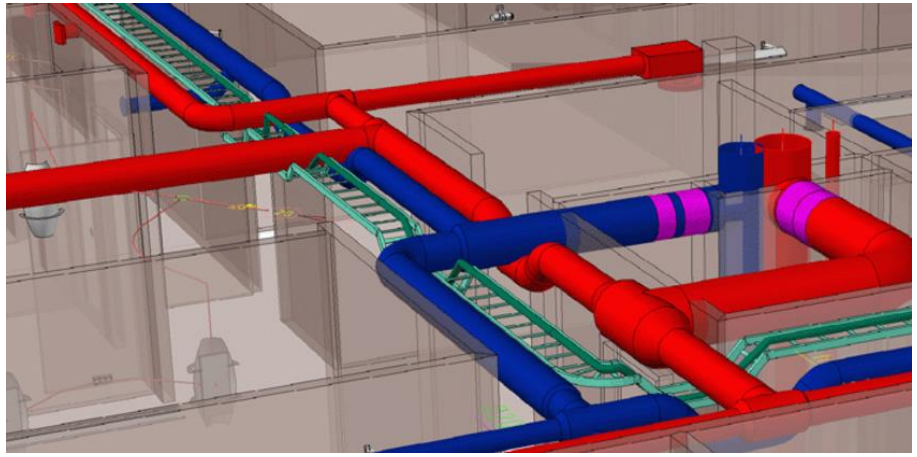
- Standardize a communication of issues
- A way to report and also find issue from a model
- E.g. BCF –tools (Building Collaboration Format)
- Communication services E.g. BIMcollab

