

8th October 2013 – EuHPN Congress Budapest

STREAMER-PROJECT: *USING BUILDING INFORMATION MODELING TO OPTIMIZE NEW AND REFURBISHED HEALTHCARE FACILITIES*



Joram Nauta – Dutch Centre for Health Assets

TNO innovation
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Streamer 
European research on energy-efficient healthcare districts

Semantics-driven Design through Geo and Building Information Modelling for Energy-efficient Buildings Integrated in Mixed-use Healthcare Districts

CP-IP FP7.EeB.NMP.2013-5:

Optimised design methodologies for energy-efficient buildings integrated in the neighbourhood energy systems



CONSORTIUM:

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ipostudio

ARUP

DWa

installatie- en energieadvies



de jong gortemaker algra



Rijnstate



The Rotherham
NHS Foundation Trust

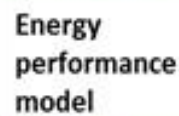
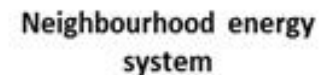
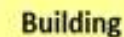
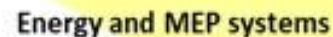
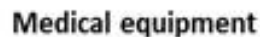


Azienda
Ospedaliero
Universitaria
Careggi



Scope: EeB design optimisation in 3 levels / areas:

1. Building MEP systems ↔ high-tech medical equipment
2. Building envelope and spatial layout ↔ new healthcare services
3. Building energy systems ↔ neighbourhood systems (grid, heat storage/exchange, etc.)





Energy Efficient Buildings are hot topic in H2020 !

EU-scope:

- Estimated that healthcare contributes ~5% to the carbon footprint;
- Hospitals use enormous amounts of energy (equivalent to small cities);
- Stricter regulations are coming into force (near/zero energy buildings, Energy performance directive, Climate Change Acts);
- Specifically existing buildings are focus areas for improvement;
- Hospital fit with improvement agenda (components=> rooms => buildings => districts).

However:

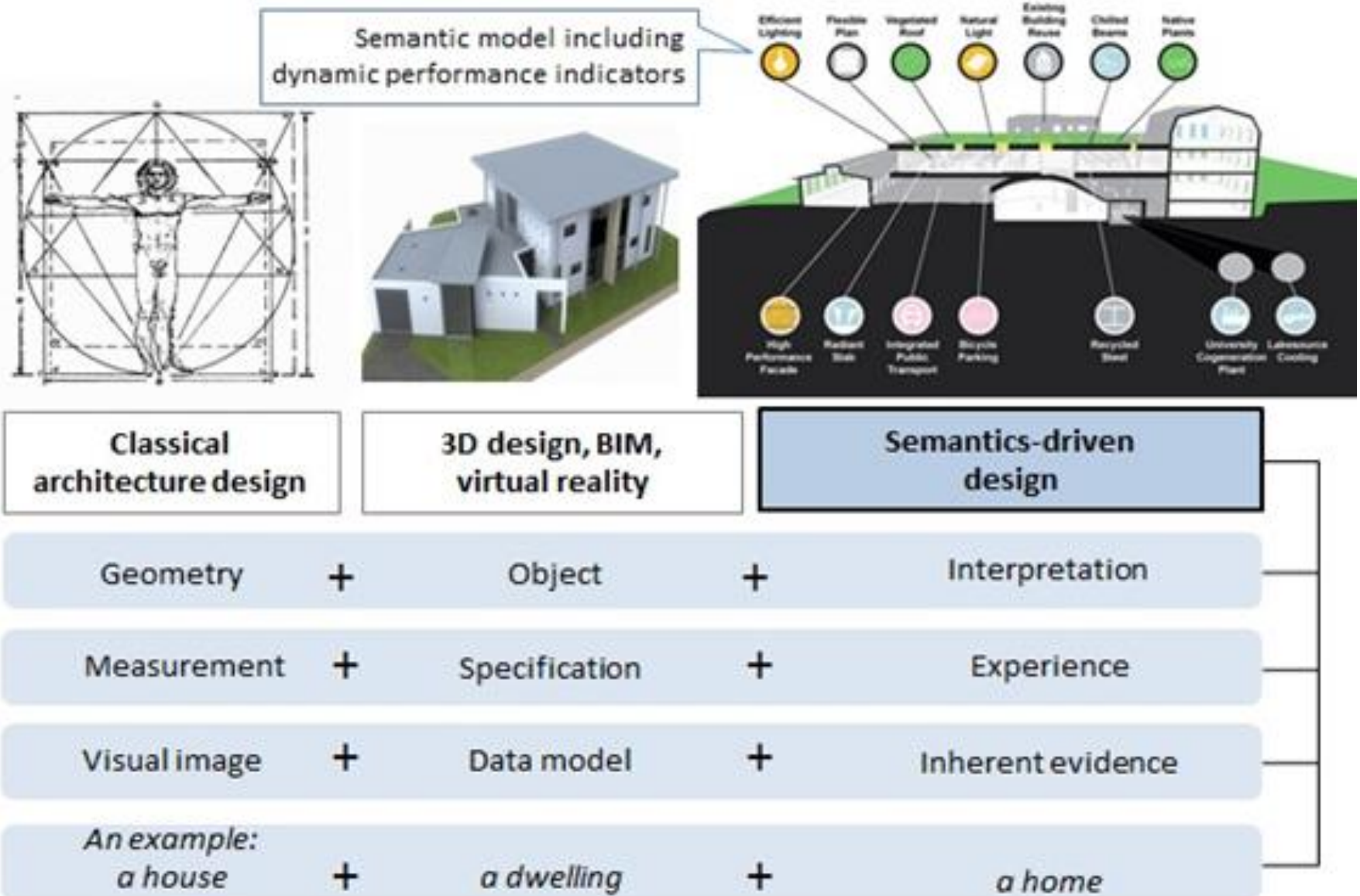
- It receives little or no attention from hospital boards;
- Only accounts for approx 2-3% of operating costs ;
- Is not an important performance indicator;
- Idea is that little can be done in existing buildings;

