BIM

Challenges and opportunities for plant constructors and technical building-installation planners

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BTGA

The German Association of the Building Services and Technical Installation Industry
(Bundesindustrieverband Technische Gebäudeausrüstung e.V.)

- Founded in Munich on 12 August 1898
  as the Association of German Central Heating Businesses *(VDCI - Verband Deutscher Centralheizungs-Industrieller)*
- 8 local state associations
- 4 direct and 17 sponsoring members
- 500 large and medium-sized businesses with around 40,000 workers and annual revenues of around EUR 7.6 billion.

www.btga.de

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BIM
information
Information
project
data
construction
Building
design
time
work
aware
well
coordination
things
lifetime
wrong
models
Modeling
require
CAD
Burrell
provides
future
electronic
experiences
UK
waste
gave
asset
facility
thermal
identifying
process
concepts
systems
Integrated
less
documentation
communication
BS1192:2007
PassivHaus
useful
part
shared
based
specifications
objective
insights
digital
key
errors
February
projects
progression
government
event
accurate
collaborative
using
Elrond
doesn
AdaptCBE
BREEAM
Snook
Just
just
standards
spent
Lonely
building

What is BIM? Wikipedia says:

Building information modelling is a method for the optimised planning, construction and management of buildings with the aid of software. In this process all parts of a building are digitally recorded, combined and networked. The building is also visualised geometrically as a virtual construction model.

Building information modelling is used both in the construction industry, for planning and building, and in facility management.

What is BIM?
The German government's guide says:

Building information modelling is a **method** for planning, realising and managing construction projects, based on data models of buildings relating to structural components.

The information database for the construction model thus created provides the source for all decisions during the entire lifecycle of the building, from initial pre-planning to demolition.

The BIM method is used in building construction and civil engineering, and in infrastructure projects such as road, rail or waterway facilities.

So what is BIM actually?

Digital model of a building; 3D computer model, further data and attributes; lifecycle-relevant data; digital virtual presentation of the physical and functional features of a building.

Management method for optimising planning, realisation and operation of buildings; information database; source for decision making.

Collaborative working method; work technology; transparent communication between all involved; project management; making collaboration easier; no software package.

So what is BIM actually?

BIM

Building

Information

Modelling

.....first build digital, then build for real

Why BIM?

Elbphilharmonie Concert Hall

10-fold cost overshoot

Significant delay

Berlin Brandenburg Airport

6-fold cost overshoot

7 years (?) behind schedule

Stuttgart 21

Cost overshoot of 33%* anticipated

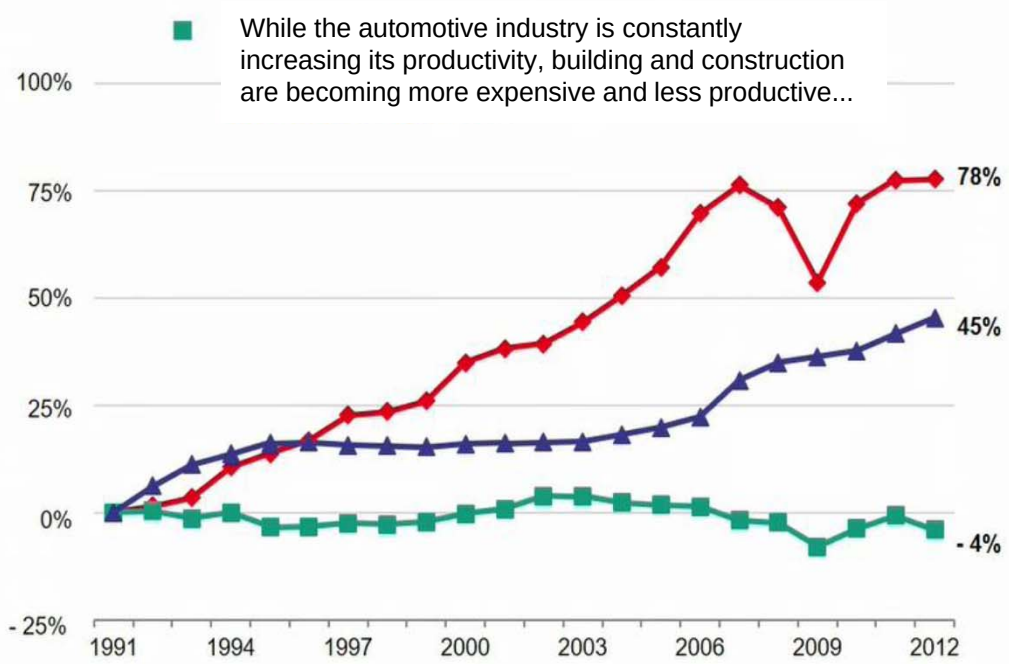
2 year delay in construction foreseeable