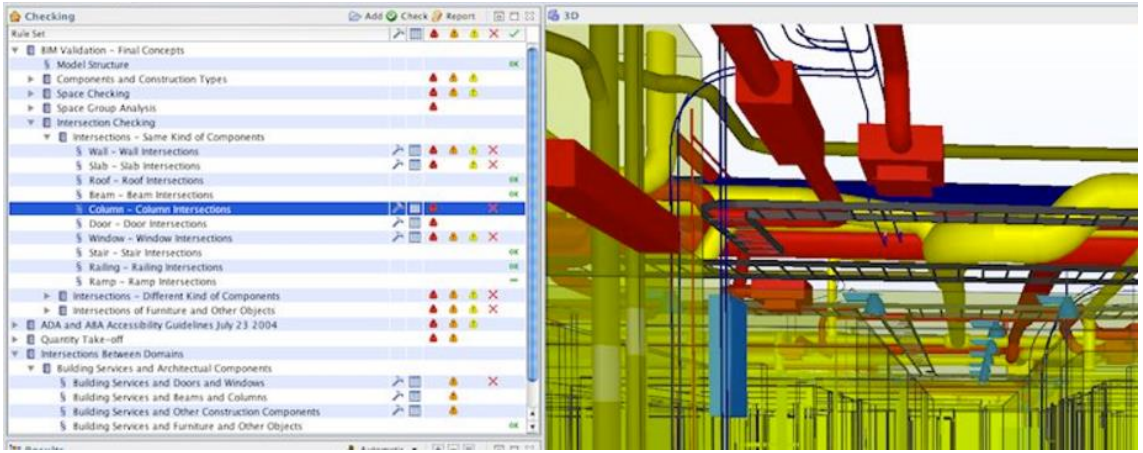
Collaboration in MEP design

Cloud based file services

- Standardize model sharing
- Global access
- E.g. Autodesk BIM360

Collaboration in MEP design





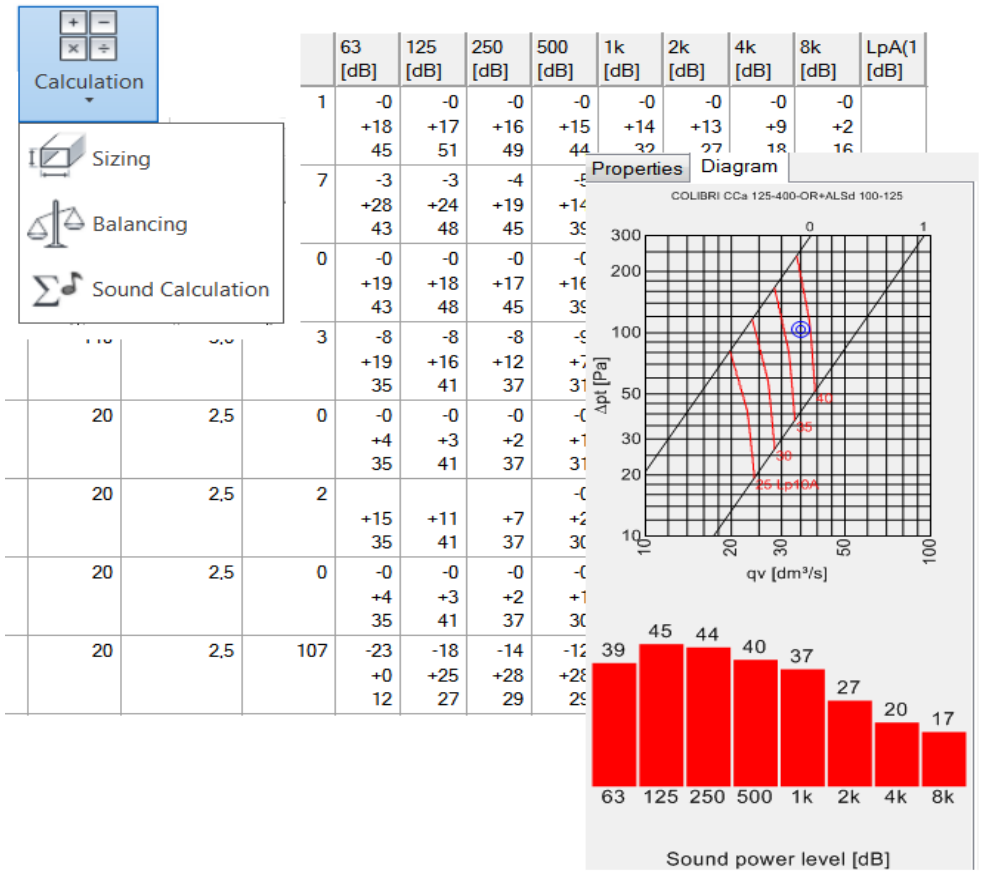
IFC

- Standardize data delivery
