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BUILDING PERFORMANCE EVALUATION and POE:
PAST, PRESENT and FUTURE

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USABLE BUILDINGS
www.usablebuildings.co.uk

Building Performance Evaluation
Post-Occupancy Evaluation

INTRODUCTION

Building performance in use
is in the public interest

- Buildings last a long time, well beyond the time horizons of their creators, with many players involved in different roles.
- As building users, the whole population has an interest in them working better in every respect.

- **Now we want to improve the performance of the new, and particularly the existing stock,** *especially (but by no means only) in terms of health, safety, energy, carbon, sustainability and resilience.*

BUT …

- feedback loops from performance in use to design, building and policymaking are poorly closed, *a disastrous oversight.*

SO DO WE UNDERSTAND WHAT WE ARE DOING?

Most designers, builders and project managers *have failed to follow through after handover.* ***Why?***

- Not what clients or government asked for, so: *"hand over and run away" is systemically embedded in standard procedures & contracts. Follow-through and feedback are not part of the standard offering*.
- Clients and government don't even allow time and money for tune-up after handover, *and often want to bury bad news (reputational risk).*
- A strong policy emphasis on construction, not performance in use, *even when feedback begins to reveal systemic problems.*
- Salami-slicing of procurement, with little continuity of design intent.
- Often rigid divisions between funding capital and operational costs.
- The industry and its associated professions didn't fill the vacuum created while governments forced deregulation agendas, progressively outsourced their central and local technical expertise including procurement, property management, research, performance feedback and dissemination, both explicit and tacit.

Post-Occupancy Evaluation or Building Performance Evaluation?

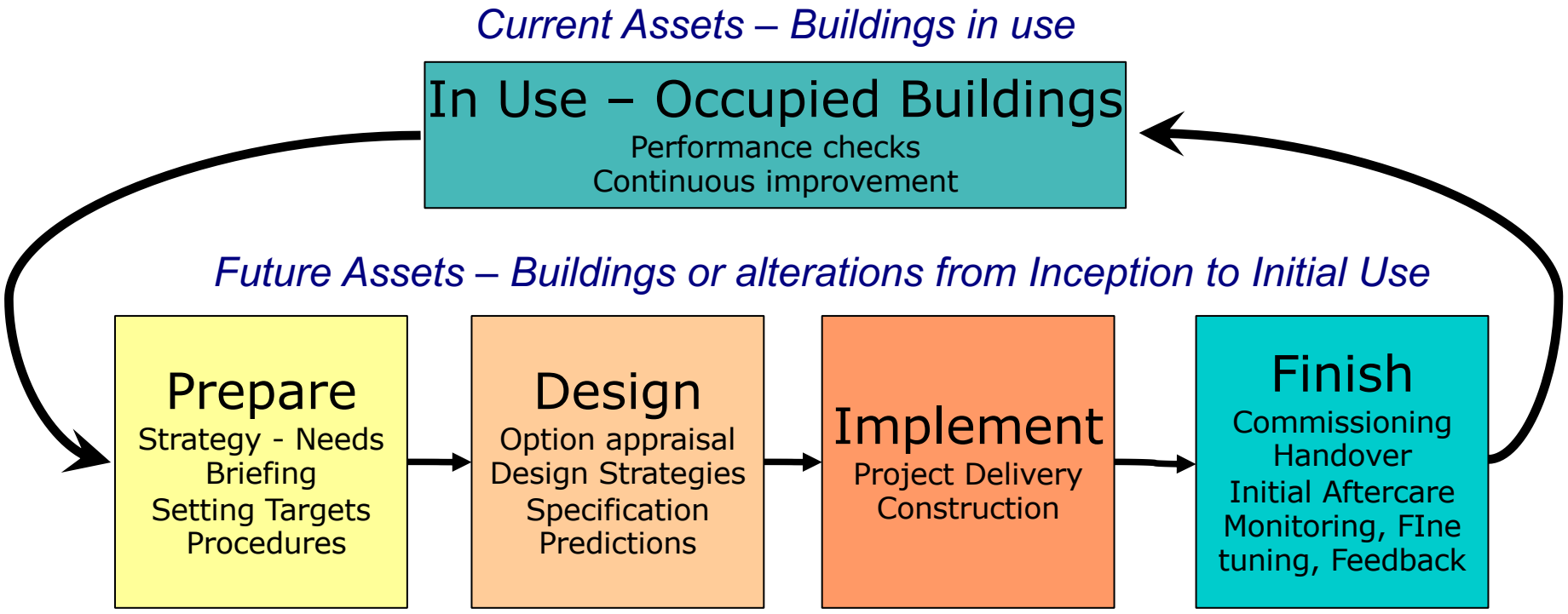
We prefer **Building Performance Evaluation,** *as it can cover any type of investigation, at any depth, at any time.*

Post-Occupancy Evaluation

- Exposes a construction industry perspective, *with handover seen as the end, not the beginning!*
- *Often regarded as academic and mostly about perceptions.*

*However, **POE** is a good term for BPE work that is integrated with the activities of the client, design, building and management team when procuring or changing a building.*

Opportunities to use BPE
over the life cycle of a project, or a building

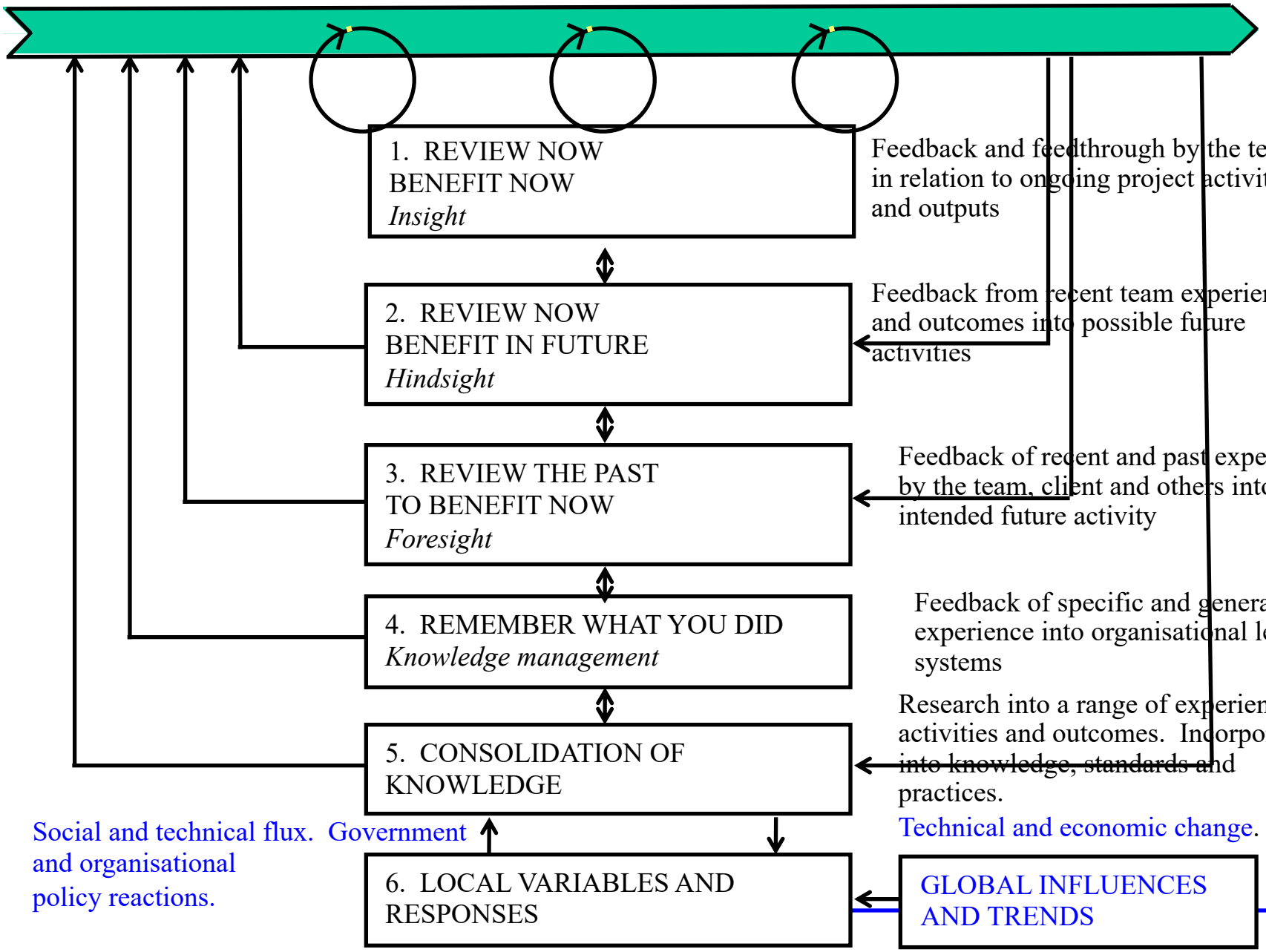


A wide range of activities, feeding into nested feedback loops

(see next slide)

Client ***Design and Building team*** ***Users and facilities managers***

Justification Briefing and design Implementation Initial use Normal use



“Any building without a feedback system is stupid. It will continue to make the same dumb mistakes, rather than interesting new ones.”

AMORY LOVINS

Rocky Mountain Institute

You can't tell how good your building is
… *unless you find out how it is working*

Elizabeth Fry building has the last laugh

The story of the Elizabeth Fry building (AJ 23.4.98) contains a number of ironies. My favourite is that it didn't even make the shortlist of the Green Building of the Year Award in 1996.

DR ROBERT LOWE
Leeds Metropolitan University

LETTER TO ARCHITECTS' JOURNAL

The good performers don't necessarily impress the judges

The original Elizabeth Fry Probe paper was published in *Building Services Journal,* 37-41 (April 1998).

It was the practice, not just the product

Factors for success at the Elizabeth Fry Building, UEA

But only the technical features were mentioned when a Royal Commission used it an exemplar

- A good client
- A good brief *incorporating the client's previous experience.*
- A good team *(worked together before on the site).*
- Specialist support *(especially on insulation and airtightness).*

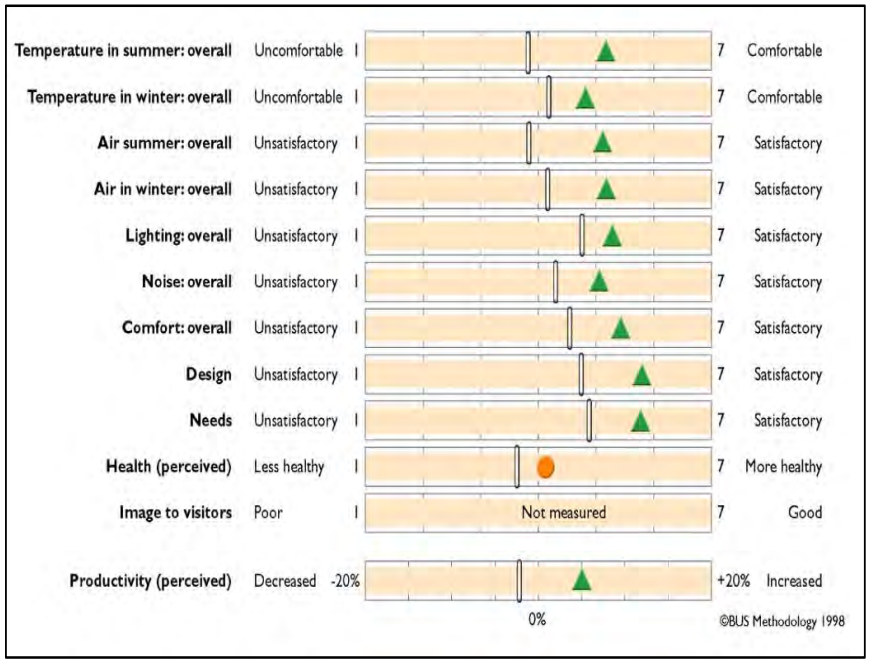
- A good, robust design, efficiently serviced *(mostly).*
- Enough time and money *(but to a normal budget).*
- An appropriate specification *(and not too clever).*
- An interested contractor *(with a traditional contract).*

- Well-built *(attention to detail, but still room for improvement).*
- Well controlled *(but only eventually, after monitoring and refit).*
- Post-handover support *(triggered by independent monitoring).*
- Management vigilance *but has it been sustained?*

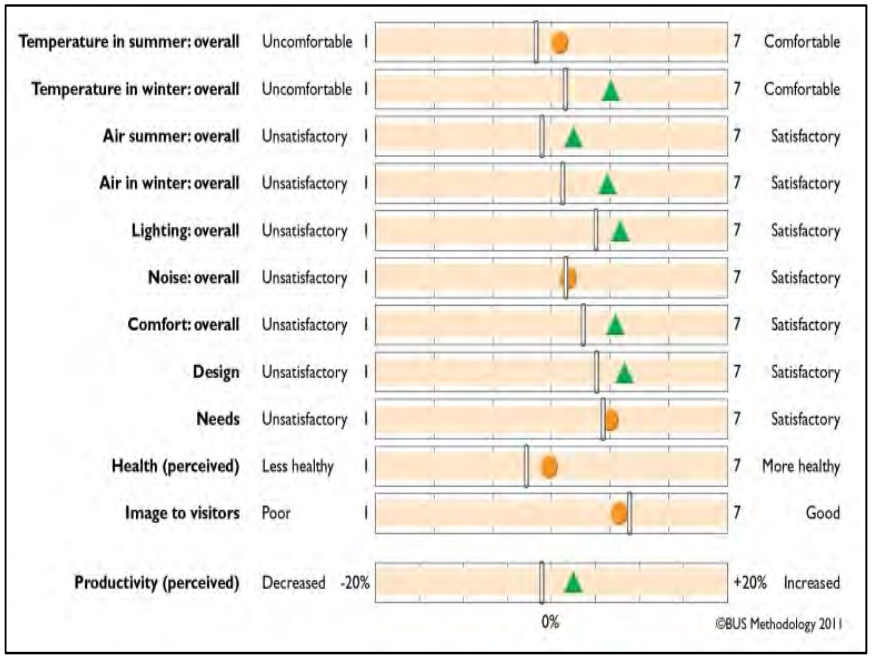
SOURCE: W Bordass et al, *Assessing building performance in use 5*, BR&I **29** (2), 144-157 (March-April 2001), Figure 6.

