

Eric Parry Architects
11 June 2015

Building performance in use: The great unknown?

Bill Bordass
the Usable Buildings Trust
www.usablebuildings.co.uk

Outline

- 1. Flying blind?**
 - 2. Strategic findings from POE and BPE**
 - 3. False dawns of building performance evaluation**
 - 4. Governments, markets and building professionals**
 - 5. Moving forward: converging onto operational reality**
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1

FLYING BLIND?

What Building Performance Evaluation
and Post-occupancy Evaluation tell us:
the evidence under our noses

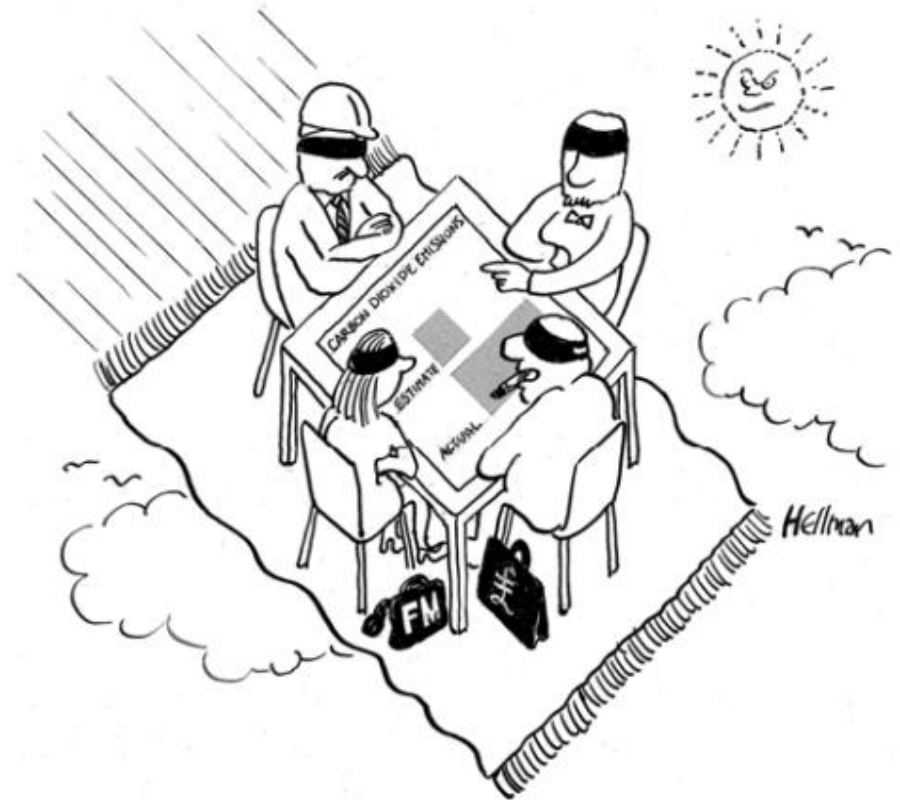
For most of the construction and property industry, *performance in use has been another country ...*

*“in theory, theory and practice
are the same,
in practice they aren't.”*
SANTA FE INSTITUTE