- Data transfer between different software
- E.g. model checking software

MEP DESIGN & BIM

1. COORDINATION
2. COLLABORATION
3. CALCULATION
4. CONTENT

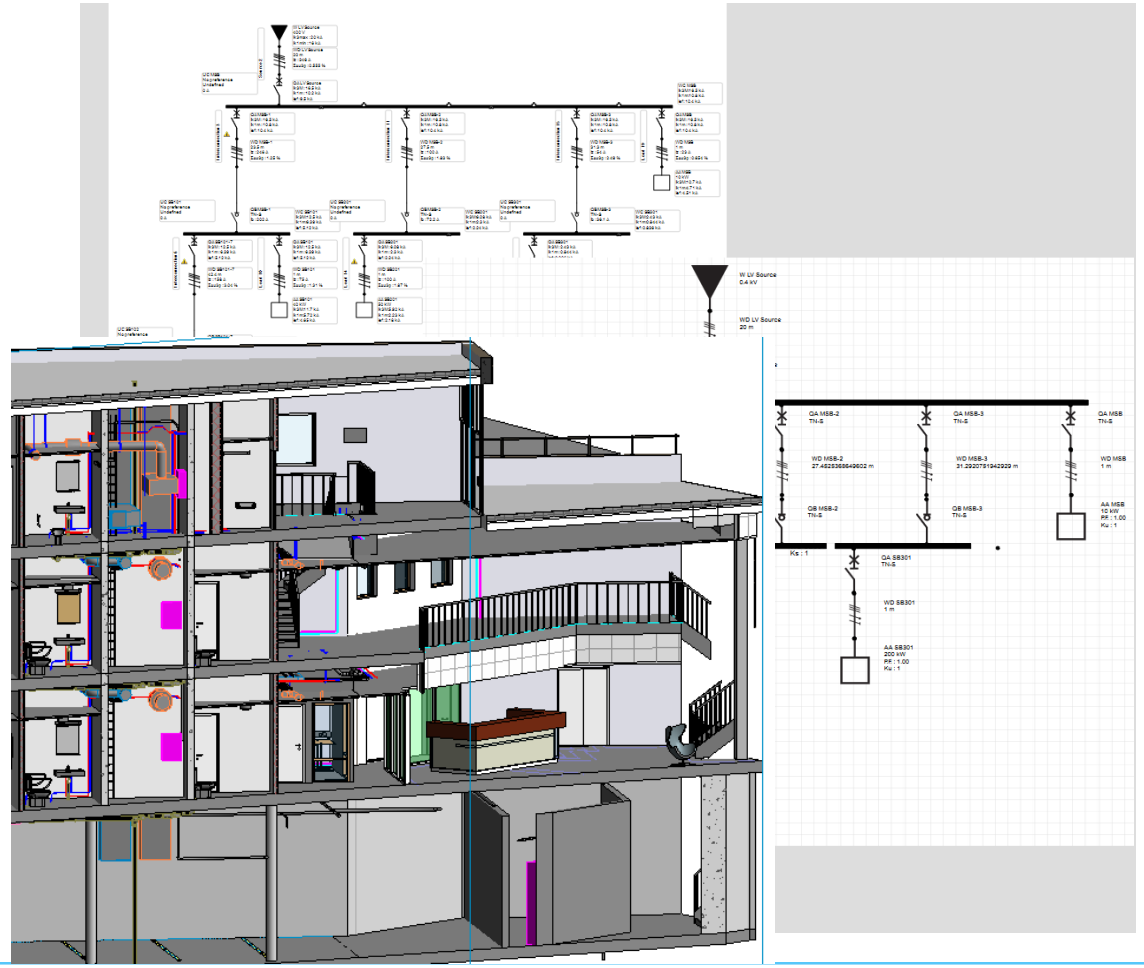
Example: Integrated engineering calculations for ventilation systems