Elizabeth Fry Revisits – *BUS Occupant Survey*

1998



2011



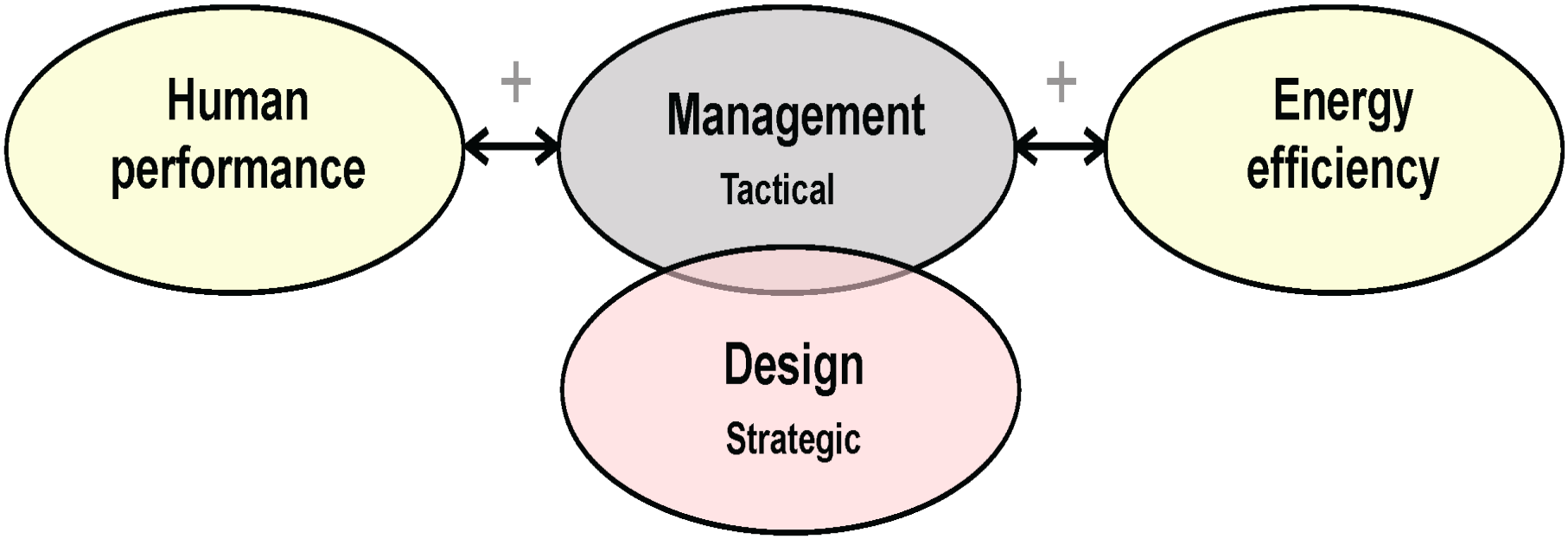
Average scores from BUS occupant survey questionnaire:
Vertical bars = benchmark medians from similar buildings.
Green triangles = significantly better than benchmark.
Orange circles = indistinguishable from benchmark, Red squares = worse

Some degradation over the years, but recognisably similar

SOURCE: W Bordass and A Leaman, *The Elizabeth Fry Building revisited,* Building Services Journal, 30-36, (March 2012).

Where good things happened …

associations of low energy with happy occupants



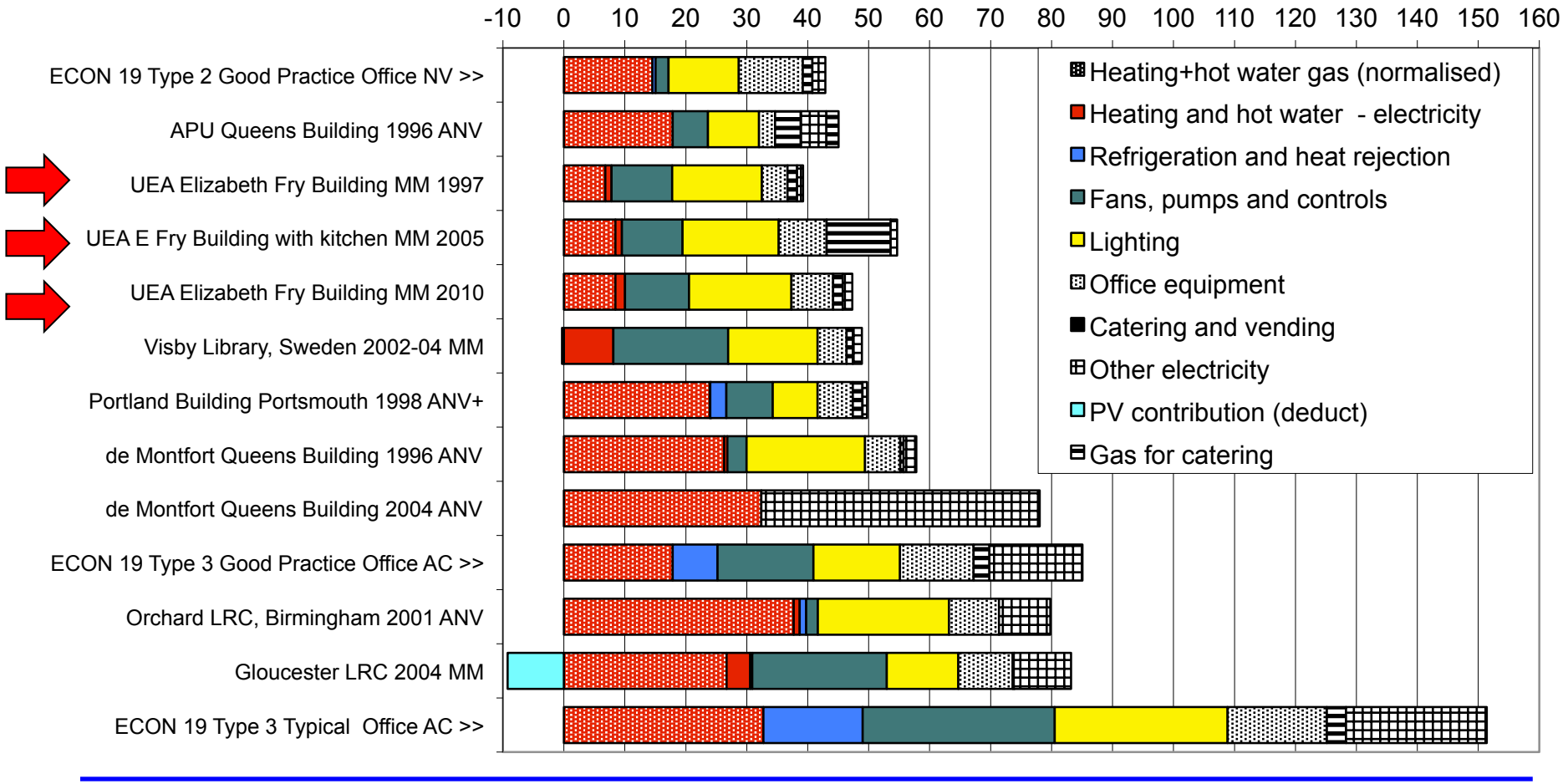
The better-performing buildings tended to be where there was a better understanding of user requirements during procurement, and better follow-through to good management in use.

One could usually name the individual or individuals responsible for championing the building in use and driving the virtuous circles.

E Fry Revisits – Energy Performance

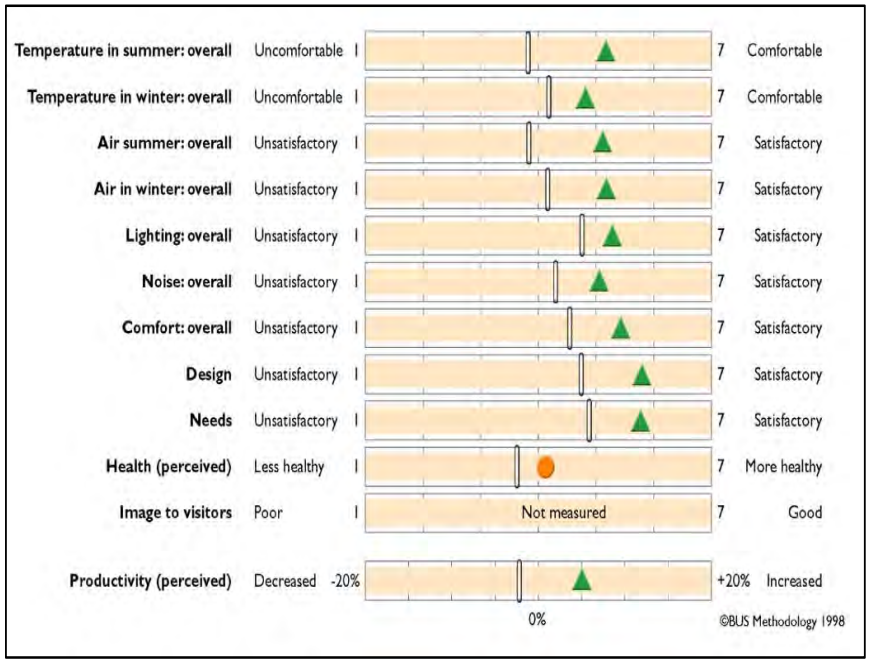
Annual CO_2 emissions from university buildings

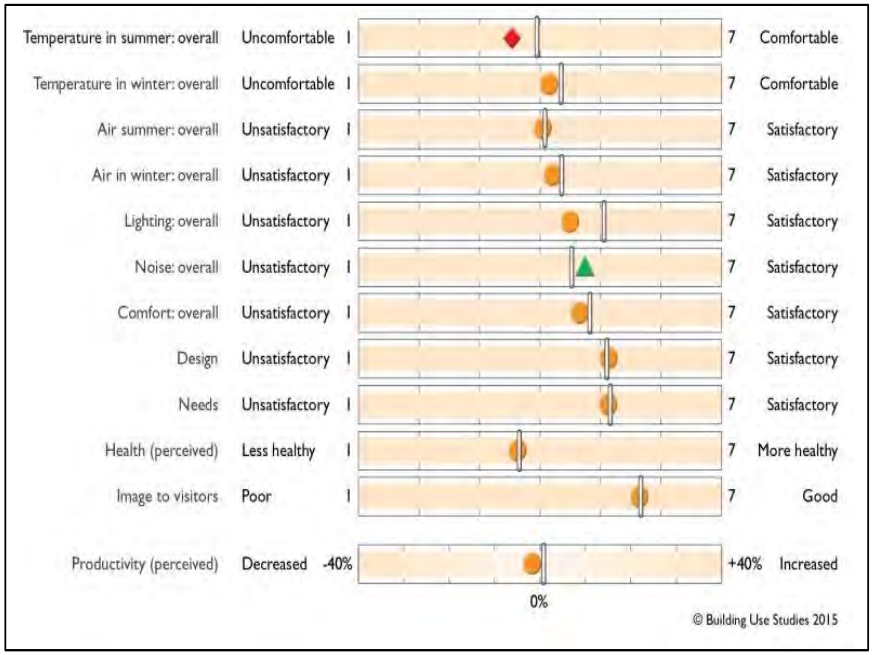
kg/m² Treated Floor Area at UK CO_2 factors of 0.184 for gas and 0.525 for electricity



Elizabeth Fry Revisit – *BUS Occupant Survey*

1998 **2015**



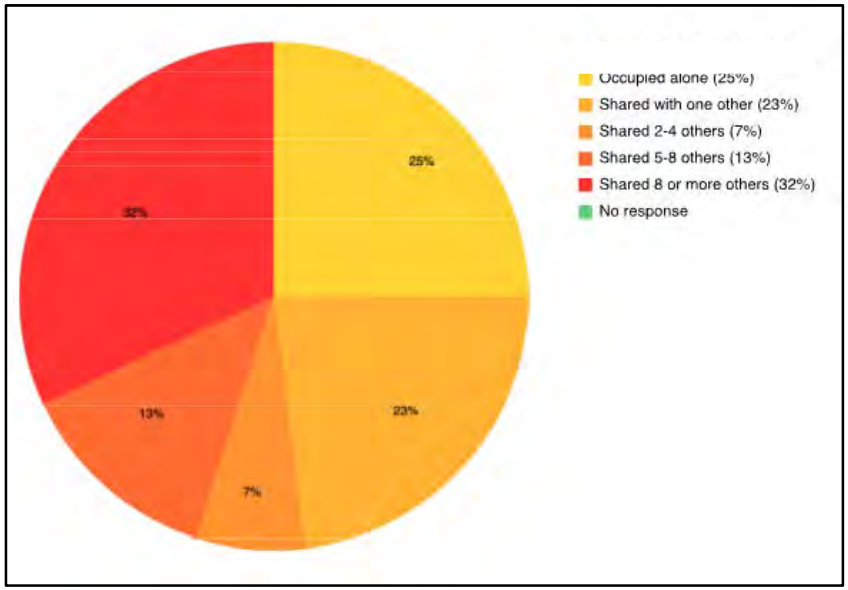


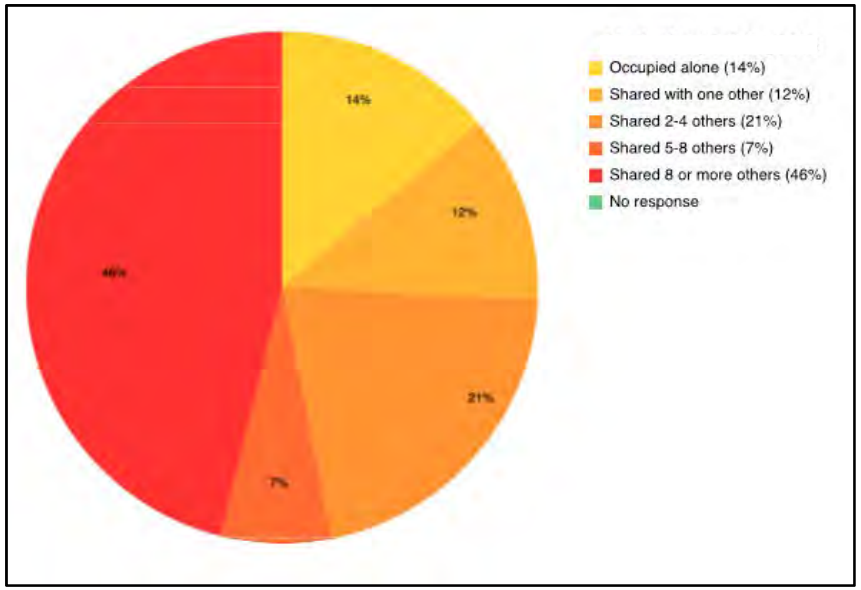
Average scores from BUS occupant survey questionnaire:
Vertical bars = benchmark medians from similar buildings.
Green triangle = significantly better than benchmark.
Orange circle = indistinguishable from benchmark, Red diamond = worse.

