

SUPPORTING SIMULATION
WITH BIM

BUROHAPPOLD

ENGINEERING



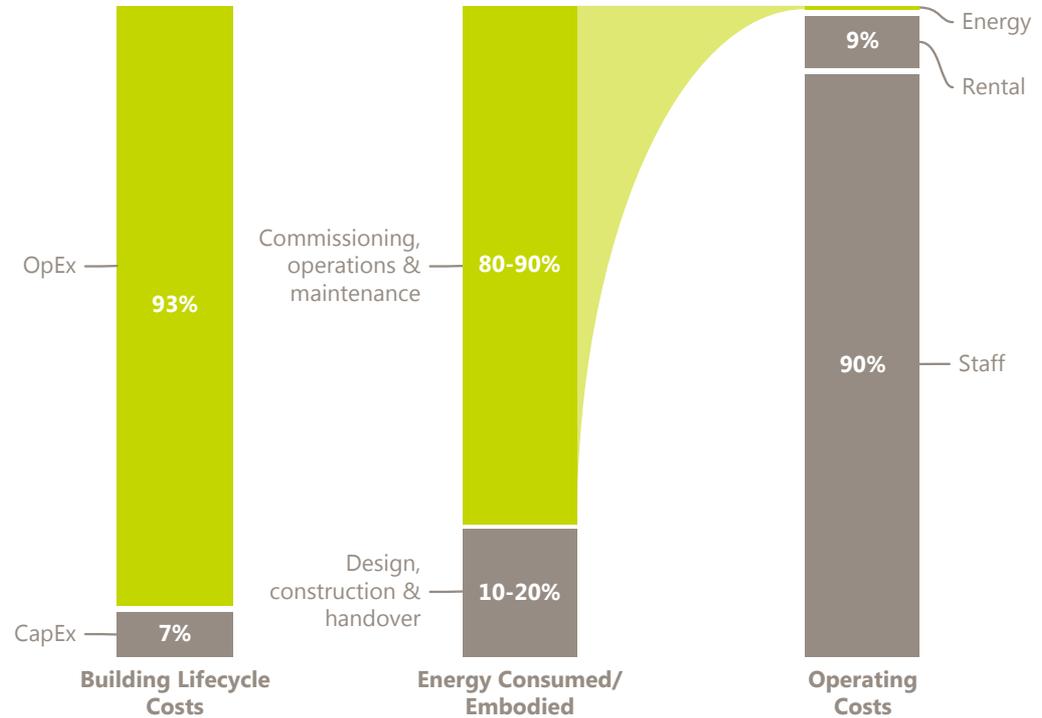
Thursday, 14 May 2015

How can BIM be used to improve the design process, let alone improving operational performance?

LOTS OF DATA ... LOTS AND LOTS OF DATA

- Data developed during design +
- Data generated throughout use
- Lots of data...but no real benefit

- What's more important;
 - ...the energy used by the building and its occupants?
 - ...the wellbeing of those occupants?
 - ...and who is this important to?