And

- Clinical processes evolve faster than buildings;
- Fit for purpose is not optimizing for current use.



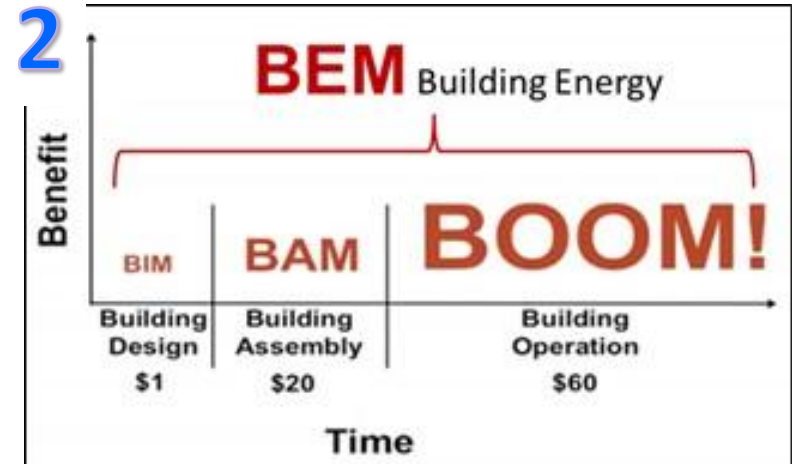
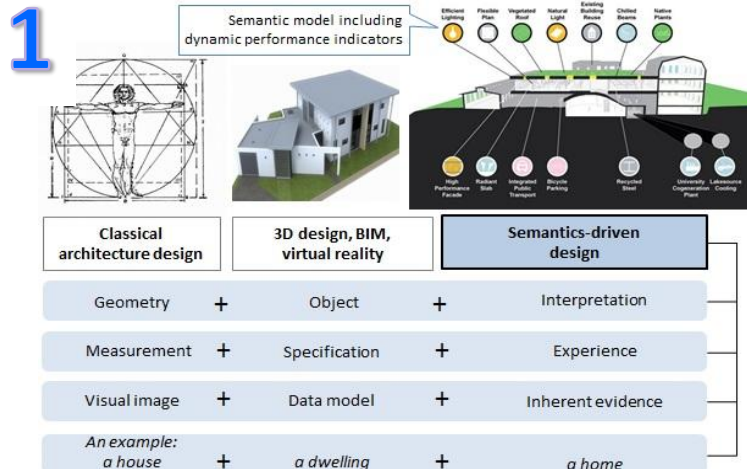
What do we know of (semantic) BIM