Now very much average – WHAT WENT WRONG?

SOURCE: R Bunn and L Marjanovich, *Occupant satisfaction signatures: Longitudinal studies,* CIBSE Symposium (April 2016).

BUS occupant questionnaire responses on room size at Elizabeth Fry: 2011 and 2015





Fewer people in individual or twin offices: *Down from 48% to 26%.*
More people in offices with 3-8 people: *Up from 20% to 28%.*
More people in large shared spaces (8 or more): *Up from 32% to 46%.*

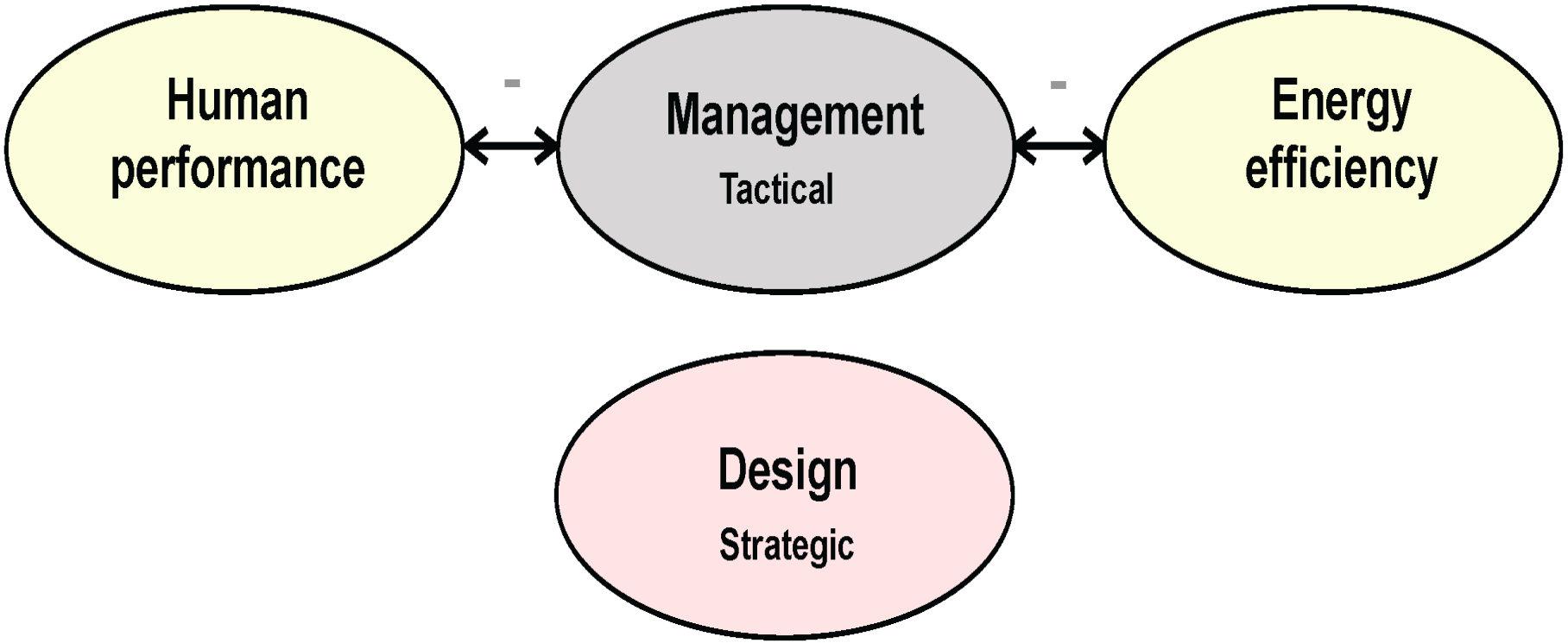
Managers and architects tend to like open-plan spaces – *but there is much more that can go wrong. COVID has of course changed things too.*

SOURCE: R Bunn and L Marjanovich, *Occupant satisfaction signatures: Longitudinal studies,* CIBSE Symposium (April 2016).

Here is one of those converted spaces

Increased occupant density: heat, noise, interruptions, etc., etc..
Loss of thermal mass of partitions and ceiling.
Trickle-charge cooling system with no local control can barely cope.
Contractor design. Less oversight by Estates or by professionals.

… and where they didn't
no positive associations



Without this understanding and commitment - *linking design to use and management* – performance in use could be disappointing, in terms of energy and/or occupant satisfaction. *So we need to bring out the leaders.*

Building Performance Evaluation
Post-Occupancy Evaluation

PART 1
THE PAST

60 years ago the RIBA Plan of Work (1963) included **STAGE M - Feedback**

PURPOSE

To analyse the management, construction and performance of the project.

TASKS TO BE DONE

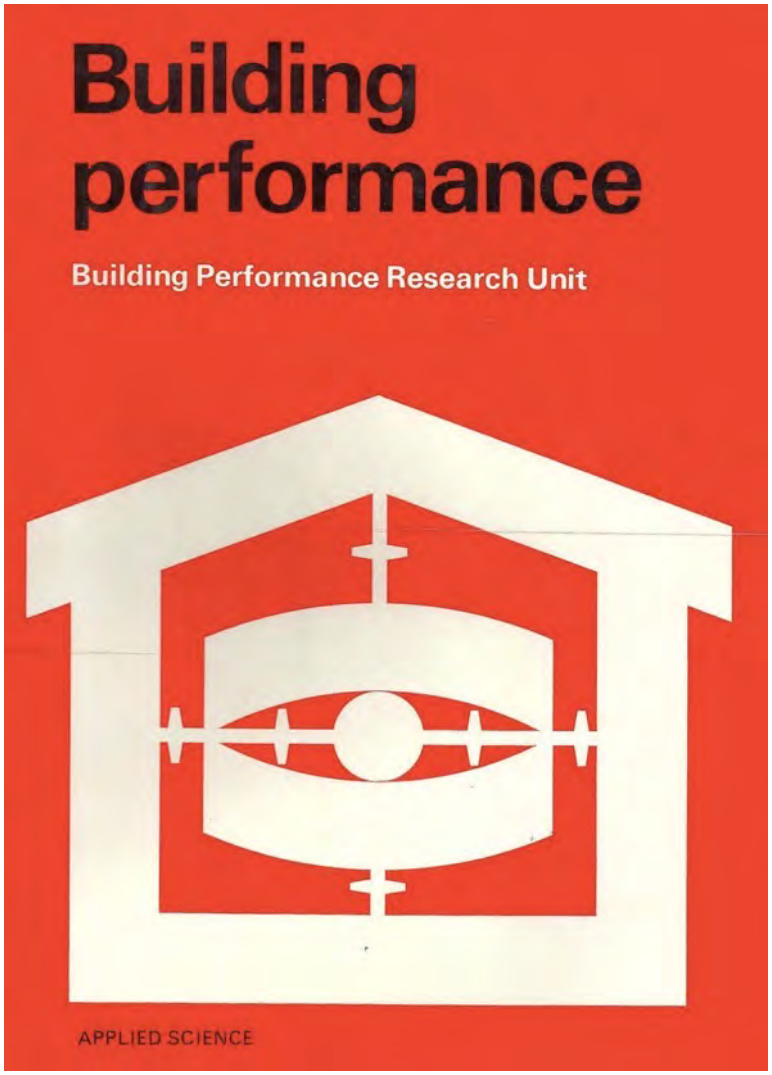
Analysis of job records.
Inspections of completed building.
Studies of building in use.

PEOPLE DIRECTLY INVOLVED

Architect, engineers, QS, contractor, client.

SO WHY ISN'T POE THE INDUSTRY STANDARD TODAY?

Building performance evaluation
started in some universities in the 1960s



Pioneers included the Univ of California, Berkeley and Strathclyde's Building Performance Research Unit (BPRU).

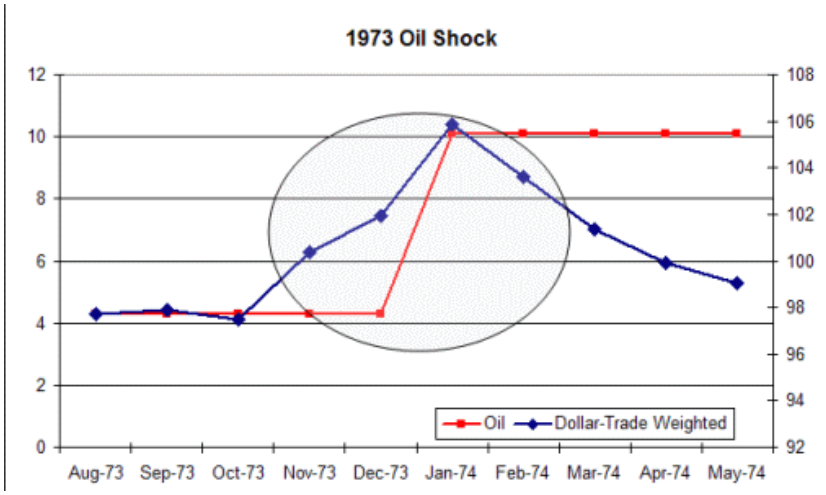
However, after BPRU's seminal book in 1972, the subject failed to gather momentum, as it did not fit academic criteria well, or get sustained client, government, industry or professional support.

"*Unfortunately, interdisciplinary subjects have a way of escaping from any discipline whatever.*" … ERIC DREXLER

In 1972 the RIBA **removed Stage M: Feedback** from *Architect's Appointment.* ***WHY? Because clients wouldn't pay for it and the RIBA didn't want to suggest that architects would do it for nothing.***

REFERENCE: T Markus et al, *Building Performance,* Applied Science Publishers (1972)

The very next year (1973) we had the oil crisis



In 1974, coal supplies also ran short in the UK, through trade union action, bringing on the 3-day week and bringing down the Tory Government …

The UK soon introduced its very first non-domestic energy building regulations

Communities and Local Government

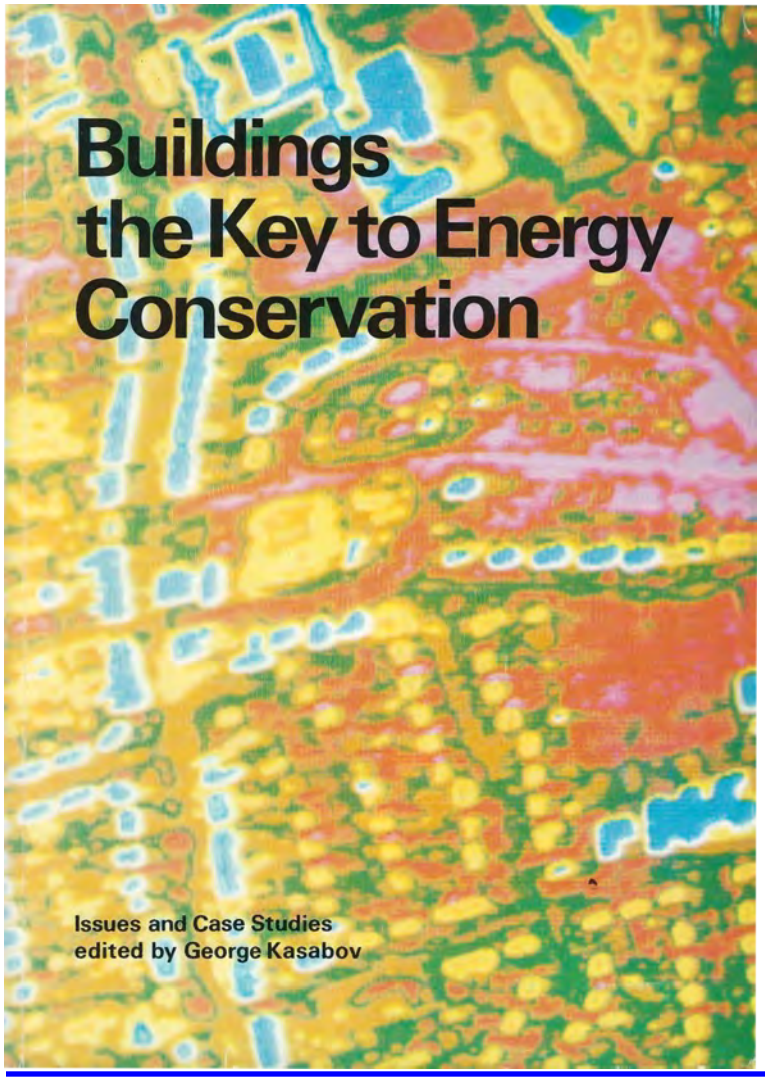
History of "Part L"