Calculations

- Use true objects including manufacturer's technical specification data
- Exact network dimensioning
- Exact system balancing
- Simulations
- Exact sound calculations
- Run in a digital model
- Tweaks and revisions can easily be made
- Based upon robust data input

Integrated Electrical calculations – Benefits



Model your network only once

- Draw once, use everywhere
- All data is kept up to date
- No more the need to copy information from program to another
  - Less manual effort
  - Fewer errors

Network based on the Revit project

- Needed data can be extracted directly from the model
  - Wire lengths are measured from the model
  - Power is gathered from each switchboard

Write results back to a model

MEP DESIGN & BIM

1. COORDINATION
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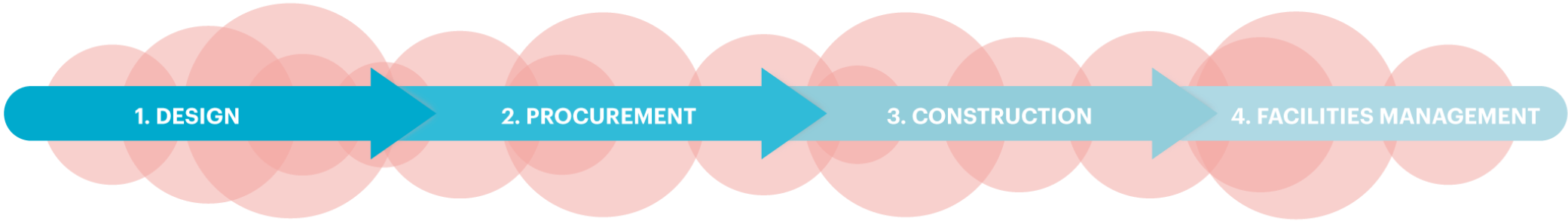
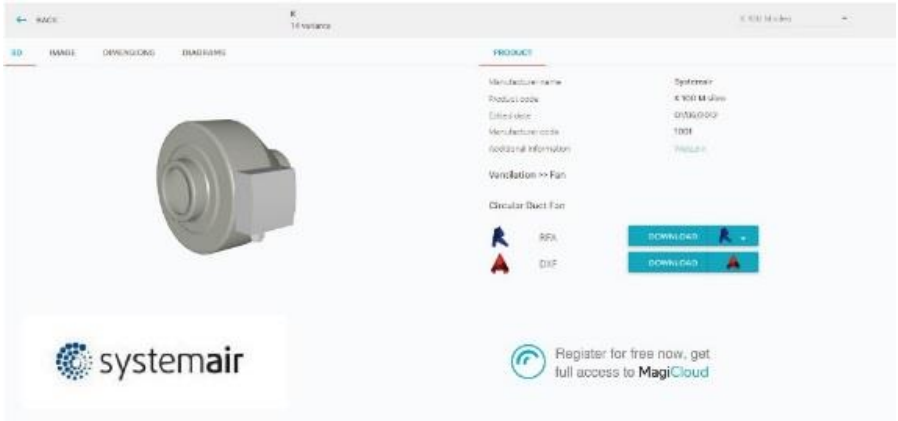
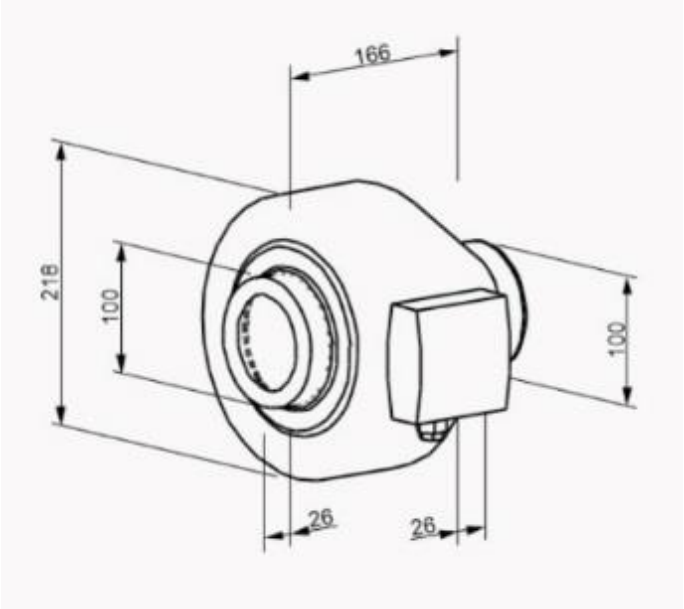
Product data in the lifecycle of the building



- Different product data related requirements in different lifecycle phases
- Demands of later phases must be taken into account already in design phase