*“Missing feedback is a common cause
of system malfunction”*
DONELLA MEADOWS

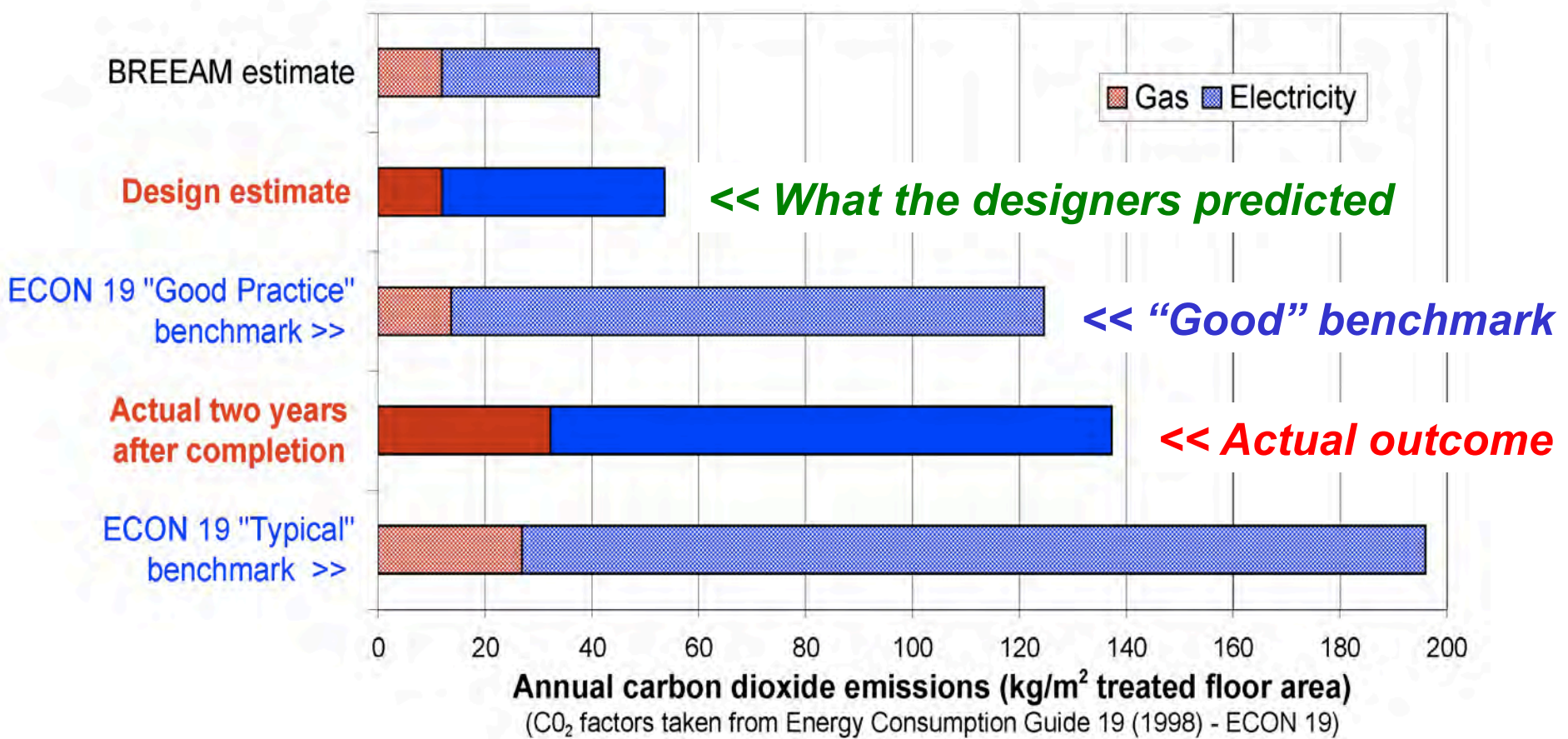
*“designers seldom get feedback, and
only notice problems when asked to
investigate a failure.”*
ALASTAIR BLYTH
CRISP Commission 00/02

*“I've seen many low-carbon designs,
but hardly any low-carbon buildings”*
ANDY SHEPPARD, Arup, 2009