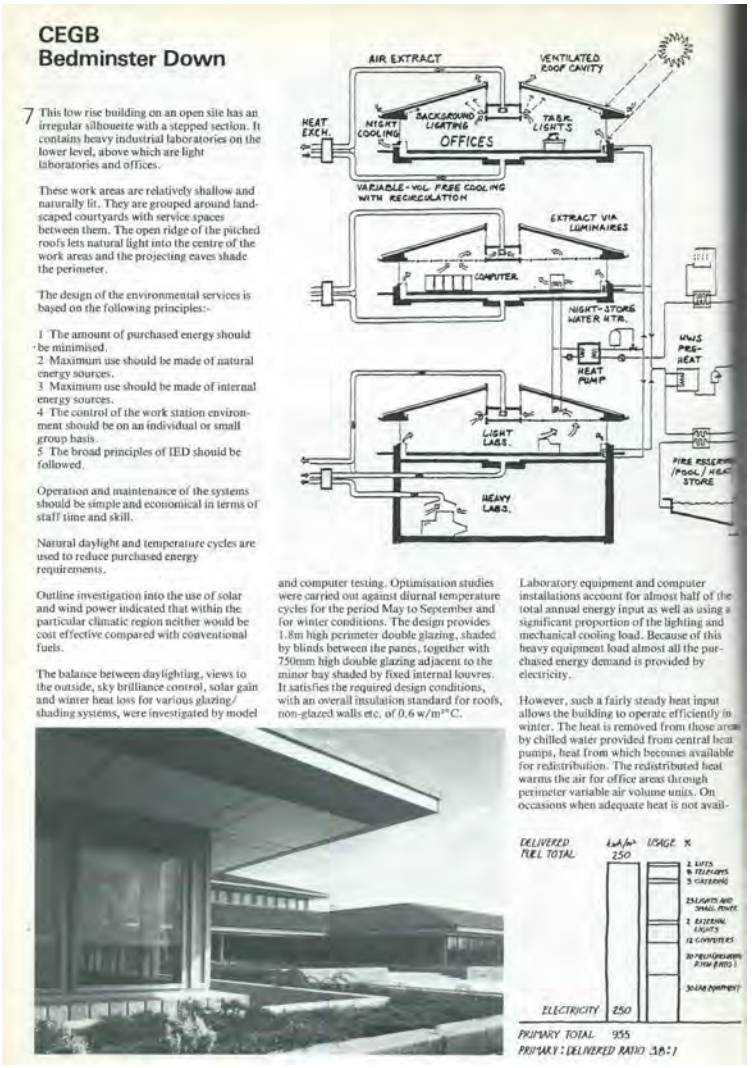
- **1962** onwards – anti-condensation, not energy efficiency.
- **1972** Conservation of fuel and power provisions for dwellings Part F…
- **1974** Ditto non dwellings – Part FF.
- **1985** Provisions recast:-
  - Functional requirement – make reasonable provision.
  - Guidance in Approved Document L – some ways of complying.
- **1990**, **1995**, **2002** Requirements improved and re-focussed first on energy efficiency and then on CO_2.

SOURCE: E King, *The history of the Building Regulations,* House Builders Federation Technical Conference, 14 Nov 2007.

And energy performance rose up the agenda

50 Case Studies of low-energy buildings (RIBA 1979)





CEGB
Bedminster Down

7 This low rise building on an open site has an irregular silhouette with a stepped section. It contains heavy industrial laboratories on the lower level, above which are light laboratories and offices.

These work areas are relatively shallow and naturally lit. They are grouped around landscaped courtyards with service spaces between them. The open ridge of the pitched roofs lets natural light into the centre of the work areas and the projecting eaves shade the perimeter.

The design of the environmental services is based on the following principles:-

1 The amount of purchased energy should be minimised.
2 Maximum use should be made of natural energy sources.
3 Maximum use should be made of internal energy sources.
4 The control of the work station environment should be on an individual or small group basis.
5 The broad principles of IED should be followed.

Operation and maintenance of the systems should be simple and economical in terms of staff time and skill.

Natural daylight and temperature cycles are used to reduce purchased energy requirements.

Outline investigation into the use of solar and wind power indicated that within the particular climatic region neither would be cost effective compared with conventional fuels.

The balance between daylighting, views to the outside, sky brilliance control, solar gain and winter heat loss for various glazing/shading systems, were investigated by model and computer testing. Optimisation studies were carried out against diurnal temperature cycles for the period May to September and for winter conditions. The design provides 1.8m high perimeter double glazing, shaded by blinds between the panes, together with 750mm high double glazing adjacent to the minor bay shaded by fixed internal louvres. It satisfies the required design conditions, with an overall insulation standard for roofs, non-glazed walls etc. of 0.6 w/m²°C.

Laboratory equipment and computer installations account for almost half of the total annual energy input as well as using a significant proportion of the lighting and mechanical cooling load. Because of this heavy equipment load almost all the purchased energy demand is provided by electricity.

However, such a fairly steady heat input allows the building to operate efficiently in winter. The heat is removed from those areas by chilled water provided from central heat pumps, heat from which becomes available for redistribution. The redistributed heat warms the air for office areas through perimeter variable air volume units. On occasions when adequate heat is not avail-

SOURCE: G Kasabov (ed), *Buildings, the Key to Energy Conservation,* RIBA Energy Group, 1979, 96 pages.

As did building-related ill-health

The WHO recognised Sick Building Syndrome in 1982

Also identified as Tight Building Syndrome in the USA

Source of diagram optipura.com

Meanwhile, government was tuning out, *while the construction industry failed to tune in*

- Ascendancy of ideas about free markets, competition and choice; a *de facto* inefficient public sector, and *"no such thing as society".*
- Professionals began to be seen as an elitist conspiracy against the public, and treated by government as just another business, *so institutions tended to fall short on their role as Learned Societies.*
- The Rothschild Report 1972, advocated a customer-contractor relationship for government-sponsored applied research … *but what happened to its idea of an intelligent government customer?*
- Government's professional skills and in-house research were outsourced and privatised, including Building Research Establishment.
- The Department of the Environment was dismembered 1997-2002.

WHERE WAS THE INSTITUTIONAL MEMORY?

Nobody else (e.g. professional institutions) helped to fill this gap effectively and provide continuity, while academe was too distant.

So policy became based more on hope, predictions, lobbies and crises, than sound experience of what works and what really needs attending to.

So 10 years later, in 1990 …

Tales of the unexpected

Office buildings claimed to be energy efficient, in reality often fall short of their quoted performance because of simple calculation errors and unknown energy-consuming extras. Matthew Coomber *reports.*

BUILDING owners beware – your energy-efficient building may not be as efficient as you have been led to believe.

Bill Bordass, an independent energy consultant and something of a guru in the field of energy efficient design, claims many offices are touted as energy efficient, but turn out not to be on closer examination.

He is helping to prepare a series of case studies of energy use in offices as part of the Energy Efficiency Office's Best Practice programme.

The studies detail energy usage and cost figures for each energy consumption elements missing or had recorded building areas much larger than that actually serviced," he says.

Errors in calculation had arisen either through mismeasurement of floor area or a failure to understand what constitutes the treated area, that is, the area of a building that consumes energy, in whatever form.

"We found that energy researchers have a tendency to look in great detail at where the energy goes, but will often ask somebody else for a building area." Usually rounded up or

Bordass says some people measure energy consumption by the whole building, some by building services only, and some by landlord's building services only. "This can produce great discrepancies when you come to measure the floor area and the devices properly," Bordass notes.

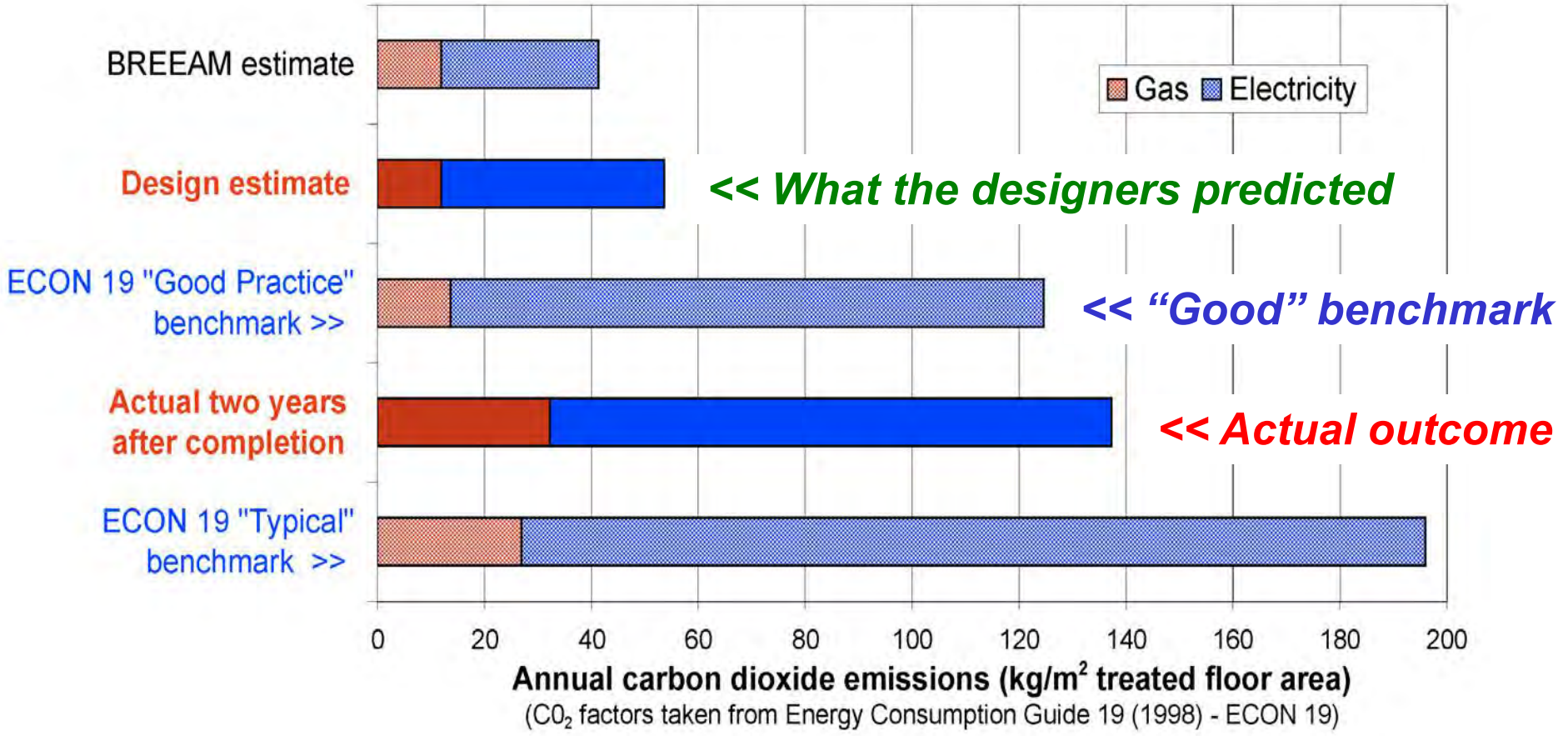
In addition, tenants can be confused about who pays for services, resulting in the doubling-up or omission of important elements of the energy bill.

The next problem concerns the assumptions that the people

SOURCE: M Coomber, *Tales of the Unexpected,* Building Magazine 38-39 (17 August 1990).

BREEAM for offices also arrived in 1990,
but energy performance gaps persisted

Data from the winner of the Green Building of the Year Award 1996



SOURCE: see discussion in S Curwell et al, *Green Building Challenge in the UK,* Building Research+Information **27**(4/5) 286 (1999).

BPE as real-world research
(after Robson, 1993)

Solving problems **NOT** Just gaining knowledge

Predicting effects **NOT** Just finding causes

Robust results, actionable factors **NOT** Only statistical relationships

Developing & testing services **NOT** Developing & testing theories

Field **NOT** Laboratory

Outside organisation **NOT** Research institution

Strict time and cost constraints **NOT** R&D environment

Researchers with wide-ranging skills **NOT** Highly specific skills

Multiple methods **NOT** Single method

Oriented to client **NOT** Oriented to academic peers

Viewed as dubious by some academics **NOT** High academic prestige

Large samples are not necessary, if you understand the context.

Case studies of individual buildings tell stories

and can establish hypotheses that can be tested elsewhere.

SOURCE: After H Robson, *Real-World Research* (Butterworth-Heinemann, 1993), 5th Edition forthcoming (2023).