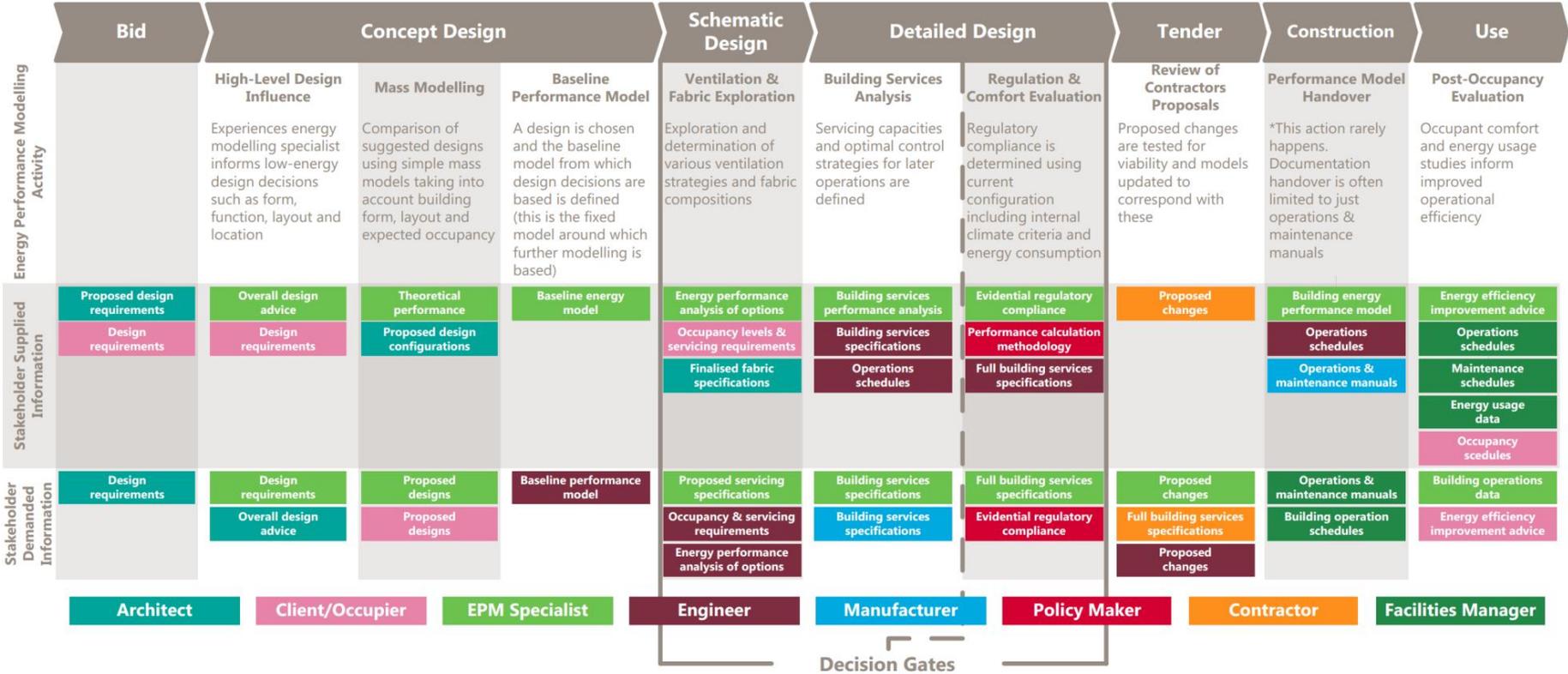


*Hughes, W.P., Ancell, D., Gruneberg, S., Hirst, L., 2004. Exposing the myth of the 15:200 ratio relating initial cost, maintenance and staffing costs of office buildings. in: Proceedings of the 20th Annual ARCOM Conference, University of Reading, HenlowWatt University, Edinburgh, pp. 375-381.
*Pisello, A., Bobker, M., Cotana, F., 2012. A Building Energy Efficiency Optimization Method by Evaluating the Effective Thermal Zones Occupancy. Energies 5, 5257-5278.
*Terrapin Bright Green, 2012. The economics of biophilia - Why designing with nature in mind makes financial sense. Terrapin Bright Green, New York, USA.