Intelligent BIM is not only 3D object





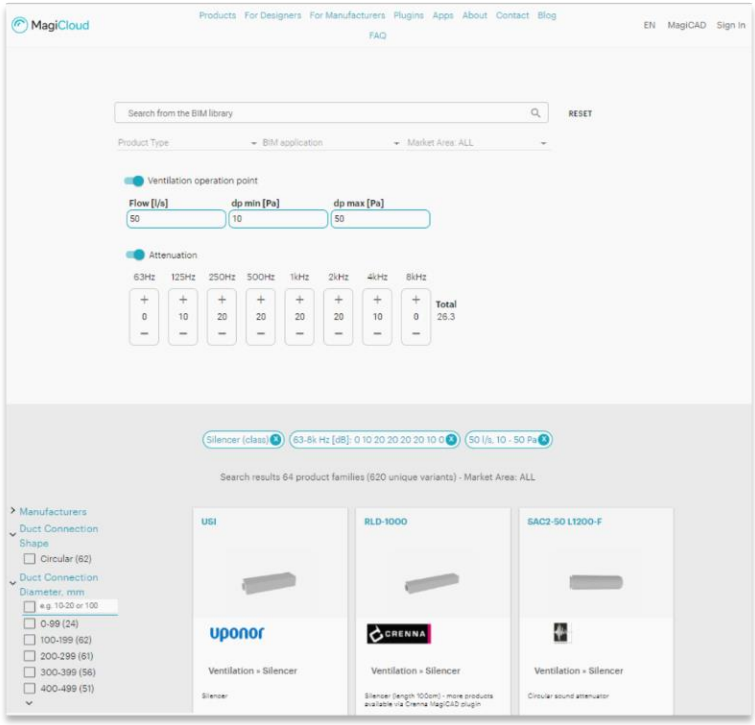
3D Object Library

- Dimensions
- 3D Object downloads

Intelligent BIM is not only 3D object

BIM Library

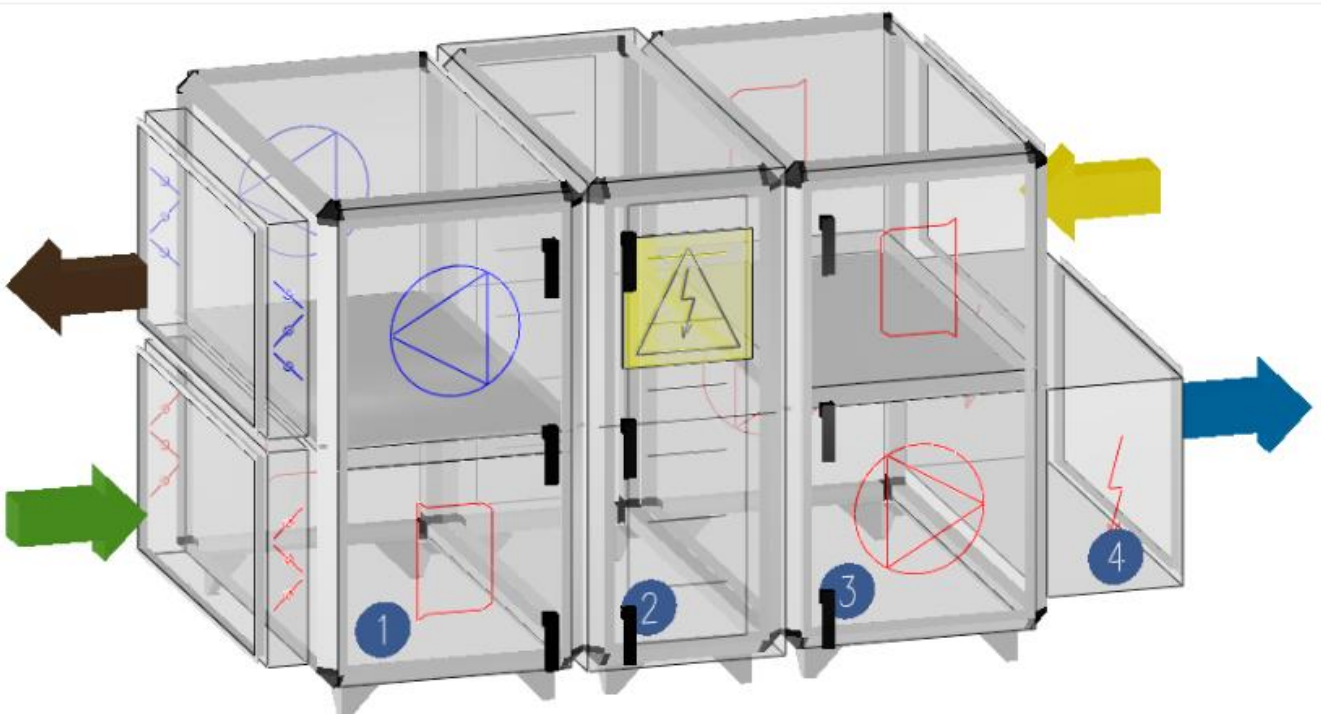
- Technical data
- Searches
- Localizations