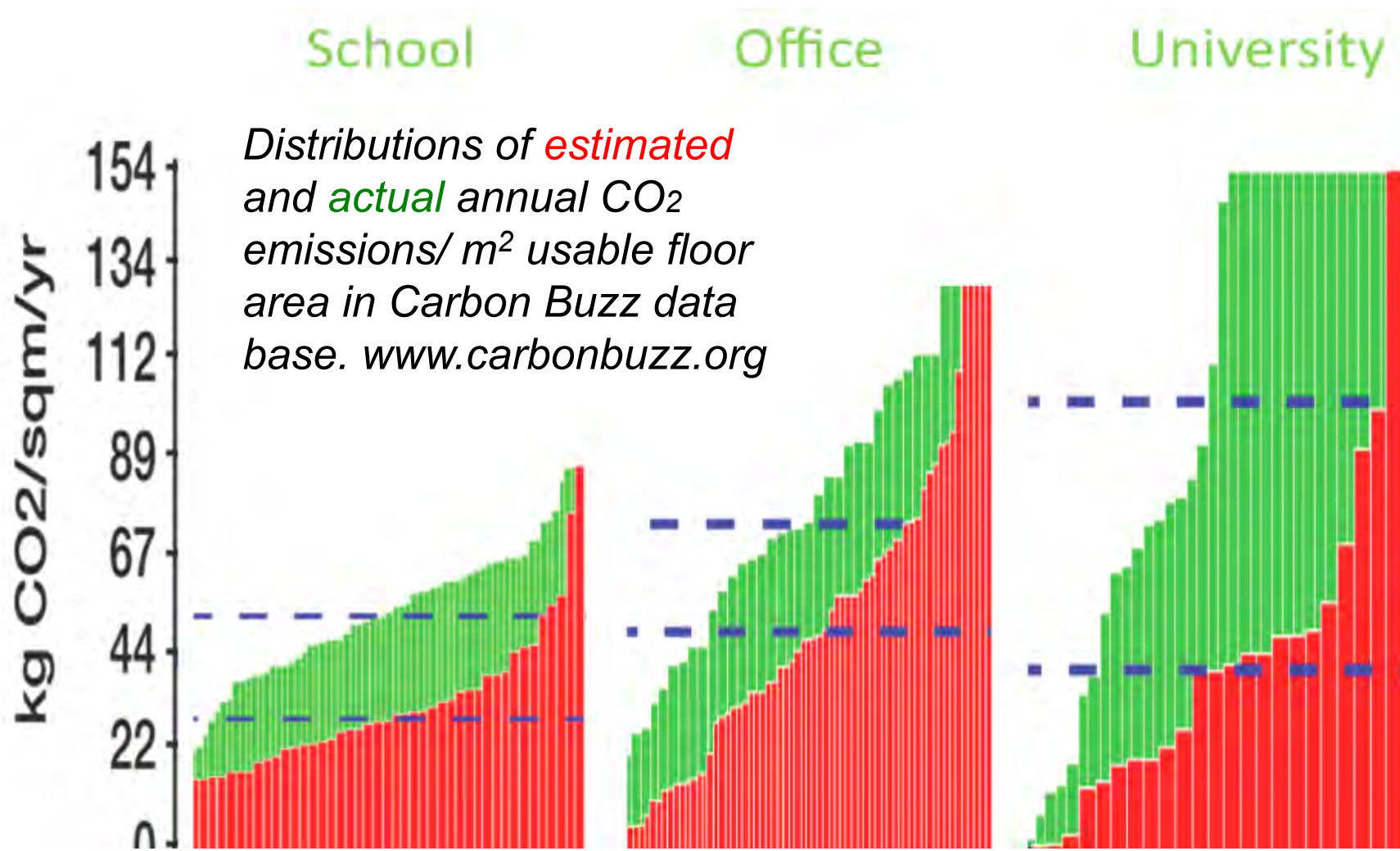


The Design-Performance Gap: *The UK couldn't deliver low-energy performance reliably in the 1990s. It is still difficult.*