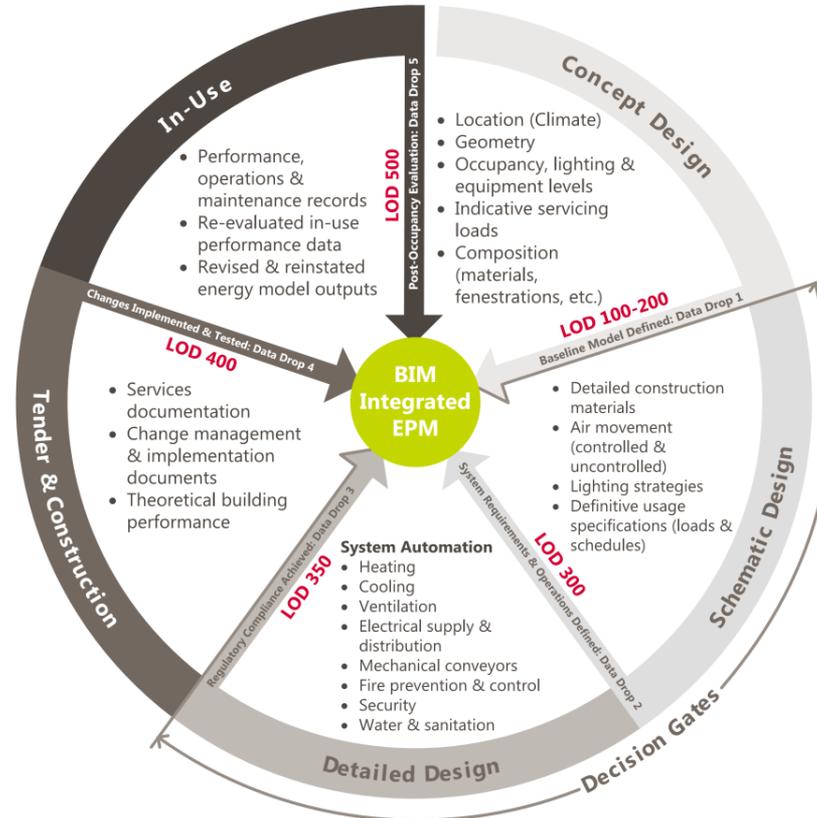
BIM AS A REFERENCE LIBRARY



THE DATA DEVELOPMENT PROCESS



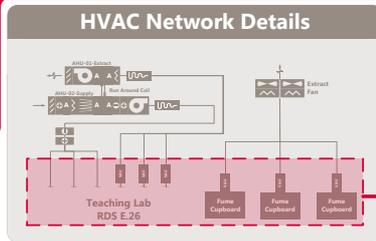
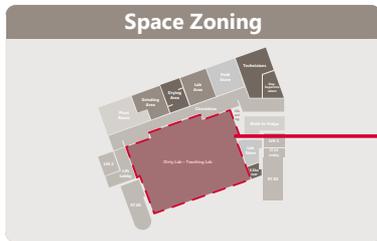
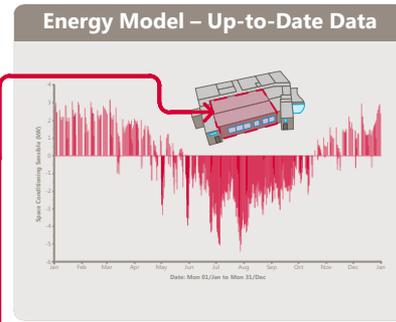
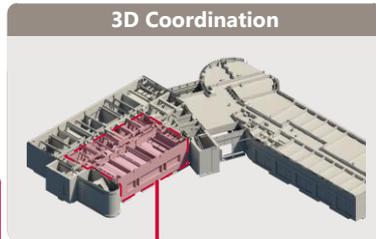
THE DATA DEVELOPMENT PROCESS



CASE STUDY – YORK UNIVERSITY

Room Data Sheet

Name	Room Type	Number	Level	Area (m ²)	Volume (m ³)	Height (m)	Usage	Priority	Category	Subcategory	Usage
001	Office	001	01	10.0	100.0	10.0	Office	1	Office	Office	Office
002	Office	002	01	10.0	100.0	10.0	Office	1	Office	Office	Office
003	Office	003	01	10.0	100.0	10.0	Office	1	Office	Office	Office
004	Office	004	01	10.0	100.0	10.0	Office	1	Office	Office	Office
005	Office	005	01	10.0	100.0	10.0	Office	1	Office	Office	Office
006	Office	006	01	10.0	100.0	10.0	Office	1	Office	Office	Office
007	Office	007	01	10.0	100.0	10.0	Office	1	Office	Office	Office
008	Office	008	01	10.0	100.0	10.0	Office	1	Office	Office	Office
009	Office	009	01	10.0	100.0	10.0	Office	1	Office	Office	Office
010	Office	010	01	10.0	100.0	10.0	Office	1	Office	Office	Office



Properties

M2012_Heater-Cooler Battery
LTHW Heating Coil B

Mechanical Equipment (1) Edit Type

Constraints

Level: 02 Second Floor
Host: Level: 02 Second Floor
Offset: 0.0

Text

EQUIPMENT COMME...
Control Point Descript...: L2_M_LTHW_HC_8
Trend Logging: 1/24
BMS Panel / Area: Main
Change Control: N/A

Electrical

PHASE: 1
Hz: 50.00 Hz

Electrical Engineering

VOLTAGE: 230.00 V

Electrical - Loads

Panel: L2_M_LTHW
Circuit Number: L2_M_LTHW

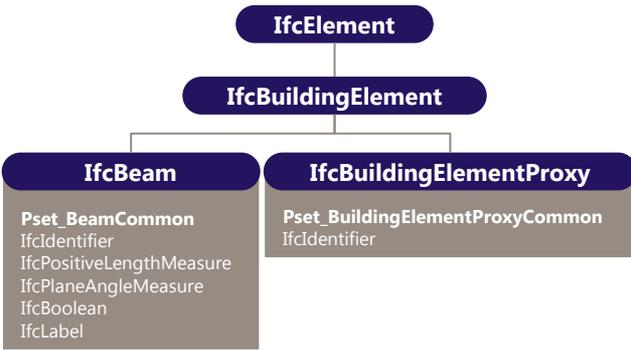
Mechanical

WATER PRESSURE: 10000.00 Pa
ROOM DELTA T: 35.00 °C
LTHW SYS RETURN TE...: 50.00 °C
LTHW SYS FLOW TEMP: 70.00 °C
ESTIMATED WATER C...: 4.674000
DESIGN HTG FLOW: 0.14 L/s
DELTA T: 30.00 °C
CORRECTION FACTOR: 0.471330
COIL LAT DB: 19.00 °C
COIL EAT DB: 0.00 °C
CALCULATED OUTPUT: 243.21 W