Intelligent BIM is not only 3D object

BIM Library & Selection tools

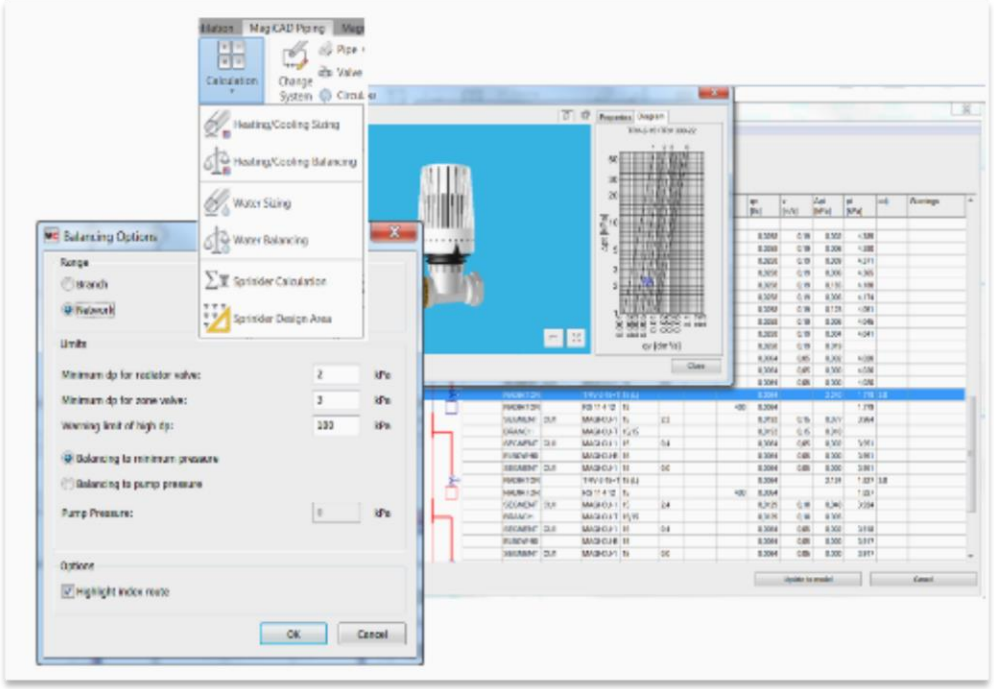
- Selection tools
- Configurable products
- Data management tools