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



The evidence is now overwhelming: *slide from Carbon Buzz Launch June 2013*



The gaps occur in new housing too: *a full 40 years after the 1973 oil crisis*

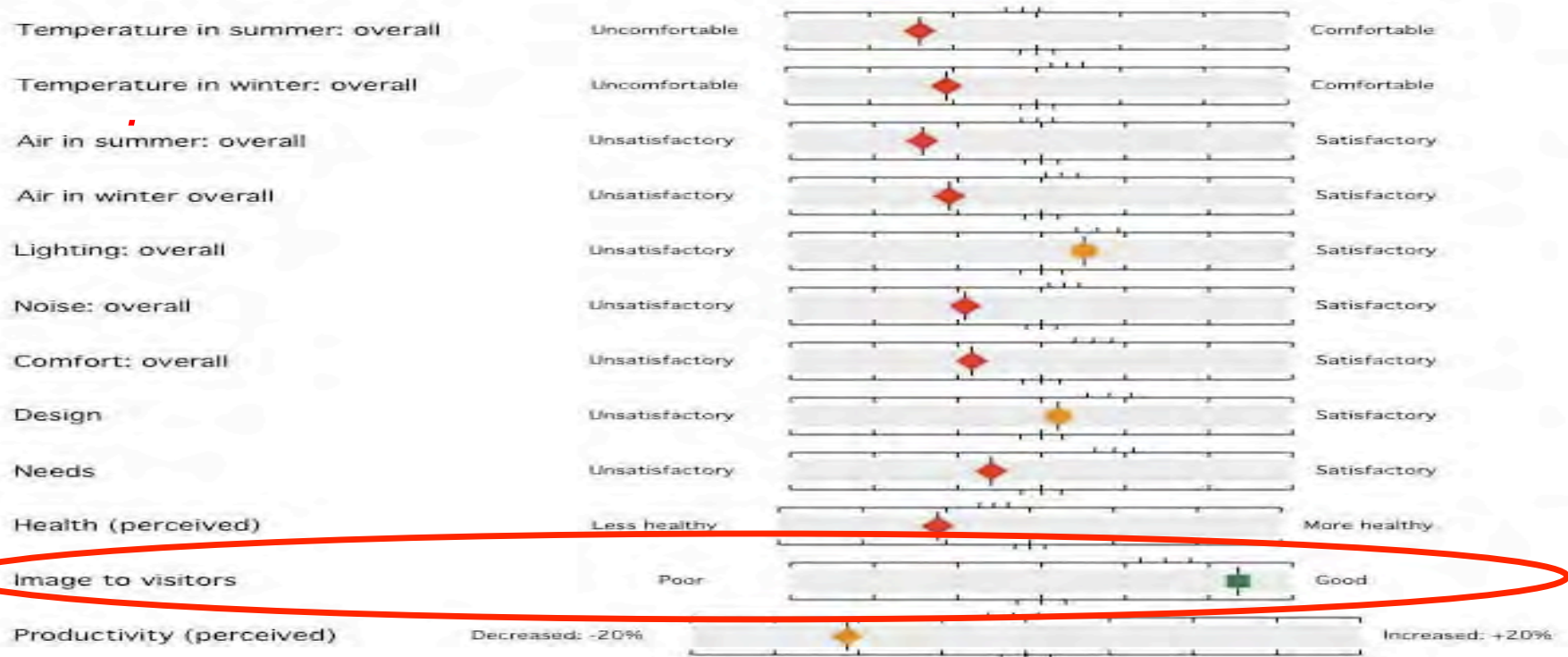
Minister launches Hub-led project to tackle the performance challenge **Ecobuild 6 March 2013**

A new project to examine the energy performance of new homes is unveiled today. The industry-backed project brings together leading housebuilders and industry experts to investigate the actual performance of homes and better understand how this compares to that expected by the original design. Communities and Local Government minister Rt Hon Don Foster MP announced a new £380,000 grant for



The gaps are 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

The gaps are not just for new buildings: *Knowledge base for retrofit*



SOME CONCLUSIONS

Industry and policy lack understanding of traditional building performance.

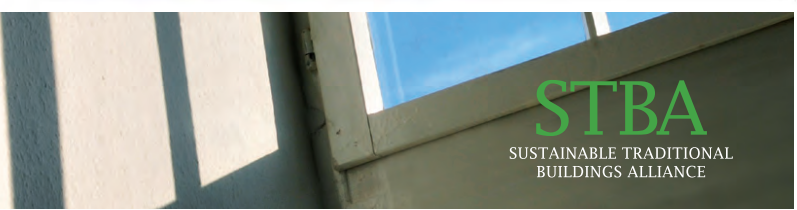
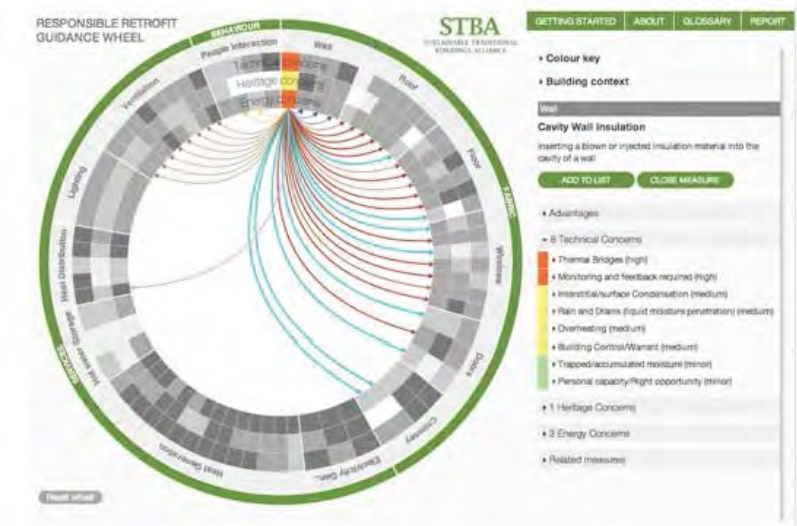
Lack of connection between research intelligence and guidance procedures.