There are many reasons:

- Cost estimates too low
- Unsatisfactory project specification, or none at all
- Fragmented planning approach instead of integrated one
- Complexity of task underestimated
- Changes to use during construction stage
- ...and much more.

* Source: Vieregg & Rössler, Munich

BIM is coming – to help digitalise the construction industry!!



Source: German Office of Statistics, Series 178, No. 1.5, Table 2.14, status: August 2012

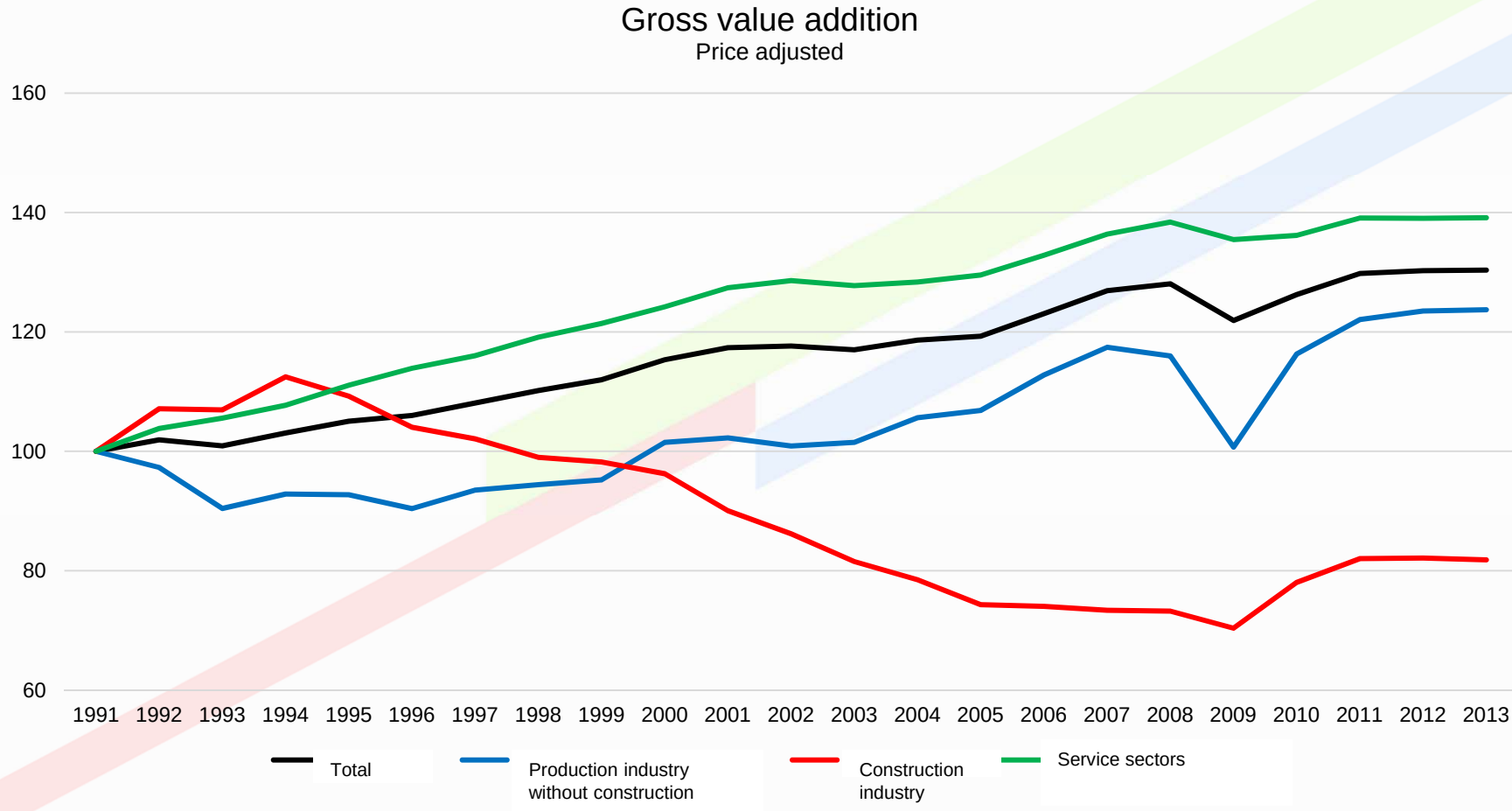
Ford production line 1913

Car production line today

Empire State Building under construction 1930

Burj Khalifa construction site 2008

Course of value addition in the construction industry



Own research, data: destatis

Scope and aims

Given the foregoing definitions, BIM can be applied with advantage in the following fields:

- Scrutinising the quality of the planning of a model