Published POEs using simplified multiple methods:

Some things we found in the twenty Probe studies 1995-2002

- New buildings often perform much worse than anticipated, *especially for energy and carbon, often for occupants, and with high running costs, and sometimes technical risks.*
- Design intent is not communicated well through the process; and designers and builders go away at handover.
- Unmanageable complication: **the enemy of good performance**.
- Buildings are seldom tuned-up and controls are a muddle. So why are we making things complicated?
- Modern procurement systems make it difficult to pay attention to critical detail. ***A bad idea when promoting innovation.***

"The English spare no expense to get something on the cheap". ***… NIKOLAUS PEVSNER***

SOURCE: For more information, go the Probe section of www.usablebuildings.co.uk

New non-domestic buildings:

Some strategic implications of the Probe POE findings

- They often perform much worse than anticipated, *especially for energy and carbon, often for occupants, and with high running costs, and sometimes technical risks.*
- Design intent is not communicated well through the process. **SO … *Understand how buildings work in use, follow through after handover, and learn from the experience.***
- **Unmanageable complication: the enemy of good performance**. **SO … *Stop making buildings complicated in the name of sustainability and get the simple things right.***
- Buildings are seldom tuned-up and controls are a muddle. **SO** … ***Design to enhance usability and manageability.***
- Modern procurement systems make it difficult to pay attention to critical detail. **SO** … ***Change the processes.***
- **AND THEREFORE**… **Focus on in-use performance, communicate it clearly and manage it properly.**

SOURCE: For more information, go the Probe section of www.usablebuildings.co.uk

Technology - management interactions:

Some conclusions from the Probe studies of public and commercial buildings, confirmed in later work by others

		Technological complexity	
		More	**Less**
Building management input	**More**	*Type A* Effective, but often costly	*Type D* Rare, not replicable?
	Less	Risky with performance penalties *Type C*	Effective, but often small-scale *Type B*

Diagram first appeared in: *Probe 19: Designer Feedback,* Building Services, the CIBSE Journal, page E21 (March 1999).

Technology - management interactions:

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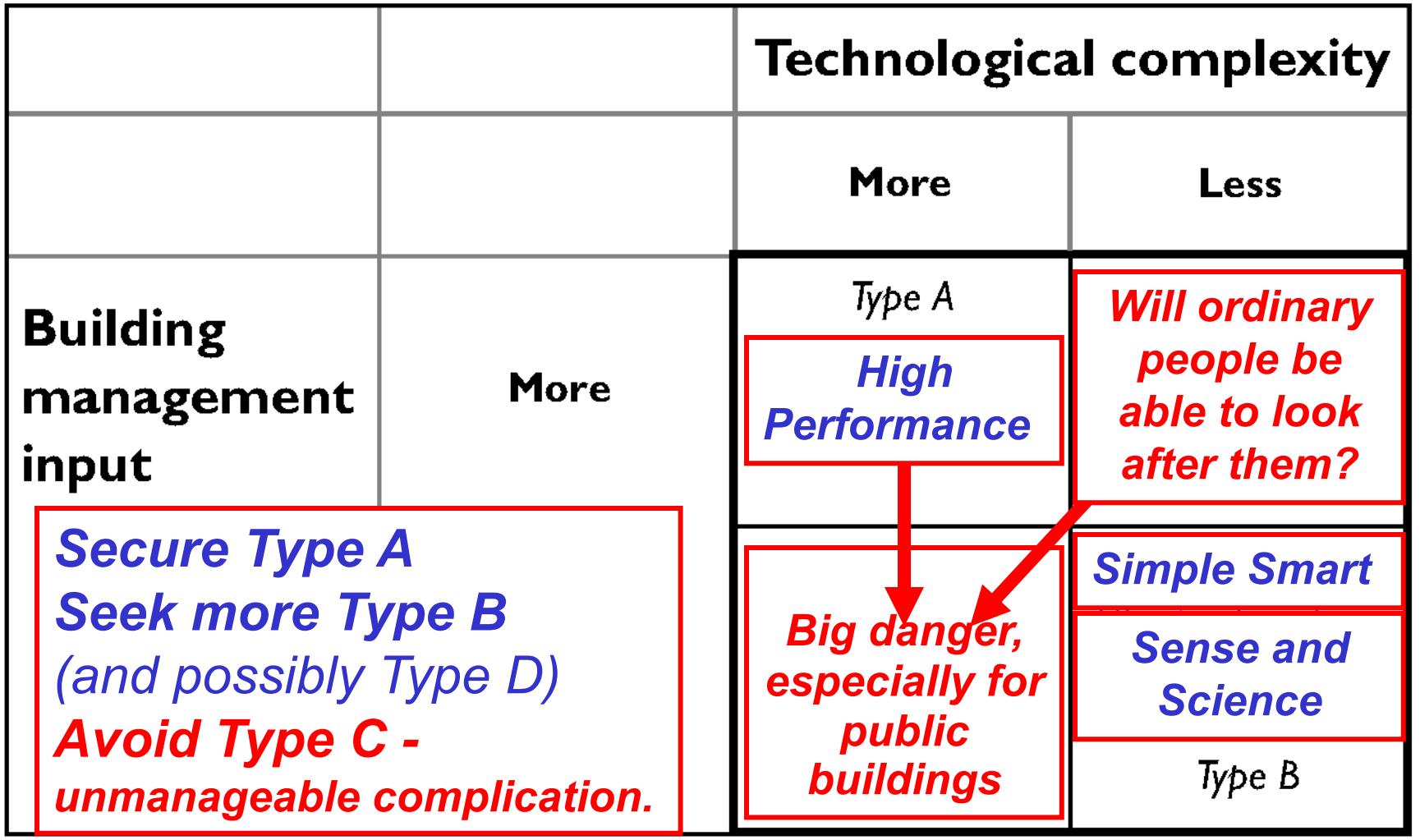
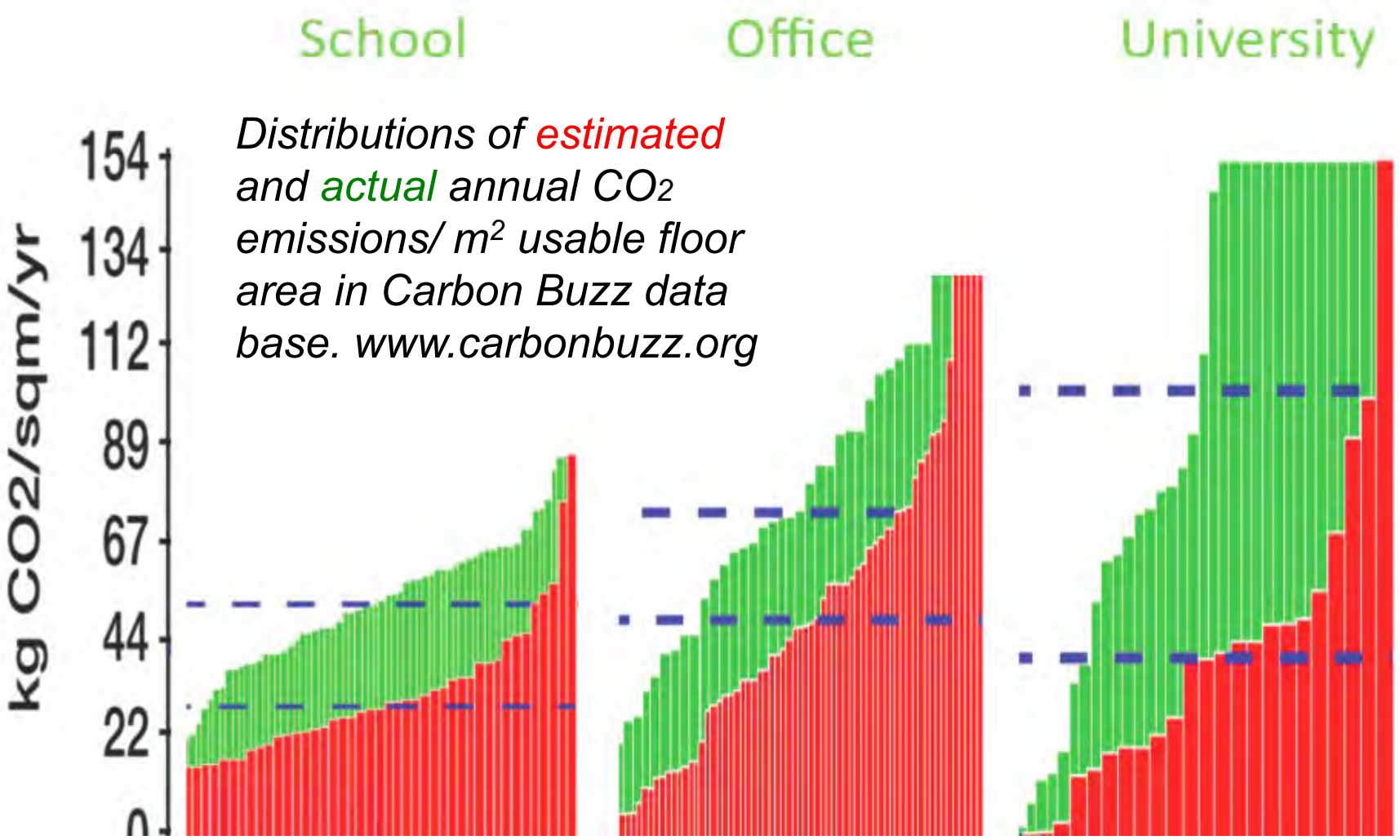


Diagram first appeared in: *Probe 19: Designer Feedback,* Building Services, the CIBSE Journal, page E21 (March 1999).

But the energy performance gaps persisted

in many other countries too



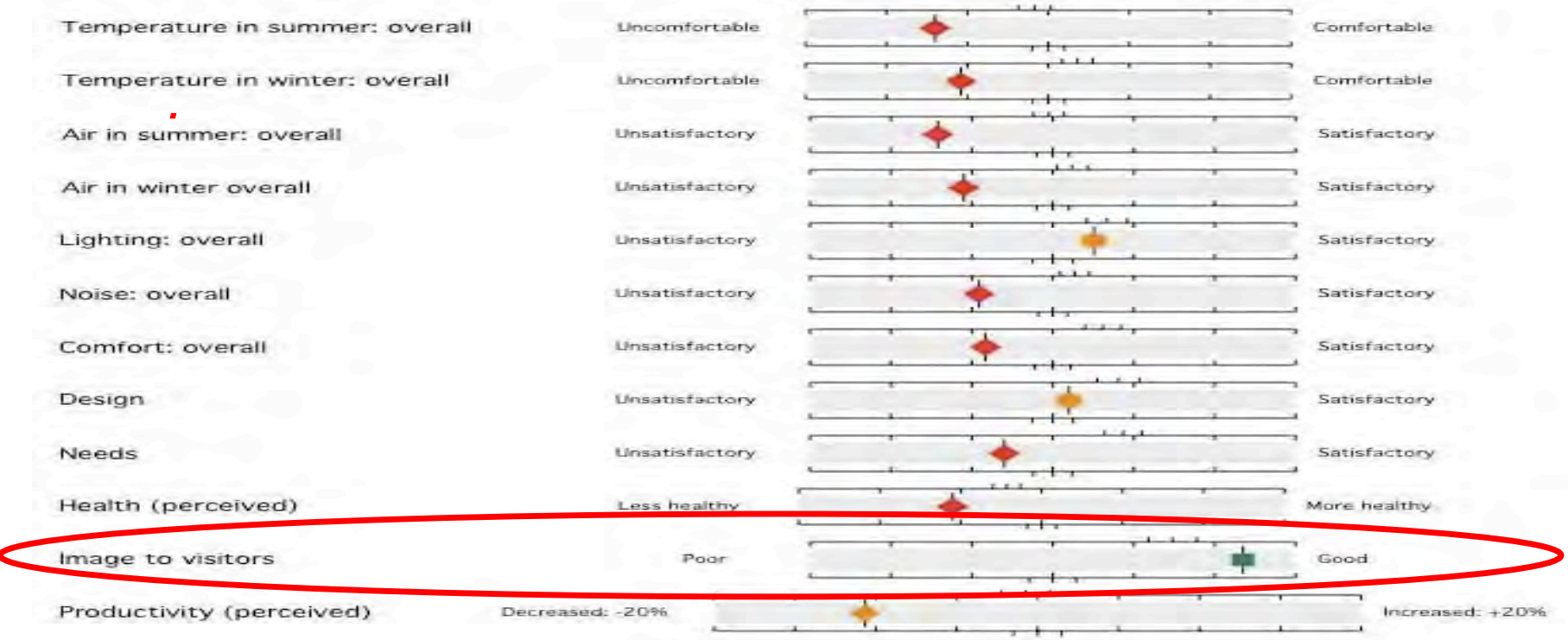
Distributions of estimated and actual annual CO_2 emissions/ m^2 usable floor area in Carbon Buzz data base. www.carbonbuzz.org

SOURCE: Ian Taylor and Judit Kimpian, *Carbon Buzz Launch slides,* 6 June 2013. www.carbonbuzz.org

The performance gaps were not just for energy:

occupant survey, multi-award-winning school

RED: below average; AMBER: Average; GREEN: Above average



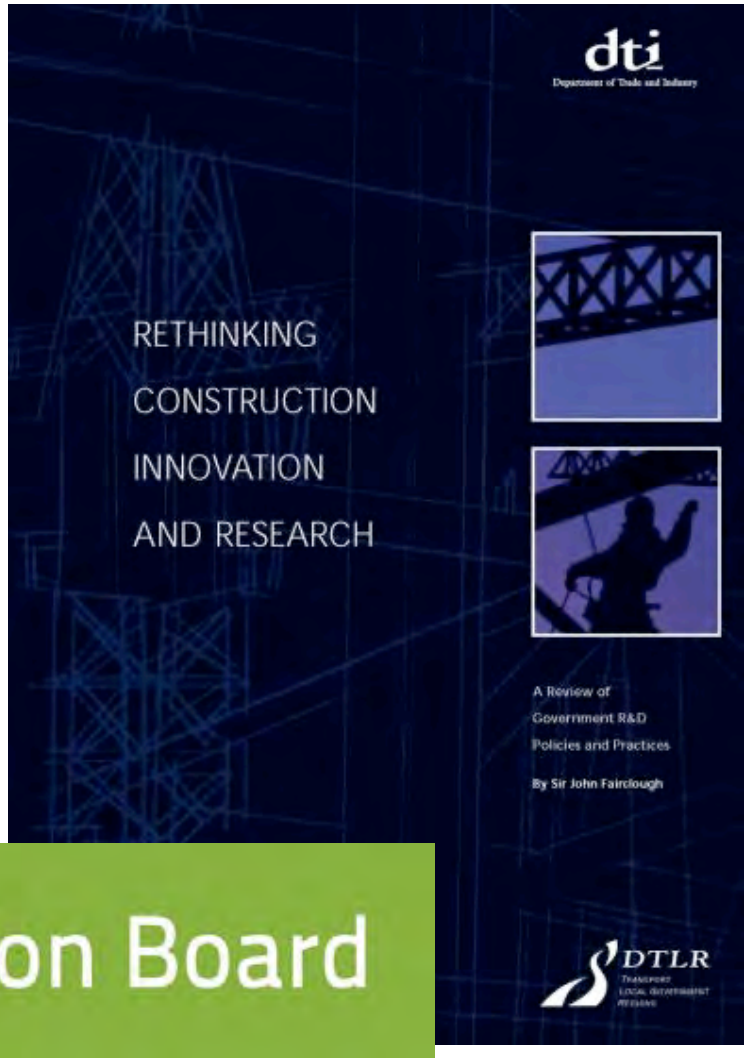
" … the architecture showed next to no sense. It leaked in the rain and was intolerably hot in sunlight. Pretty perhaps, sustainable maybe, but practical it is not." … STUDENT

SOURCE: BUS Method survey of a building services engineering award-winning Academy school in South East England, 2009

And buildings policy continued to focus on construction, *not performance in use …*

RETHINKING CONSTRUCTION

RT OF THE CONSTRUCTION TASK FORCE



The Green Construction Board

REFERENCES: The Egan Report (DTI, 1998), the Fairclough Report (DTI and DTLR, 2002)

So yet again ... *Some conclusions from TSB Building Performance Evaluation programme 2010-14*

Significant problems with integrating new technologies,
especially configuring and optimising BMSs.
Insufficient thought given to how occupants will use them.