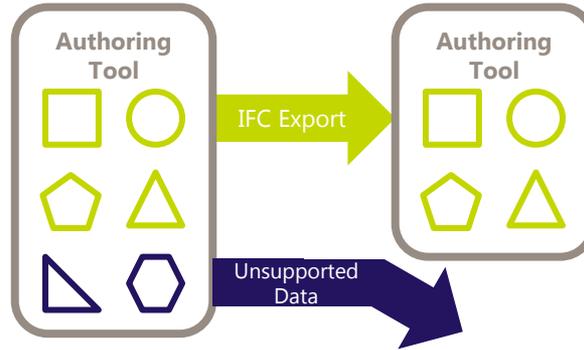
Data contributing towards the up to date energy performance model

Extensible parameter attribution within Revit

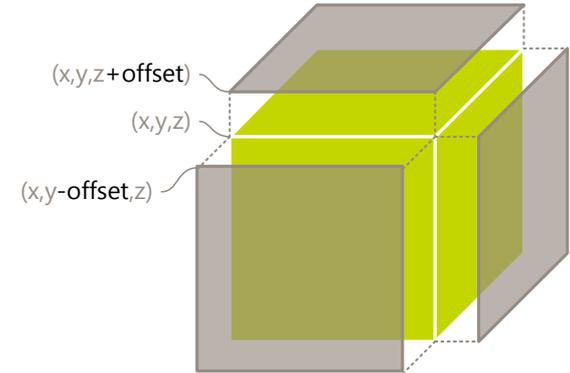
PITFALLS AND OBSTACLES



Data loss through proprietary attribute storage methods



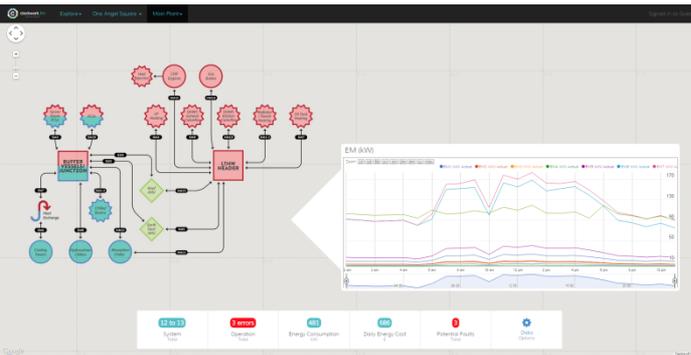
Data loss through export to other platforms



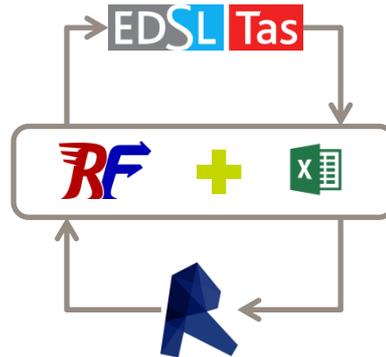
Geometry misrepresentation through offset coordinate assignment

WHERE NEXT

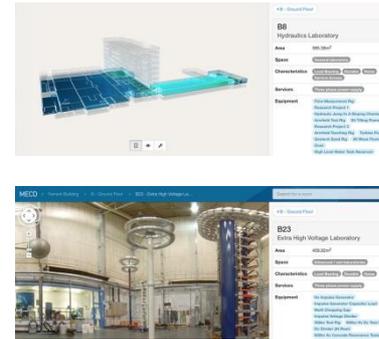
- Ad-hoc tools manipulating ad-hoc data



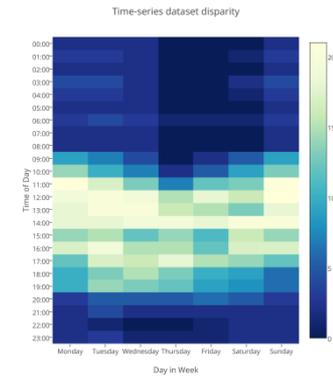
Clockwork FM



Systems and geometry export/import between tools



Space use and movement planning



Data management and visualisation

CALL FOR PAPERS – SPECIAL ISSUE OF SCIENCE AND TECHNOLOGY FOR THE BUILT ENVIRONMENT

- ***"BIM Applications for HVAC&R Engineering and Operations"***
- Manuscript submission June 12th
- Topics of interest:
 - HVAC&R performance modeling and simulation
 - Modeling of HVAC equipment
 - Fault detection and diagnosis
 - Building in-use management
 - BIM tools and performance simulation
 - BIM and energy system dynamics, controls and optimization
 - BIM applications for Facilities Management
- Contact t.gerrish@lboro.ac.uk for further details and the invitation containing instructions

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