Significant uncertainty in application of models and software.

Some methods used are inappropriate.

A systemic approach is necessary to avoid unintended consequences.

There are good opportunities, but some will need to be developed using a rather different basis and structure.



Simple dysfunctions in recent buildings: *Poor window design, leading to overheating*





Wasteful overprovision in new buildings:
In a “low energy” building’s kitchen

... and widely dysfunctional controls



Controls for End Users



Usability criteria	Ranking (controller as supplied)	
	Poor	Excellent
Clarity of purpose	●	
Intuitive switching	●	
Labelling and annotation	●	
Ease of use	■■■■■	
Indication of system response	■■■■■■■■■■	
Degree of fine control	●	



This control for lighting has clear switching with four settings clearly illuminated, plus an off setting. The numbers by the setting are arbitrary.

Apart from the numbering, the switch is not labelled as to what it does. The red light for setting 1 is on the far left of its button, hinting that there be more than one stage for each setting. Is the off button for system off, or does it apply to each of the four stages in turn? Does the vertical button to the right raise or lower the lighting generally, or on each setting? In the absence of clear annotation, the user is forced to experiment.



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Labelling and annotation	■■■■■	
Ease of use	■■■■■■■■■■	
Indication of system response	●	
Degree of fine control	■■■■■	

This controller is clearly a control device for ventilation. The knob at the lower left appears to offer control over a setpoint (presumably for temperature), against an arbitrary scale of plus or minus. In the absence of controller feedback, the user would need to learn the settings by experimentation. The function of the knob on the right is clearer, with three fan speed-settings, but is it for room ventilation or a fan in a heating/cooling unit? Probably the latter, as experience has forced the facilities manager to append a label telling users not to switch off the fan.

*“we sell dreams and install nightmares”
– CONTROLS SUPPLIER*

2

STRATEGIC FINDINGS FROM CASE STUDIES OF BUILDINGS IN USE

BPE – Building Performance Evaluation

POE – Post-Occupancy Evaluation

New non-domestic buildings:

What we found in the Probe studies 1995-2002

- 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; 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**



New non-domestic buildings:

What we found in the Probe studies 1995-2002

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- 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.***



You can't tell if you have a good building
... *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