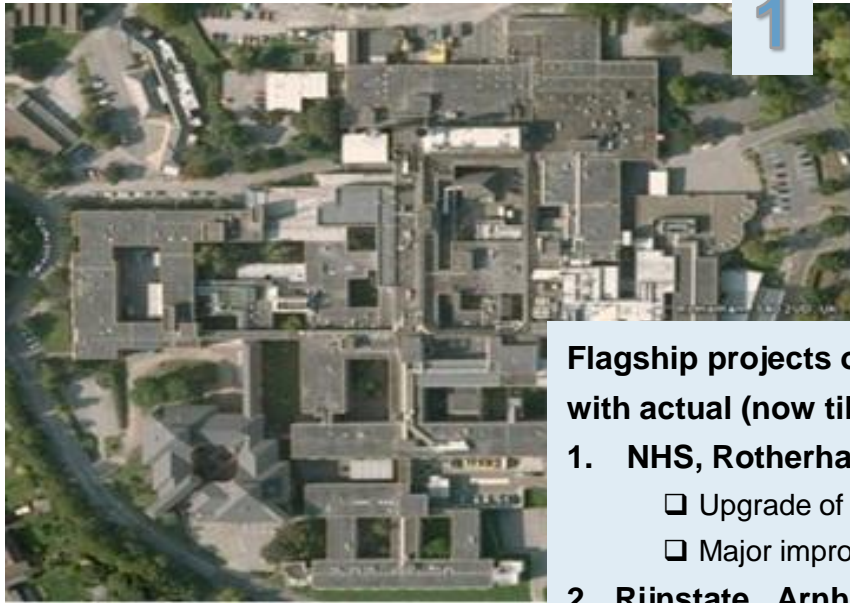


Results for Designers/Users



1. **Generic semantic BIM+GIS typology models** of Energy-efficient Buildings in healthcare districts: adjustable semantic BIM+GIS models as 'design template' for new-built and retrofitting projects.
2. **Framework for BEM (Building Energy Model)**: lifecycle model inter-connecting BIM, BAM, BOOM.
3. **Design decision-support tool**: interactive tool which accommodates: a) design proposals; b) analysis results regarding energy performance, lifecycle-cost, and functional optimisation; c) stakeholder's requirements, decision criteria, and priorities.





**Flagship projects of 4 hospital districts
with actual (now till 2020) EeB design plans:**

1. NHS, Rotherham, UK

- ☐ Upgrade of Building Management Systems
- ☐ Major improvements in overall building fabric

2. Rijnstate, Arnhem, NL

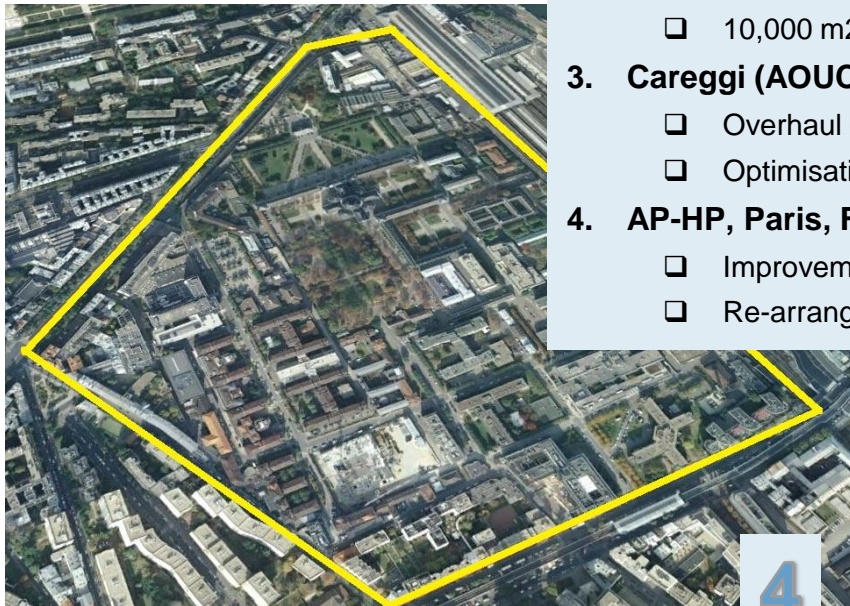
- ☐ Mid-life renovation to replace MEP systems
- ☐ 10,000 m2 extension and new buildings