- Scrutinising the building functions of a model
- Visualising structural components, planning, details
- Subcontractor management
- Quantity checks – material lists for tenders
- Drawing up tenders
- Transferring the model to calculation programs
- Coordinating different building models (collision check)
- Scrutinising building functions (simulation of building operation based on virtual data)

Scope and aims

- Communication about changes to model – workflow (PFV: provision for voids)
- Data extracts from the model for particular areas of application (MDV: model view definitions): coordination view, basic handover view
- Document management on the construction site
- Defect management
- Recognition of structural components and documentation RFID
- Prefabrication of structural components
- Cost savings

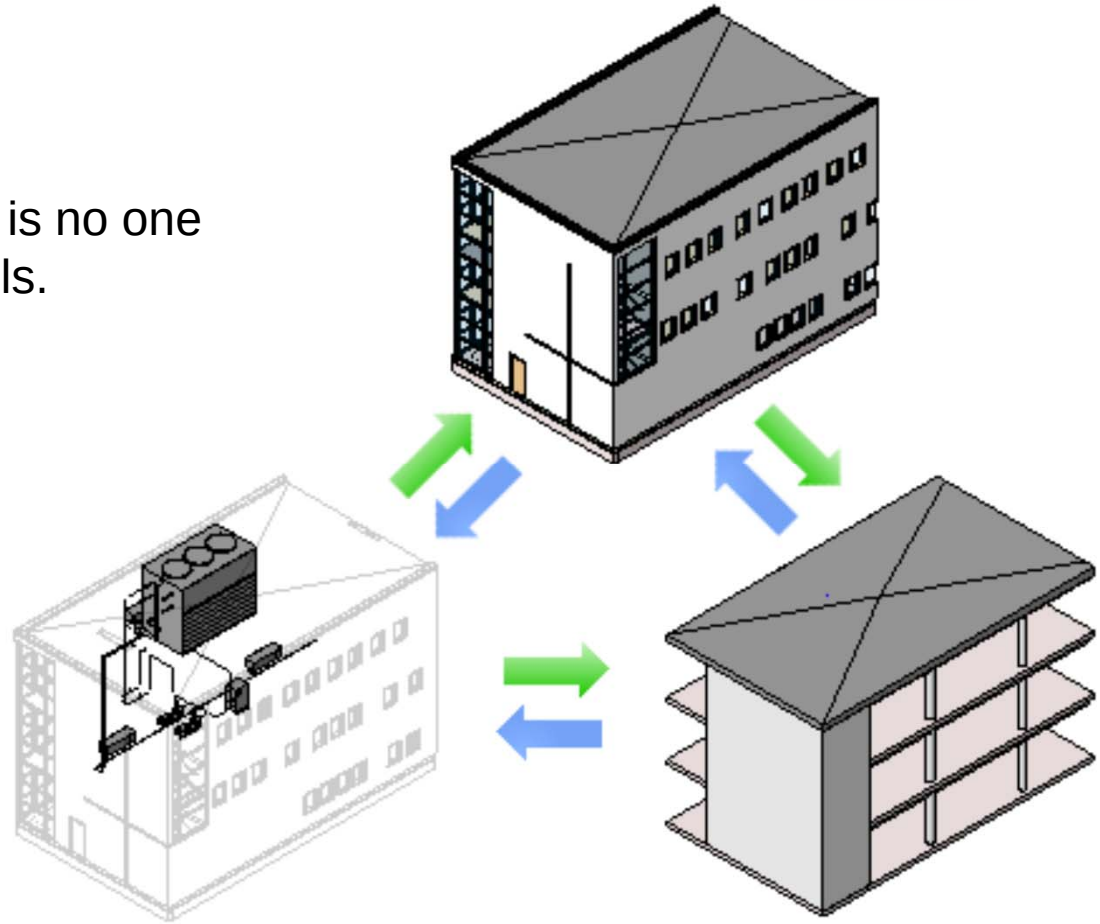
What are the advantages of BIM?