"Controls are something of a minefield."
Tendency to make control of heating, lighting and renewable energy systems over-complicated. The one air source heat pump had operational issues in cold weather.

Problems with automatic window controls.

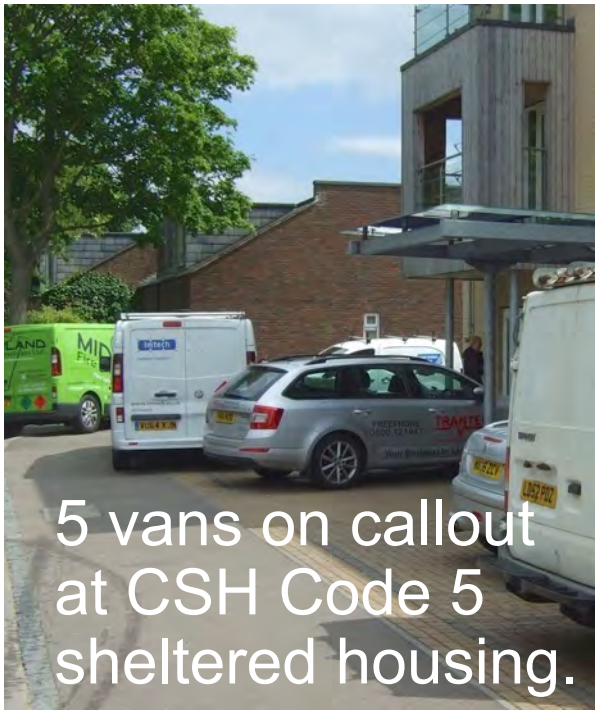
Multiple systems fighting each other *e.g.* cooling vs heating, different heating systems jockeying for control.

Maintenance, control & metering problems,
especially with biomass boilers, PVs and solar heating.

SOURCE: J Palmer & P Armitage, BPE Programme, Early findings from non-domestic projects, Innovate UK (Nov 2014)

And in spite of such insights from case studies, *complication has burgeoned this century*

- Technical complication
- Legislative complication
- Contractual complication
- Bureaucratic complication
- Tick-box procedures: feature creep
- Complication for building users and managers



So less money to spend on basics

And the complication disease has spread to housing too!

NOTHING JOINS UP PROPERLY!

"Complexity is profitable, [it] makes people believe you understand it."
JON DANIELSSON

F Stevenson et al,: *The usability of control interfaces in low-carbon housing,* Architectural Science Review, 1-13 (2013).

Policymakers (and some academics) often ignore Case Studies, *saying they are anecdotal:* ***THEY ARE NOT!***

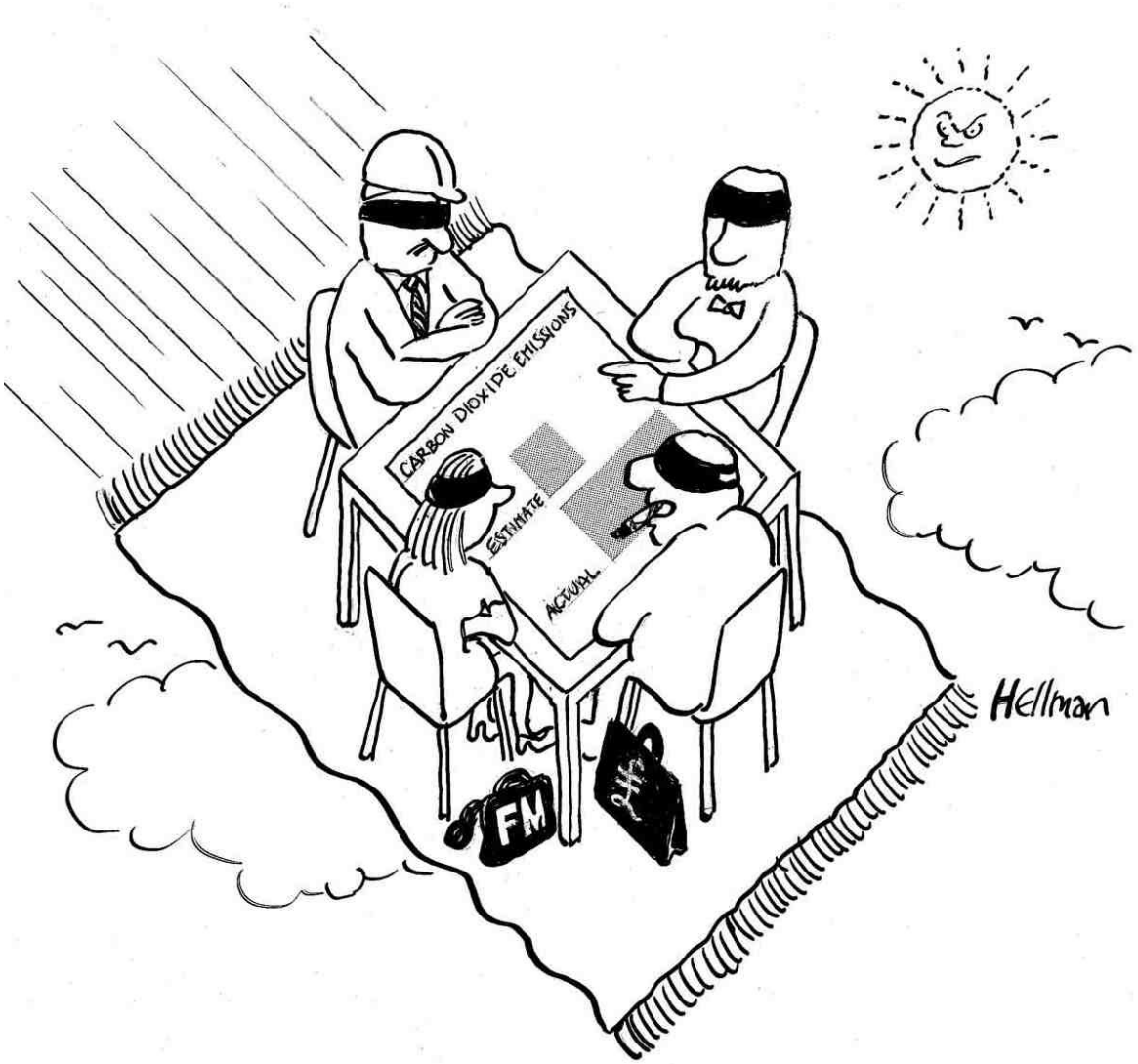
FIVE MISUNDERSTANDINGS *(after Flyvbjerg)*

1. *General knowledge is better than context-specific knowledge.*
   WRONG: *They complement each other.*
2. *You can't begin to generalise from a single case.*
   WRONG: *Individual cases and outliers can be bellwethers.*
3. *They might help you make hypotheses, but other methods are better for hypothesis-testing and theory-building.*
   WRONG: *They can also test hypotheses, using multiple methods.*
4. *They have a bias to confirming the investigator's bias.*
   NOT REALLY: *They often provide new and richer insights,*
   BUT *they need to be done with a degree of independence.*
5. *They do not let one develop general propositions and theories.*
   BUT: *They do help us develop coherent strategies for the future.*

Why do people ignore advance warning signals - the dead canary in the coal mine? **SEEKING MORE DATA IS OFTEN A DELAYING TACTIC.**

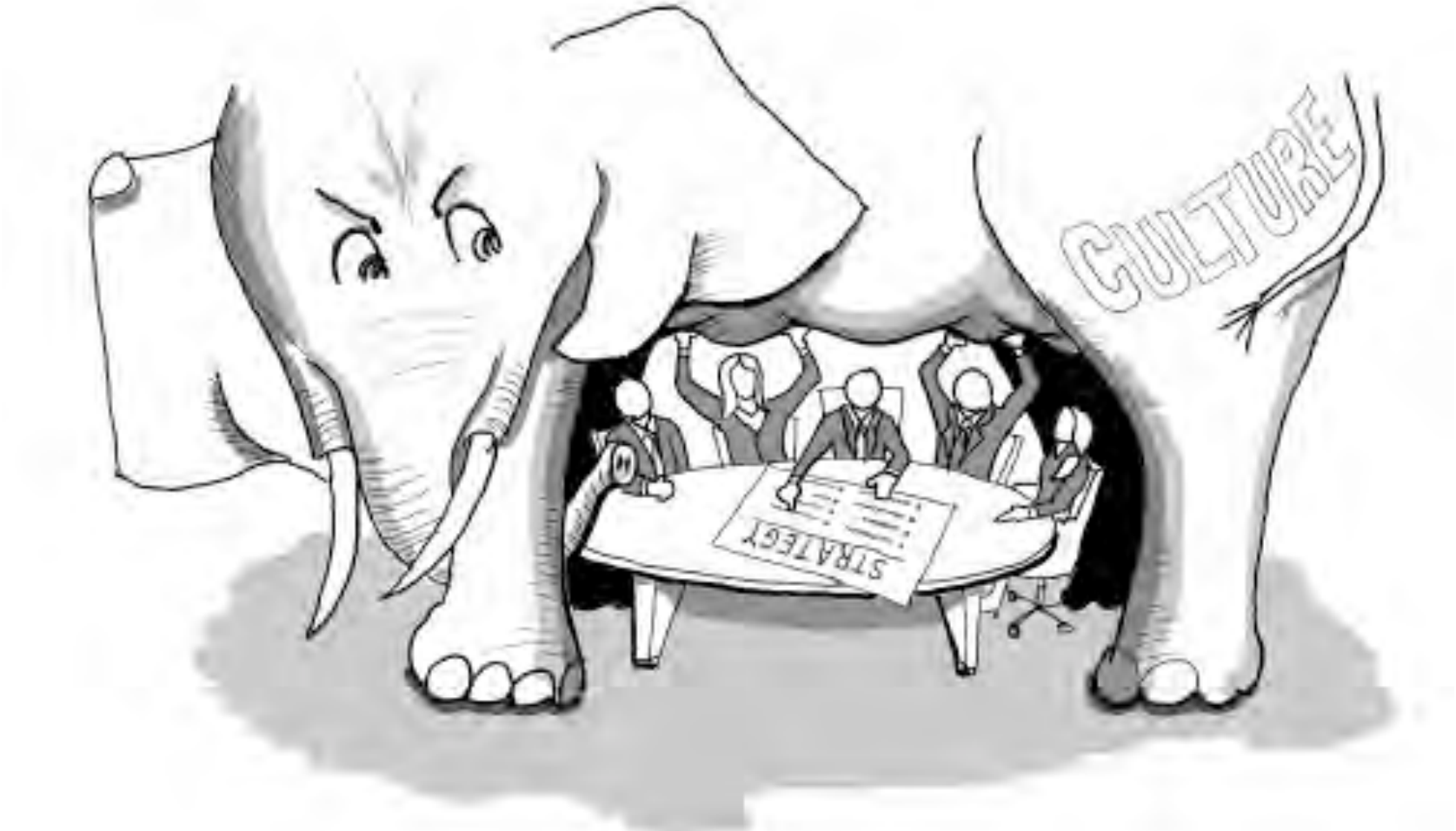
REFERENCE: B Flyvbjerg, *Five misunderstandings about case study research,* Qualitative Enquiry ***12***, 219-245 (2006),

So 22 years after we commissioned this, *many remain ignorant of the true outcomes of their projects*



SOURCE: by Louis Hellman for cover of W Bordass, *Flying Blind,* Association for the Conservation of Energy, London, (2001).

The elephant isn't in the room, *IT IS THE ROOM!*



WE HAVE A SYSTEMIC PROBLEM: Blindness to performance in use

It's not just the construction industry, it's the way we all go about things

SOURCE: Bruce Flye, 2012, www.bruceflye.com/concept-graphics/illustrations/4092610

This should have woken everybody up …

but we fear it may be interpreted too narrowly

SEE ALSO: Peter Apps, *Show me the bodies: How we let Grenfell happen,* One World Publishers (2022)

Building Performance Evaluation
Post-Occupancy Evaluation

PART 2
THE PRESENT

What is BPE about?