3. Careggi (AOUC), Firenze, Italy

- ☐ Overhaul of electricity and heat distribution
- ☐ Optimisation of inter-building functions

4. AP-HP, Paris, France

- ☐ Improvement of logistic and waste systems
- ☐ Re-arrangement of building spaces

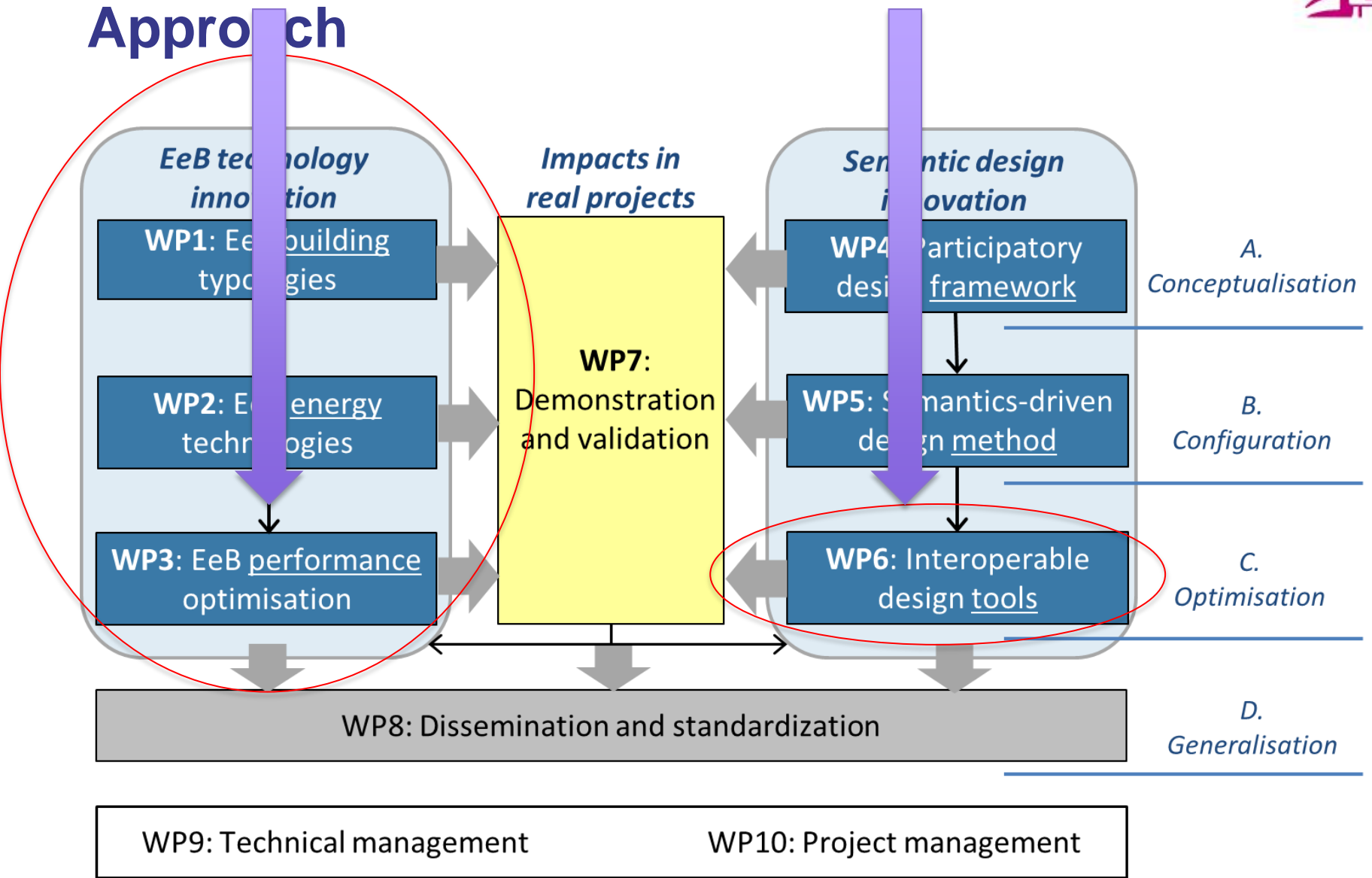


What other types of performance do we expect?