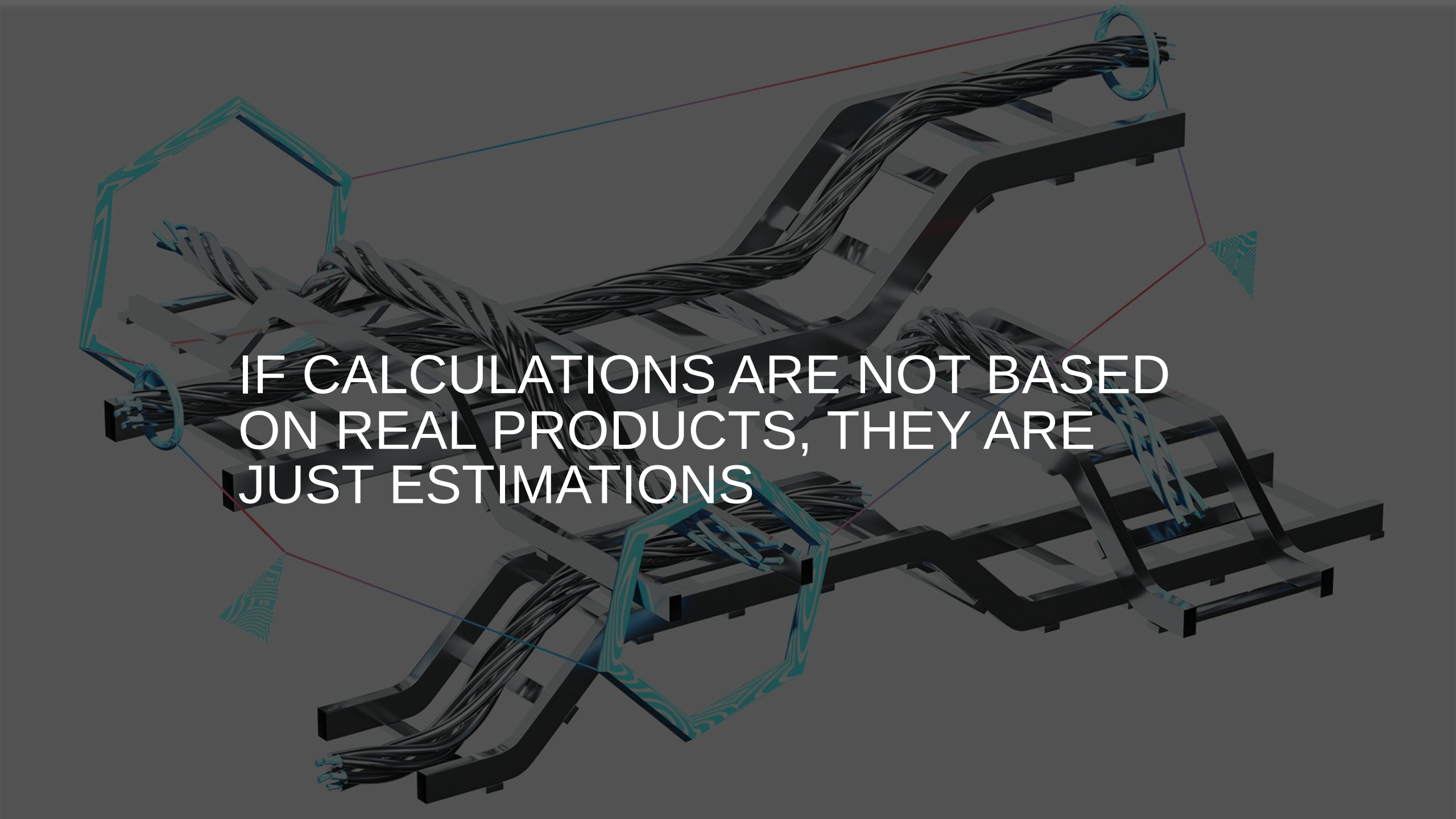


Intelligent BIM is not only 3D object

Design tool integrations

- Network connections
- Calculations
- Views – LOD
- Data for collaboration




IF CALCULATIONS ARE NOT BASED ON REAL PRODUCTS, THEY ARE JUST ESTIMATIONS

Decrease design project **costs and time by 30%**

- More sales
- Better profitability
- Better competitiveness
- Less risk in design projects

"MagiCAD **cuts our design time by 50**% as we only have to do the designs once. **It integrates seamlessly with AutoCAD and Revit MEP,** offering a single, unified design process which includes also calculations"

Managing Director **Colin Taylor**, Domestic Sprinklers, United Kingdom

"MagiCAD has made our **MEP design 50 % faster on Revit MEP** by enabling perfect coordination. Clash detection, easy change management, automatic provisions for voids – all of these tools are very helpful in everyday work with the model. Also access to MagiCAD's vast product libraries is a huge facilitation of project workflow"

Section Manager **Marek Piotrowicz**, TB Poland, Poland

"Over the years, we have found that using MagiCAD saves us a lot of time and enhances also overall project productivity. We have estimated that MagiCAD's time-saving functions, such as easy riser diagram features and faster revisions, can **save up to 30 per cent of total project tim**e."