- Multiple entries are avoided
- Cost and deadline certainty is increased
- Workflows become more efficient
- Productivity is improved
- The quality of planning and realisation is optimised
- Buildings, structural components, statics and building technology can be checked for collisions across all trades involved in construction
- Building designs can be optimised more simply when it comes to static calculations, house and building technology, structural physics, acoustics or energy consumption

Opportunities and challenges across the planning stages

Data model

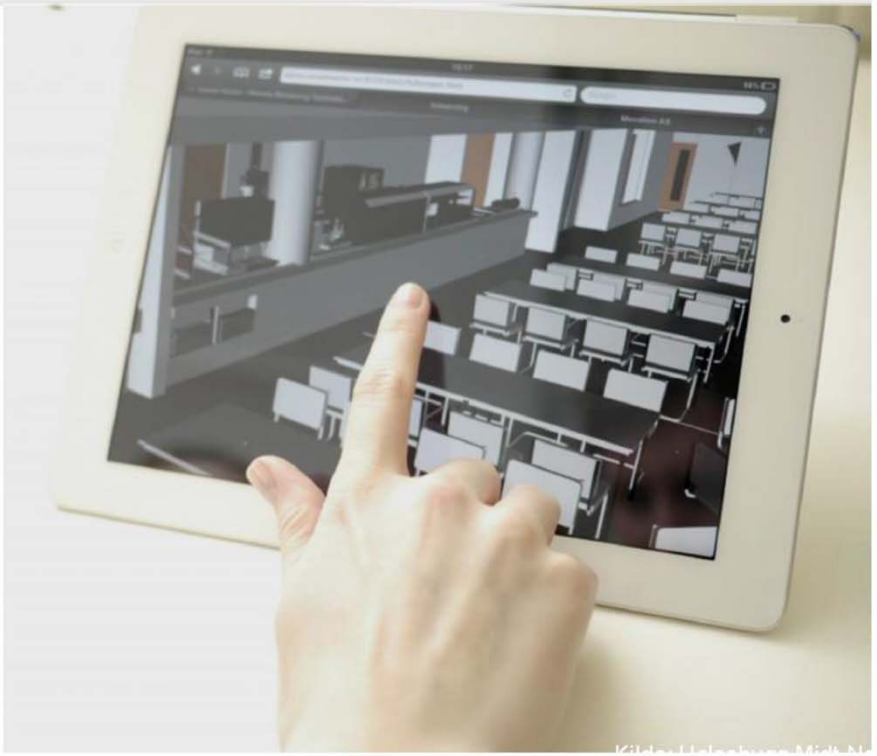
Usually at the present time there is no one model but various different models.