How do we want this to look like??



Approach



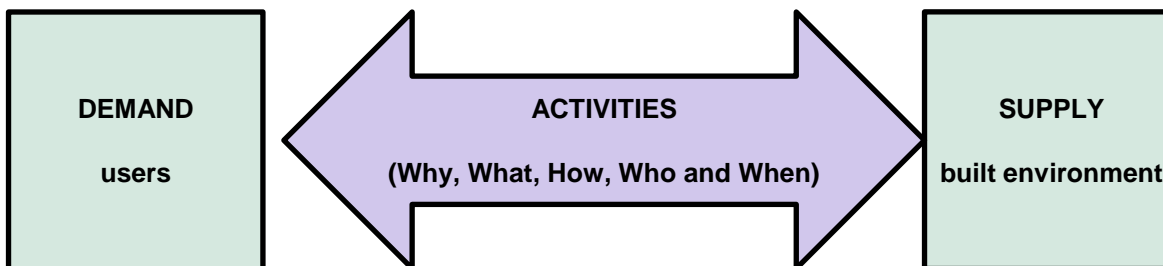
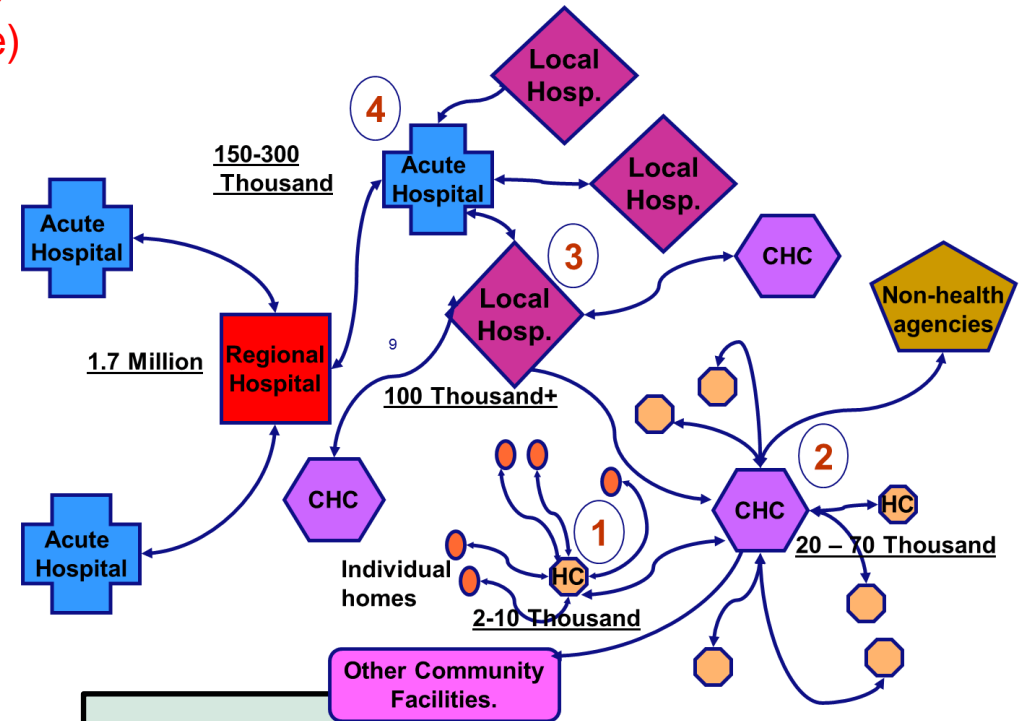


Approach (from point of health care system)

Logic of reasoning (top down):

- **HC System determines infrastructure & organisation principle (out of scope)**
- Organisational principle determines function
- Form follows function
- Function dictates activity
- Activity determines (a.o.) energy demand