General Manager **Gürkan Görgün**, Eko Tasarim, Turkey

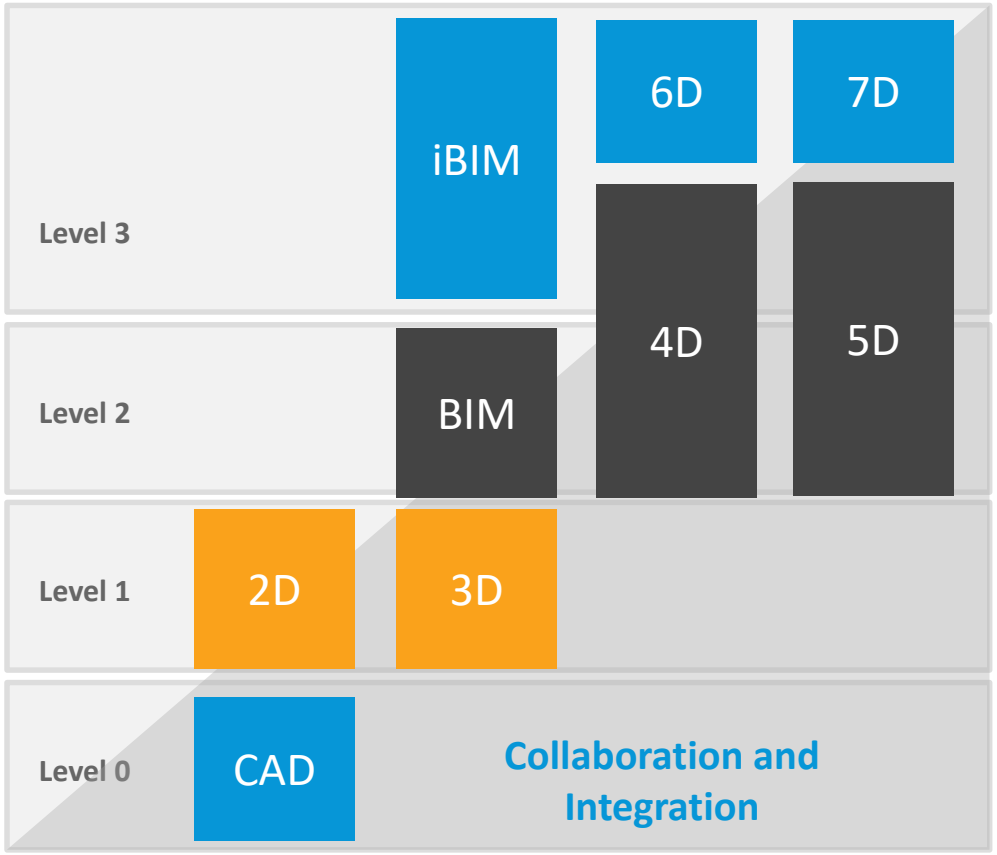
Decrease operational costs by 3%

Overall costs of the building

- Operational costs cover ~ 70%
- Design ~1%
- Construction ~30%

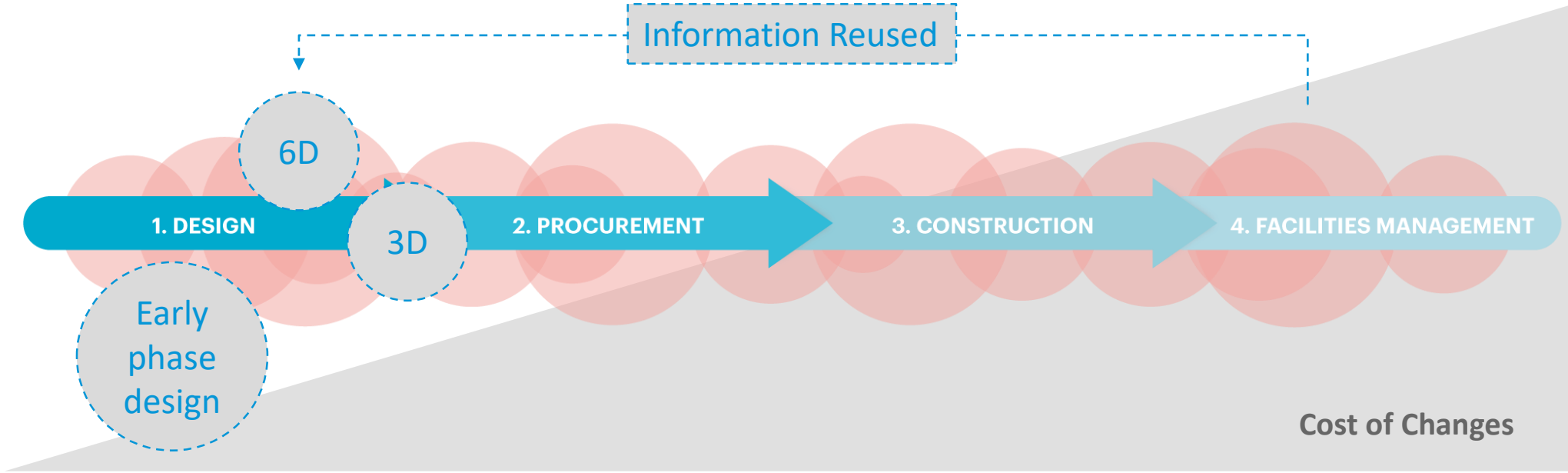

OPPORTUNITIES OF BIM ARE
ABUNDANT. THE TIME TO ACT IS NOW

BIM Maturity



- BIM possibilities drive demand for processes outside of 3D modelling
- Need for collaboration increase

BIM today and tomorrow



- Changes are cheaper in a digital model
- More design is done earlier in the process
- Cloud is a natural environment for collaboration
- Performance data is needed for faster and better design

5 Bullet Point Summary

- 5 Big global challenges in construction market
- Four pillars of the BIM project - more design will be done earlier
- MEP DESIGN & BIM covering COORDINATION, COLLABORATION, CALCULATION & CONTENT – BIM is not only 3D Geometry
- Why is BIM necessary? Lot of efficiency and cost saving can be reached with MEP design already now
- Look into the future

Thank you!

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