Opportunities and challenges across the planning stages – through realisation…

BIM on site

Caverion worked with a company that had developed a solution that made it possible to stream the BIM-model tol iPads on site.



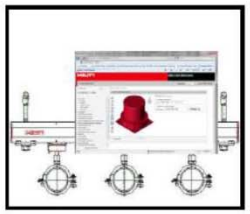
Opportunities and challenges across the planning stages – through realisation…

BIM to field process in Hilti data environment

Planning | **Realisation** | **Operation**

Architectural Design → Engineering Design → Tendering → Detailing → Purchasing → Construction → Validation → Facility Management → Demolition

Project: installation of sanitary pipes in a concrete wall, using anchor bars

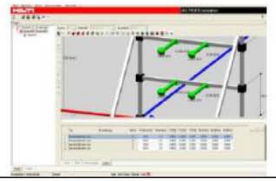


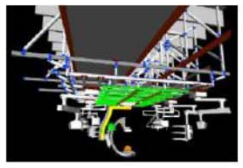
Planning
- Lay-out Plan using CAD software,
- Placement of BIM/CAD objects from the library
- Detailing

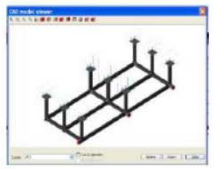
Data transfer to Total station
- Import of relevant data sets re. measuring equipment

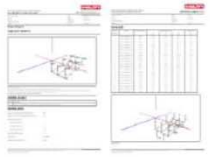
Realisation
- BIM to field: transfer of fastening points to concrete wall Assembly of bars

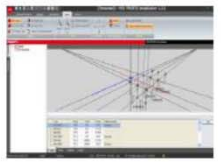
Verification
- Field to BIM
- Data control through storage and transmission of measurement values











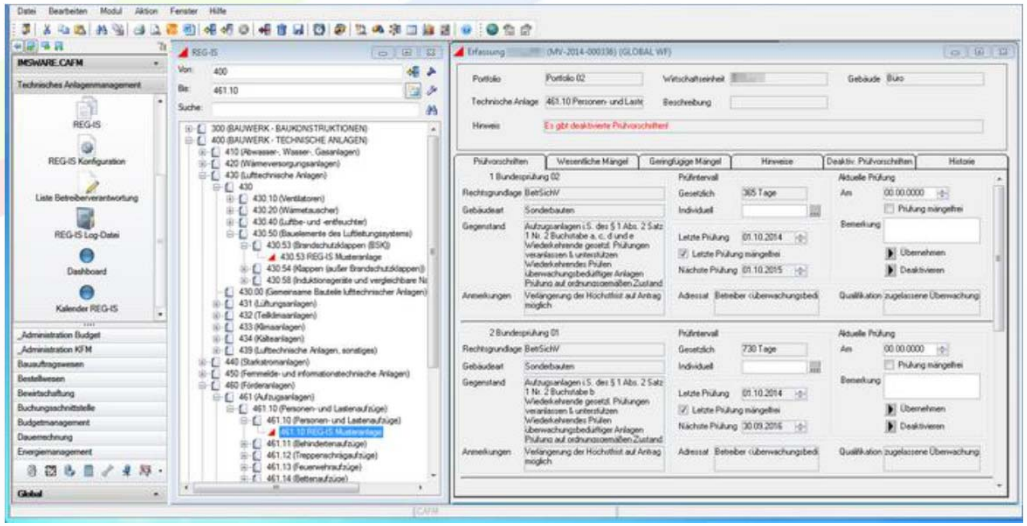
Opportunities and challenges across the planning stages – up to operation

CAFM in operation

Current status
- Cost-intensive after-recording of CAD data for management
- Basis are 2D data

Blocks, attributes
- Tabular

As-build model as basis
- No “after-recording”
- All modelled buildings land in FM
- Database built up in step with planning and construction



What challenges arise when working in a BIM environment?