Example: Northern Ireland



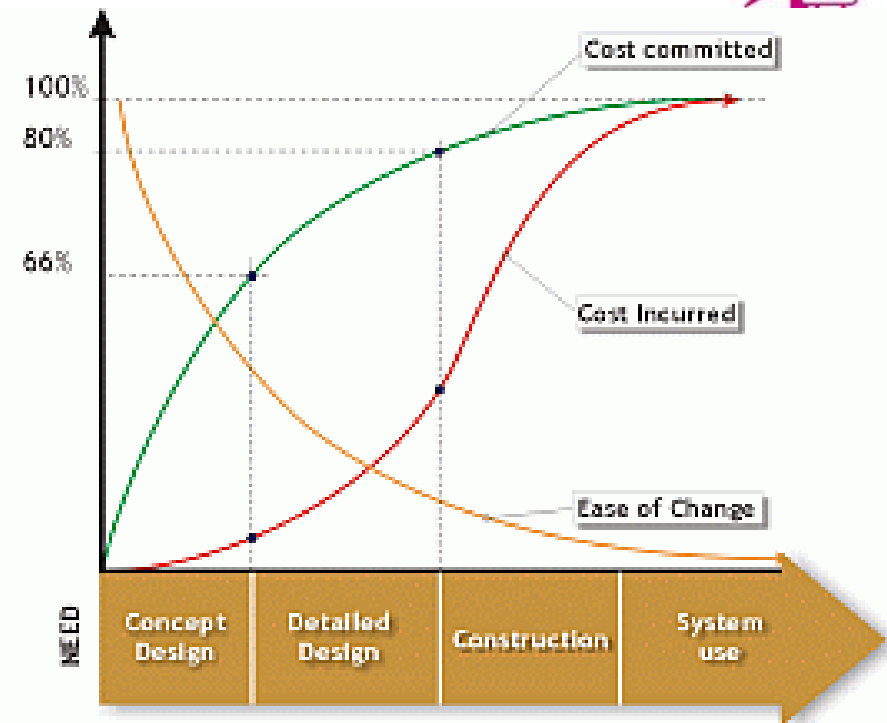


Design Approach

- From ideas & sketches to building blocks (concept design)
- Form building blocks into departmental layouts/floor plans
- From floor plans to detailed designs

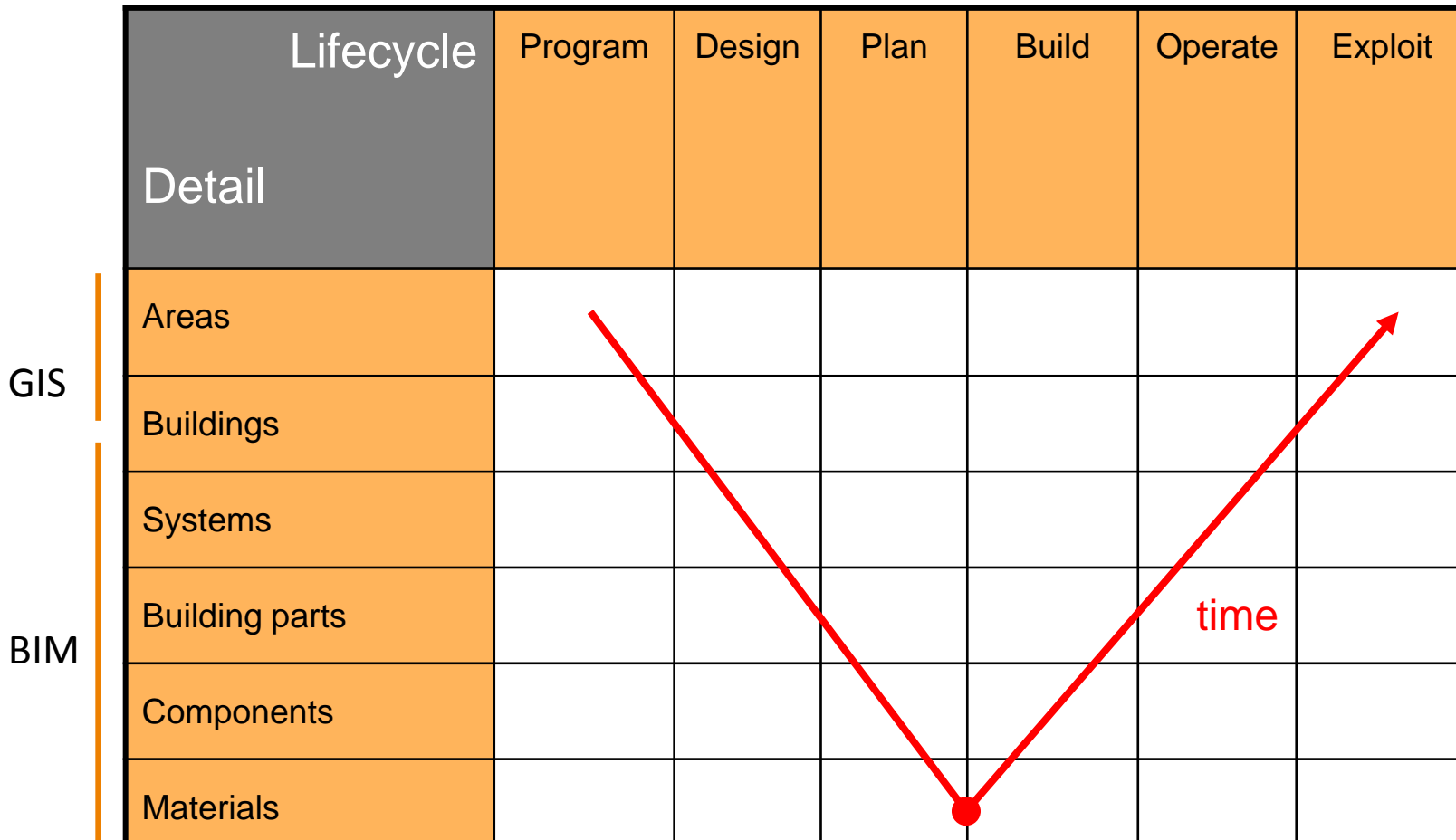
Adding detail and information as the design progresses