- Finding out how buildings actually work in use.
- Using multiple methods, *to develop better insights.*
- It's not that complicated: *many things are blindingly obvious, once you open your eyes.*
- It doesn't need to take a lot of time or money: *you just need to get going.*
- It's about improving practice, not developing theories, *though it may help others to develop theories.*
- The key ingredient is a focus on outcomes and actions.
- When should clients and designers do it? **NOW!**
  - ***Foresight**:* before doing work.
  - ***Hindsight**:* after doing work – *the traditional POE.*
  - ***Insight**:* while doing work.

BPE: it's not that difficult … BUT

- You must want to improve.
- Start small, with what interests you most.
- Link feedback to project delivery: *Get all team members committed to BPE and feedback at the start, as part of their conditions of appointment.*
- Formulate at least some project targets in ways that can be measured afterwards.
- Ease transition from handover to occupation, *with feedthrough, fine tuning and learning.*
- Progress to Knowledge Management systems.

Some principles

- **START BY DOING ONLY A FEW THINGS**
  Otherwise you may get indigestion.
  Simplicity is also easier to manage and communicate.
  The fewer the points, the more likely the action.

- **USE PROVEN TECHNIQUES WHERE YOU CAN**
  It takes time to develop robust methods and benchmarks

- **DON'T GET INTO TOO MUCH DETAIL TO START WITH**
  *You can **drill down later** if you need to.*
  By then you will know what is important.

- **BUT DEVELOP YOUR PERIPHERAL VISION** *Good techniques can help with this. So can working in pairs.*

Start simple, add detail

Adopt a drill-down approach where practicable:

1. BASIC (indicative): *the wet finger.* ***What have we got?***
2. INTERMEDIATE (investigative): *get useful data.* ***What does it mean?***
3. ADVANCED (diagnostic): *deeper investigation.* ***What can we do?***

None of these levels is academic research in the traditional sense – we see that as Level 4. ***Can we understand it and explain it in depth?***

Ideally, beyond the Basic level, the work may need to involve a mentor, consultants, or academic input, with experience of a range of projects.

Ideally, POE work should also be should also be:
- ***Separate*** from the client, design and building team, to provide objectivity and a wider view.
- ***Connected****,* so the people and organisations directly involved (e.g. as clients, designers, builders and managers) learn through personal experience, and take this back into their organisations and the wider world.

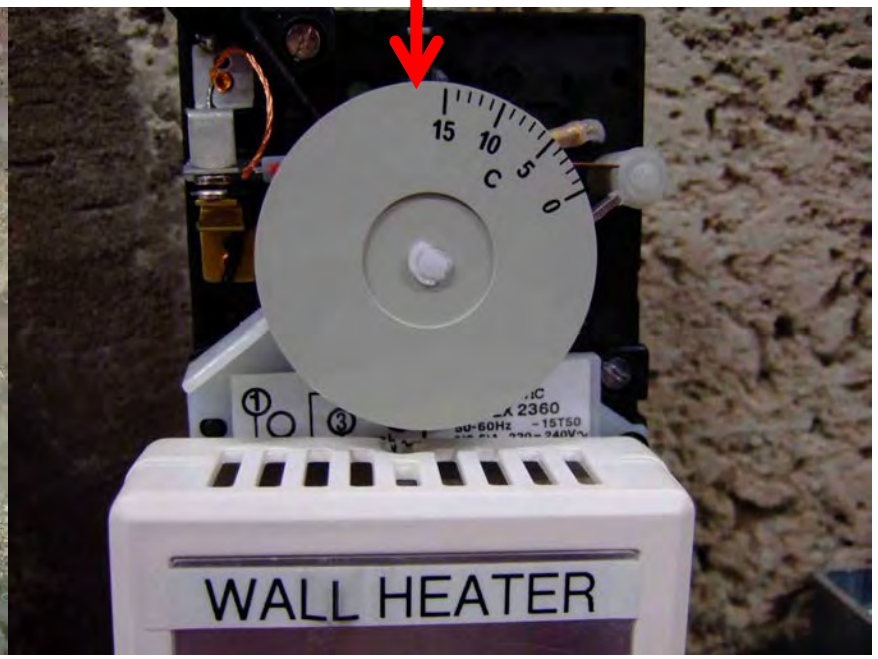
SOURCE: The three-level classification follows ASHRAE *Performance Measurement Protocols* Guide (2010).

LEVEL 1 – Basic
Half to one day on site for 1 or 2 people

- Short pre-visit questionnaire to collect basic data.
- Semi-structured interview with occupier – *in managed buildings, frequently the building or facilities manager.*
- Walk-around with the occupier/manager.
- Inspection of mechanical & electrical plant and controls, *with operating and maintenance staff if available.*
- Inspection of record drawings, user guides, O&M manuals and commissioning and test results.
- Review of basic energy data, if available.
- Observations and spot checks of internal conditions.
- Casual discussions with other occupants, if possible.
- Take photos, *including infra-red if you have a camera.*

SEE ALSO: A Leaman et al, Building evaluation: Practice and principles, Building Research & Info **38**, 564-577 (2010).

BPE can trap unintended consequences *that would often be difficult to anticipate*



Over Summer 2009, this frost thermostat *(improperly set at 17° C on installation)* energised the wall heater in a plant room of a new low-energy school, and wasted more electricity than the wind generator *(intended to offset the entire building's annual heating energy use)* created.

Some appropriate techniques

- **INITIAL SCREENING**
  Pre-visit questionnaire – before visiting the building.
- **PROCESS IMPROVEMENT** *TO ENGAGE WITH OUTCOMES*
  e.g. Soft Landings, RIBA Plan for Use, GIRI Get it Right initiative.
- **EXPECTATIONS MANAGEMENT**
  CIBSE TM54 helps to collect and manage design intent for energy and CO_2.
- **WALK-THROUGH SURVEYS**
  CIC Design Quality Indicator method.
- **COLLECTING ENERGY USE DATA**
  CIBSE TM22 can help to organise this, and is coordinated with TM54 + TM61.
- **OCCUPANT SATISFACTION SURVEY**
  "People are the best measuring instruments, they are just harder to calibrate" … G RAW. So use well-established questionnaires where possible.
- **STRUCTURED DISCUSSIONS** WITH THE PLAYERS
  Learning from Experience, HEDQF and BUS methods.
- **TECHNICAL MEASUREMENTS** *e.g. heat, light, sound, air, energy, fabric.*
  See various standards and the ASHRAE Performance Measurement Protocol.
- **OTHER POE TECHNIQUES**
  UBT's Techniques Portfolio www.usablebuildings.co.uk/fp/index.html contains some examples, *but is in need of updating. See also the next Section.*

LEVEL 2 - A general purpose BPE package
as used in Probe and elsewhere

- **LEVEL 1 WALK-THROUGH SURVEY**
  Gives rapid insights, but beware professional bias.
- **DISCUSSIONS WITH OCCUPIERS AND MANAGEMENT**
  Along with the walk-through survey.
- **MEASURE SOME HARD DATA,** *e.g. CIBSE TM22 energy survey.*
- **COLLECT SOME SOFT DATA,** *typically an occupant questionnaire.*
- **PULL IT ALL TOGETHER**: *this already brings considerable insights*
- **FOLOW-UP VISIT AND STRUCTURED DISCUSSIONS to which you bring the data and try to understand more of the context.**
  Learning from Experience, BUS and HEDQF methods.
- **IDENTIFY WHAT YOU CAN IMPROVE EASILY** *Try to improve it; and see what happens. There may be unintended consequences.*

DO MORE ONLY WHERE IT CAN BE JUSTIFIED AND AFFORDED:
Matters exposed during the GP survey are often highly specific. It seldom makes sense to collect a broader range of data at the outset: it just adds to the cost and complexity of the BPE and makes action less likely.

SEE R Cohen et al, *The Probe process,* Building Research and Information 29 (2), 85-102 (March-April 2001).

Keep things in proportion

- The law of diminishing returns applies to BPE with a vengeance.
- Key issues are often identified rapidly:
  adding detail may not always be relevant.
- The more difficult part can be to get problems fixed:
  both in the building and more widely in organisational practises.
- It is therefore often best start quickly and cheaply, comment rapidly, build occupier confidence, seek action.

- It is often best for a novice to work with an experienced person: not just for training purposes, but to facilitate comparisons with other buildings; and to maintain client and occupier confidence by providing rapid feedback on how their performance relates to others. *Otherwise the process may be regarded as slow, data-hungry and unrewarding.*

Less can often do more

FOR EXAMPLE:

BUS Methodology occupant survey

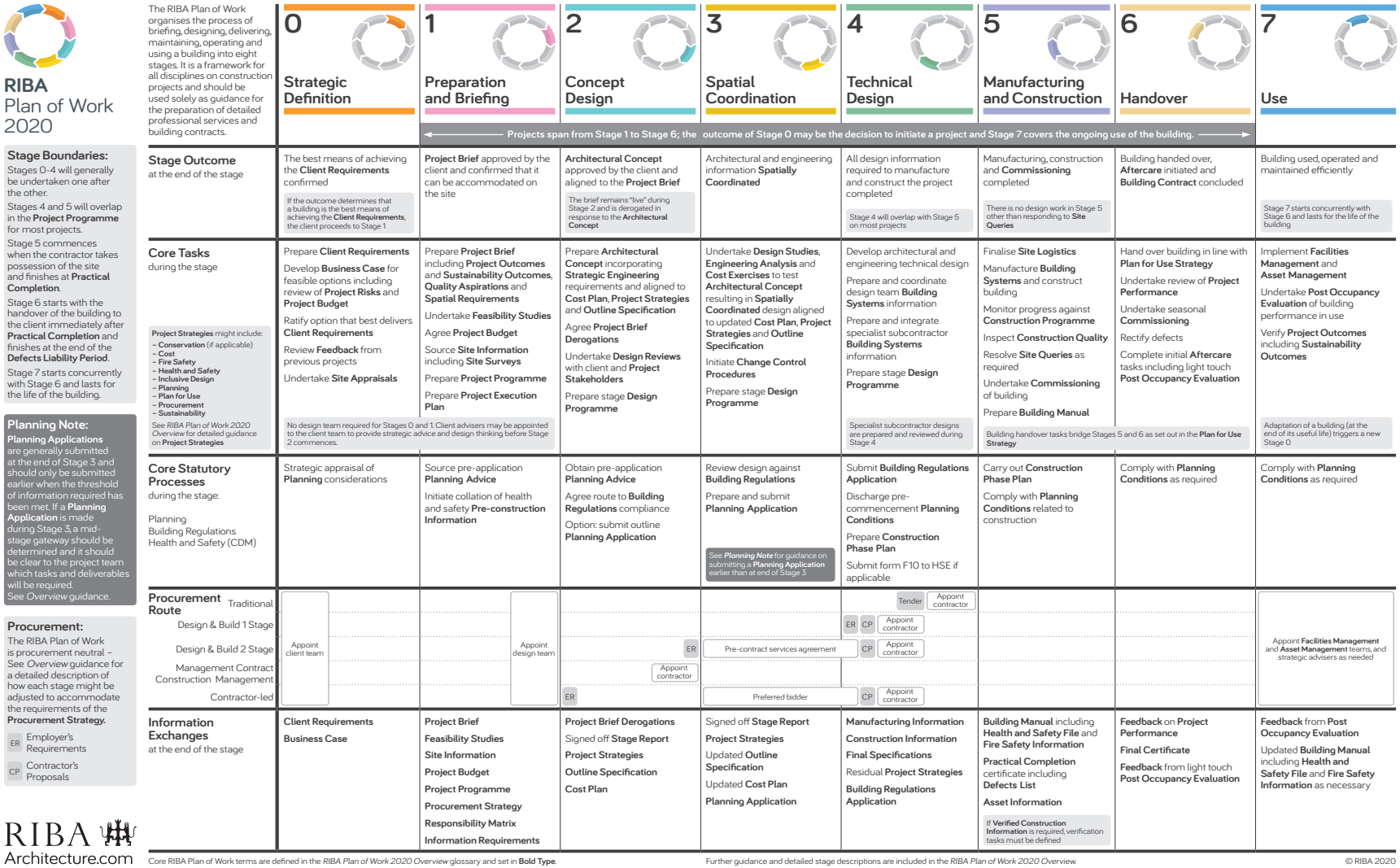
- Started as an 18 page questionnaire.
- Honed down to 2 pages of the most relevant ones *(shorter and longer versions also available).*
- Space for open-ended write-in responses – gives answers to questions not asked explicitly.