Building and updating a BIM data model is more time-consuming than drawing-based CAD planning, because 3D data must be entered and building data (materials, characteristics, costs, deadlines etc.) must be input.

The burden of work involved shifts, because pre-planning and design planning take on a greater weight. Definitions and decisions must be made earlier.

Another challenging aspect is that of data management and communication. In particular, major projects must be subdivided into so-called subject models. Strict standards must be observed in the interests of a properly functioning amalgamation.

General challenges - BIM

Consistency of data model across planning period

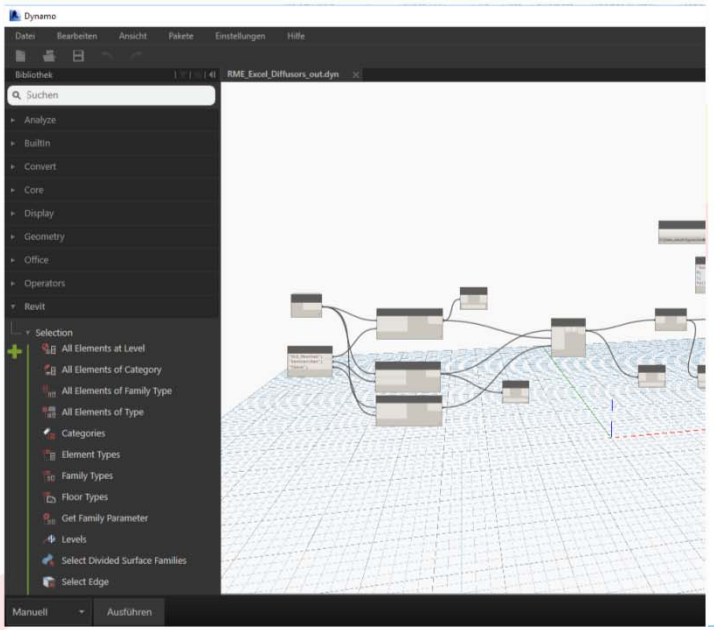
- Data lost in model through change of buildings
- Classification, characteristic features