Iterative process, capturing & storing information (enriching)





BIM approach (top down & bottom up)





In an ideal world.....

This project delivers an open

(semantic) Design library
(room level or functional level)

To aid designers in making a

Design (at a certain stage)

And showing the

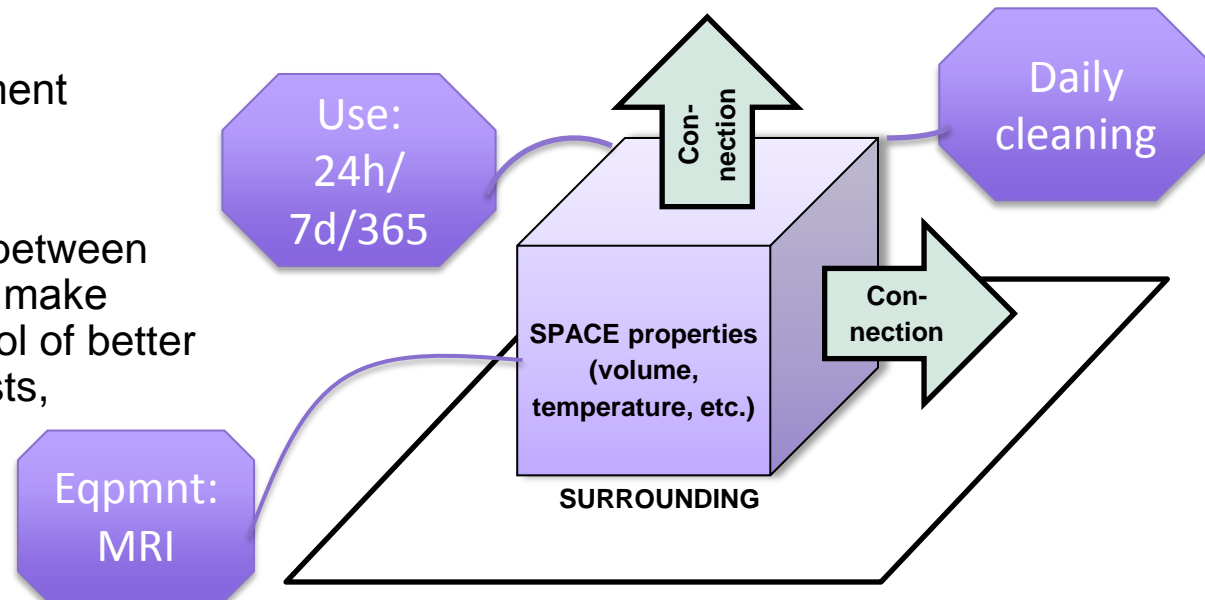
Effect on KPI's (energy)