CIBSE TM22 energy survey *(1999 Excel version)*

- Includes iterative 3-stage approach.
- Often proves quicker than deciphering submeters.
- Also helps detects faults in metering *(all too common).*
- Sadly the 2006 and 2013 versions are not as user friendly, *but simpler variants are now being discussed.*

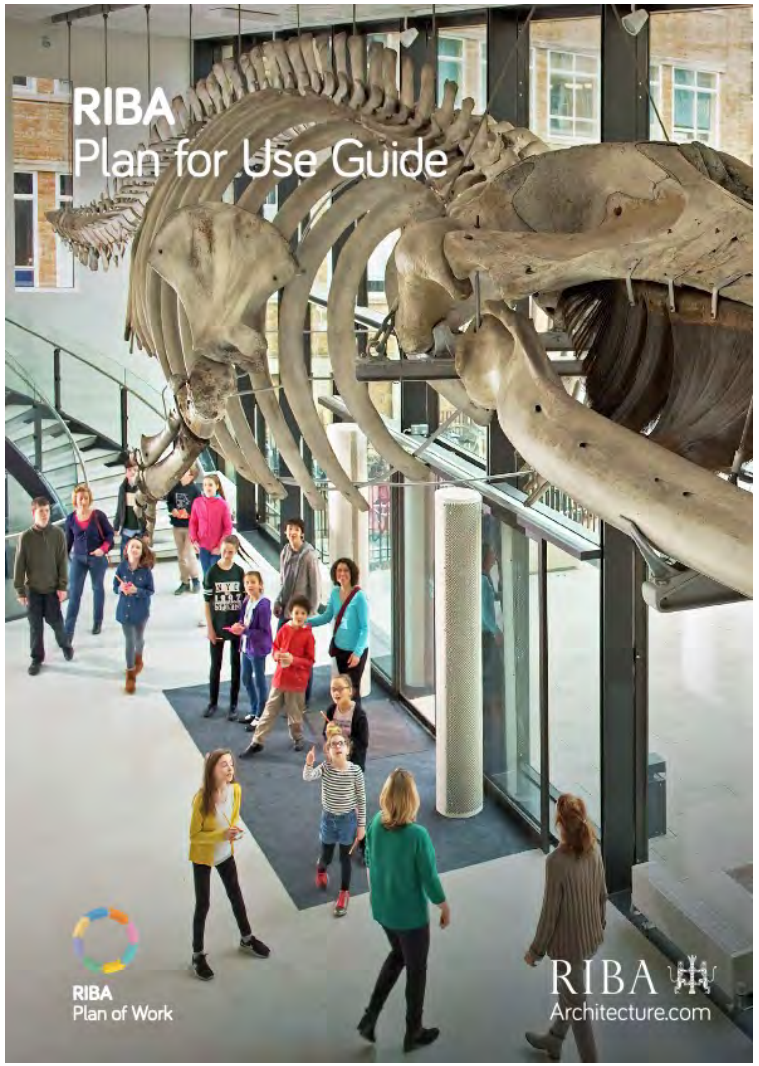
POE has recently risen up the agenda

RIBA PoW 2020 Stage 7 USE incl POE+Feedback



Supporting POE throughout the procurement process

Soft Landings 2009-14 and RIBA Plan for Use 2021



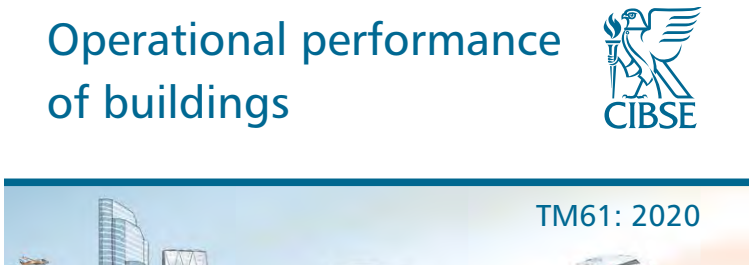
Soft Landings: *converging onto good outcomes*

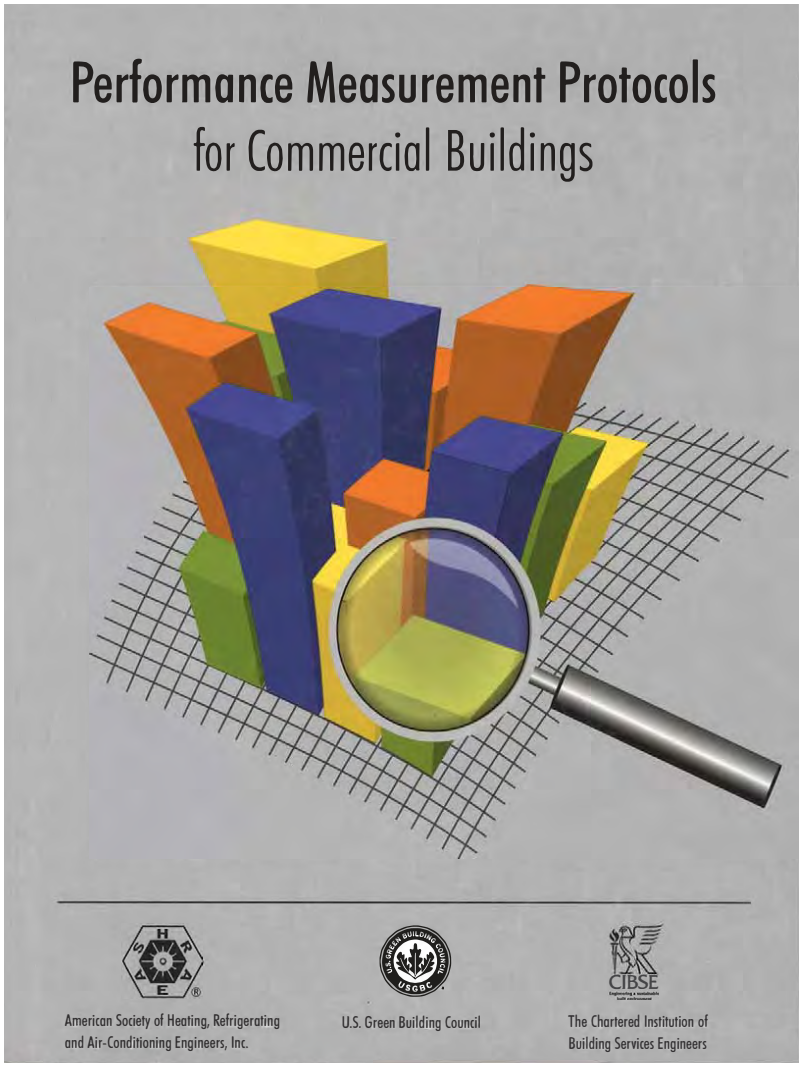
The Five Stages in the Framework (July 2009)

1. **Inception and Briefing**
   Appropriate processes.
   Assigned responsibilities.
   Well-informed targets.
2. **Design development**
   and expectations management.
3. **Preparation for handover**
   better operational readiness.
4. **Initial aftercare**
   Information, troubleshooting,
   fine tuning, training.
5. **Longer-term aftercare**
   monitoring, review, independent
   POE, feedback and feedforward.

Supporting POE throughout the procurement process

And from building services engineering institutions

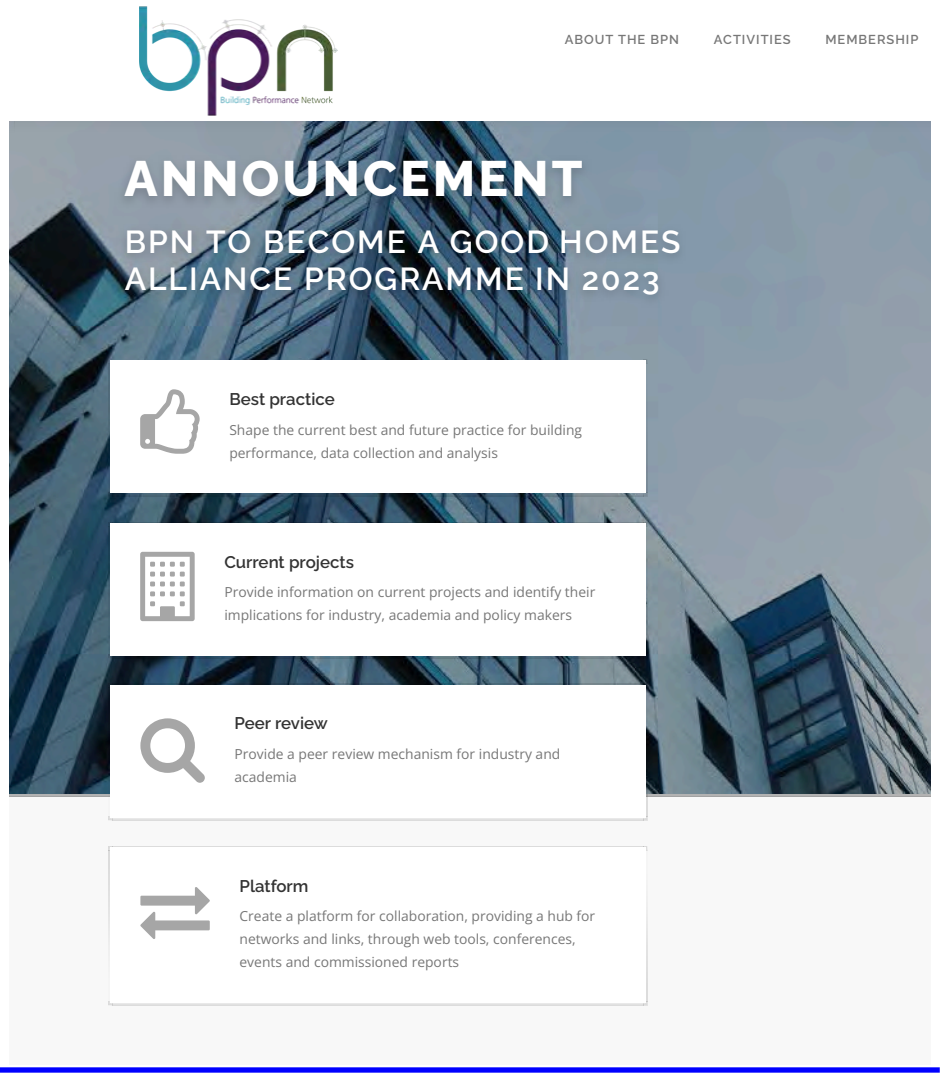




CIBSE Technical Memoranda TM61, 62 and TM 63 (2020) and ASHRAE *Performance Measurement Protocols* Guide (2010).

There's even a British Standard for BPE
and a Building Performance Network

bsi. | UK Research and Innovation | bpn



SOURCE: https://building-performance.network

Building Performance Evaluation
Post-Occupancy Evaluation

PART 3
THE FUTURE

Sustainability raises challenging moral and ethical dilemmas

- Work ‘after us’ and for ‘the other’.
- Intergenerational equity.
- Deferred impacts over long periods.
- Differential geographical and social impacts.
- Growing levels of uncertainty and unpredictability.

It needs vision, imagination, reflection and commitment

“[it] does not tempt us to be less moral than we might otherwise be; it invites us to be more moral than we could ever have imagined.” … MALCOLM BULL

RIBA Plan of Work 2013 let sustainability checkpoints be switched on and off ! Fortunately the 2020 Plan doesn’t.

SOURCES: S Hill, Edge debate, New Professionalism, 20 Feb 2013, M Bull, London Review of Books, 3-6, 24 May 2012

"The house is on fire"

… GRETA THUNBERGxs

- We must save energy and carbon in a hurry *embodied not just operational ...* and remember.
- this is but a small – *but essential* - part of what we need to do to improve the environment.
- We need more thinking and less stuff; and
- to make much better use of what we already have.

Much of what we have got used to,
we're not necessarily entitled to.

Building projects need to converge onto good outcomes, *not diverge from good intentions*

- Many construction-related institutions require their members to understand and practice sustainable development.
- How can members do this unless they understand the consequences of their actions? *The real outcomes.*
- If they don't, they are working outside their region of competence …
- **or in other words, not acting in a fit manner for a professional !**

SO?

- Re-define perceptions of the professional's role, to follow-through properly and to engage with outcomes.
- Closing the feedback loop – rapidly and efficiently.
- Move from *Design for Compliance* to ***Design for Performance***.

ARB – Architects Registration Board

Sustainability Competence Requirements 2021

A. ETHICS AND PROFESSIONALISM:
SA1. Climate science; SA2. Resilience, mitigation, adaptation;
SA3. Sustainable regenerative solutions and ethical sourcing;
SA4. Maintain knowledge of key legislation; **SA5. Share building performance data**.

B. SUSTAINABLE DESIGN PRINCIPLES:
SB1. Relationships between buildings, settlements, communities, climate. Design LZC;
SB2. Social sustainability and value; SB3. Biodiversity, access to green infrastructure;
SB4. • Retrofit and Fabric First • Passive Design • Daylight • Renewables • LCA and LCC • WLC and Low embodied carbon design • Water cycle, demand, supply, and reduction.

C. ENVIRONMENTAL AND BUILDING PHYSICS.
SC1. Temperature, humidity, sound & light; SC2. Comfort, IAQ & energy; SC3. Calculate operational and embodied energy and carbon **SC4. Do POE/BPE and understand gaps.**

D. CONSTRUCTION TECHNOLOGY.
SD1. Embodied carbon: resource & **performance** implications; SD2. Airtightness, thermal integrity; **SD3. Performance of energy systems**; SD4. Circular economy principles.

SOURCE: arb.org.uk/wp-content/uploads/ARB-Competence-Guidelines_-Sustainability.pdf

Conclusions

- If we are to meet the challenges of sustainability, the role of the building professional must change radically.
- Instead of drifting away from good initial intentions, projects must converge onto good in-use outcomes.
- This needs routine follow-through, assessment, review and reflection, *to close feedback loops & initiate virtuous circles.*
- It needs leadership, *not increased amounts of bureaucracy.*
- **Building performance in use needs to become an independent knowledge domain,** *properly resourced in the public interest, to support and challenge the industry and its clients, and to help inform policy making.*

THE FUTURE: New professionals *follow through design intent into reality*

- They understand what is needed *strategic briefing*
- Are clear what they want, and communicate it plainly *strategic design*
- Are ambitious, but realistic *question all assumptions, understand users*
- Follow things right through *e.g. using **Soft Landings** procedures*
- Review what they do *manage expectations, undertake reality checks*
- Are clear what they are after *specify: what, why and how*
- Check that things will work *technical feasibility, usability and manageability*
- Get things done well *communicate, train, inspect*
- Finish them off *commission, operational readiness, handover, dialogue*
- Help the users to understand and take ownership *provide aftercare support*
- Review performance in use *including **post-occupancy evaluation***
- Work with occupiers to make things better *monitoring, review and fine tuning*
- Anticipate and spot unintended consequences *revenge effects*
- Learn from it all ***and share their experiences***

The New Professionals: THAT'S YOU !

www.usablebuildings.co.uk