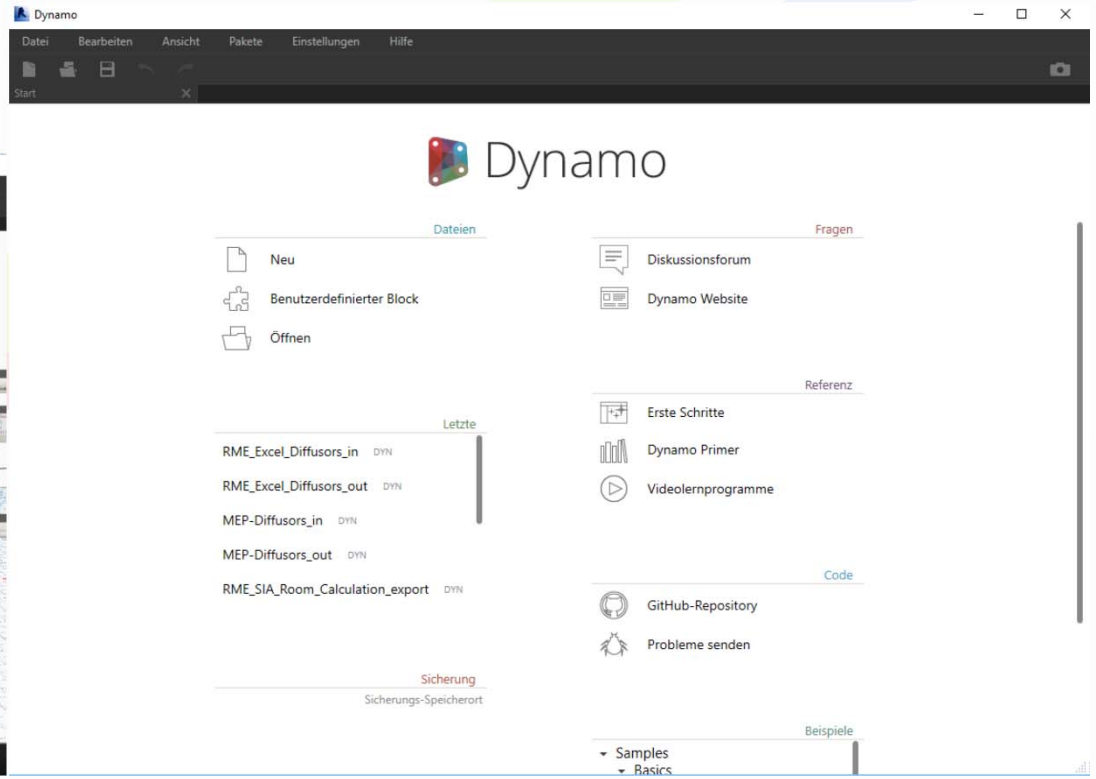
Operation and practical problems

- Missing families
- Missing manufacturers' data
- Size of manufacturers' data

General challenges - BIM

Everything gets dynamic!





BIM needs organisation

planen-bauen 4.0

Company for the Digitalisation of Planning, Building and Operation
(Gesellschaft zur Digitalisierung des Planens, Bauens und Betreibens mbH)

After a long process, on 20 February 2015 the founding agreement for “planen-bauen 4.0-Gesellschaft zur Digitalisierung des Planens, Bauens und Betreibens mbH” (www.planen-bauen40.de) was signed in Berlin by 14 associations and institutions (see press release). The company has been entered in the Commercial Register since the end of 2015.

planen-bauen 4.0 harks back to a recommendation by the Commission on the Reform of Major Construction Works, headed by the German Minister of Transport, Mr. Dobrindt. Its task is to realise, coordinate and support the digitalisation of the entire value-added chain of planning, building and operation in Germany. Its aim is to help identify risks and to develop solutions for them. The value-added chain will cover the whole life-cycle of buildings, including the manufacture of their raw materials, their construction, operation and maintenance, their demolition and recycling.

12 pages set out basic fields of action:

- **People**
  Roles, partnership, collaboration
- **Technology**
  Data exchange, data management, visualisation…
- **Processes**
  Sustainability, security, workflow,
- **Framework conditions**
  Responsibility, property, Architects‘ and Engineers‘ Fee Scales (HOAI)…

https://www.vdi.de/fileadmin/vdi_de/redakteur_dateien/gbg_dateien/Agenda_BIM_v3_09_2016.pdf

BIM can be a business model

Using the comprehensive databases created by the BIM method, it is possible to generate additional outputs. This additional benefit and the services associated with it can be marketed, and the fees involved be subject to free agreement.

A few examples:

- Simulations for comparing alternatives, escape routes, visitor flows, routes to work etc. already at the planning stage
- Simulations of future changes to the building shell, technical plant...
- Production of a digital room book
- Conditioning and transferring data into a CADM system
- Drawing up an as-build data model
- 3D simulations of the building and all its fittings, including allocation to area
- Updating data models during building operation
- etc….

Was is the future task of the higher-education sector?

BIM is not a software. The introduction and realisation of BIM is less of an IT task than a management one.
The decisive factor is project coordination, since the new planning method assumes early and close collaboration across trades and specialisms.

Training of our engineers in all 3 dimensions must therefore be expanded..

BIM software skills (based on IT and CAD training)

Project organisation and project management

Collaboration, teamwork and communication

Application of the BIM method offers opportunities and possibilities to an extent not yet foreseeable

Do not underestimate the consequences
if we, in the building services and technical installations sector,
“miss the bus”!