To help create better design decisions for now and in future



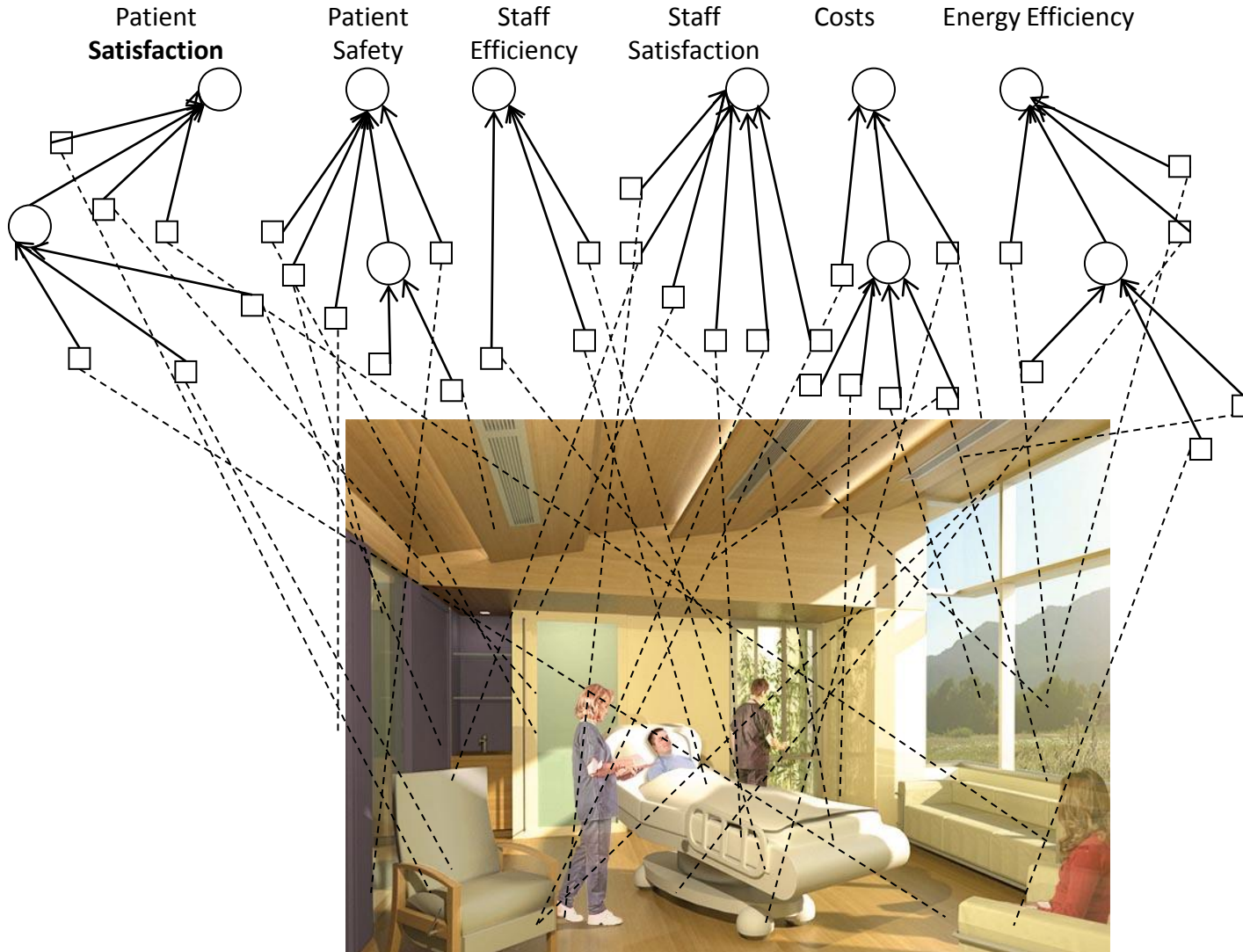
Interpretation so far...

- Common denominator is necessary between BIM world & Hospital designers (**legoblocks+ semantic labels**)
- Link between design, use of design by hospital (activities + equipments) and energy performance is crucial
- It's about actual refurbishment projects!
- More logic and hierarchy between important hospital KPI's to make decision design-support tool of better value to others (safety, costs, satisfaction, flexibility)





Building Performance





More information:

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