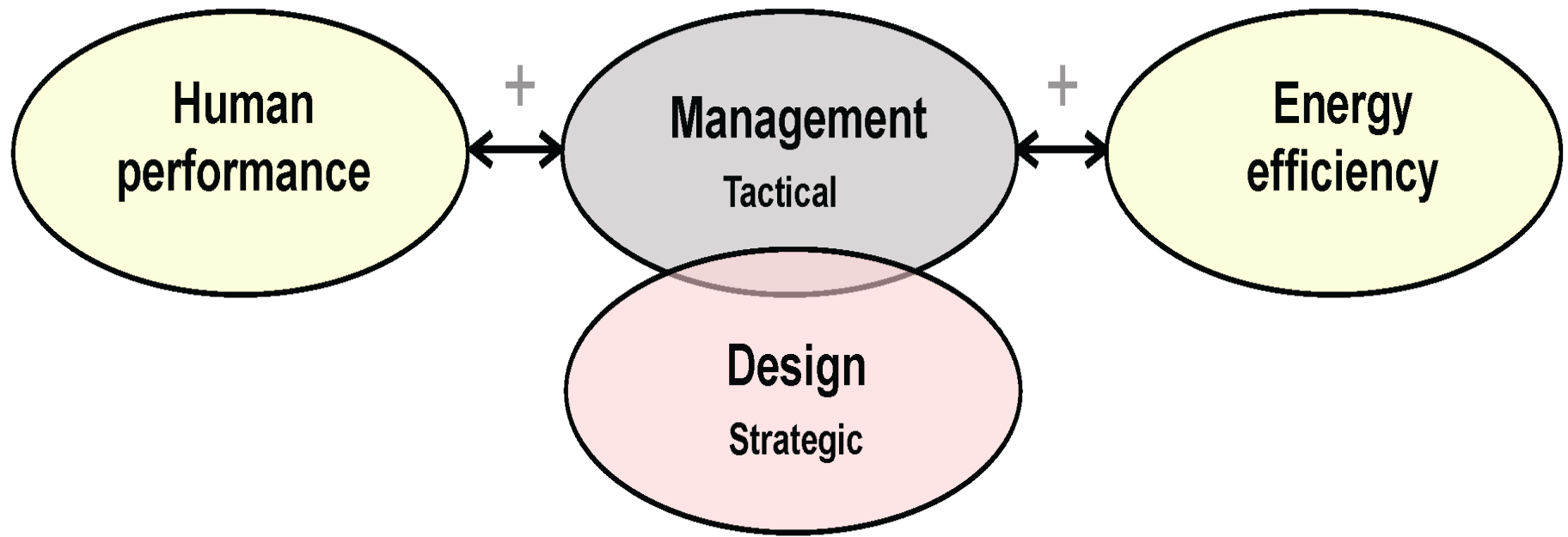


LETTER TO ARCHITECTS' JOURNAL

The good performers don't necessarily impress the judges

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.

It's the practice, not just the product

Factors for success at the Elizabeth Fry Building, UEA

- A good client.
- A good brief.
- A good team *(worked together before on the site).*
- Specialist support *(e.g. 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 *(which has been largely sustained).*

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

In spite of these insights from the 1990s, *complication has burgeoned in recent years*

- 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

The complication disease has now spread to housing too!

AND NOTHING JOINS UP PROPERLY!

“Complexity is profitable, [it] makes people believe you understand it.”

JON DANIELSSON

Don't provide what
occupiers can't afford to manage



Technology - management interactions:
conclusions from the Probe studies of public and commercial buildings and confirmed by later work

		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: *conclusions from the Probe studies of public and commercial buildings and confirmed by later work*

		Technological complexity	
		More	Less
Building management input	More	Type A High Performance <i>For some this is the holy grail BUT</i>	Type D Will ordinary people be able to look after them?
		Big danger, especially for public buildings	Simple Smart
			Sense and Science
			Type B

Secure Type A
Seek more Type B
(and possibly Type D)
Avoid Type C - unmanageable complication.

Examples of unmanageable complication in domestic buildings

SIGMA HOUSE, BRE (*illustrated*)

- Extensive feedback from occupants, including comfort, ergonomics, space.
- Complicated, confusing and unreliable technologies and renewables.
- Energy use much higher than predicted.

ELMSWELL, ORWELL

- Two-thirds of residents could not programme their thermostats.
- Mechanical ventilation with heat recovery was present, but 95% of people had windows open in winter.
- Design air change was 0.5 to 1 ac/h. One open window could provide 17 ac/h!



So yet again ... *Some conclusions from report on TSB Building Performance Evaluation programme*

- *Significant problems with integrating new technologies, especially configuring and optimising BMSs.*
Insufficient thought given to how occupants need to 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, or different heating systems jockeying for control.*
- *Maintenance, control & metering problems, especially with biomass boilers, PVs and solar heating.*

3

FALSE DAWNS

of building performance evaluation

50 years ago: RIBA Plan of Work (1963)

STAGE M: Feedback

PURPOSE

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

TASKS TO BE DONE

Analysis of job records.

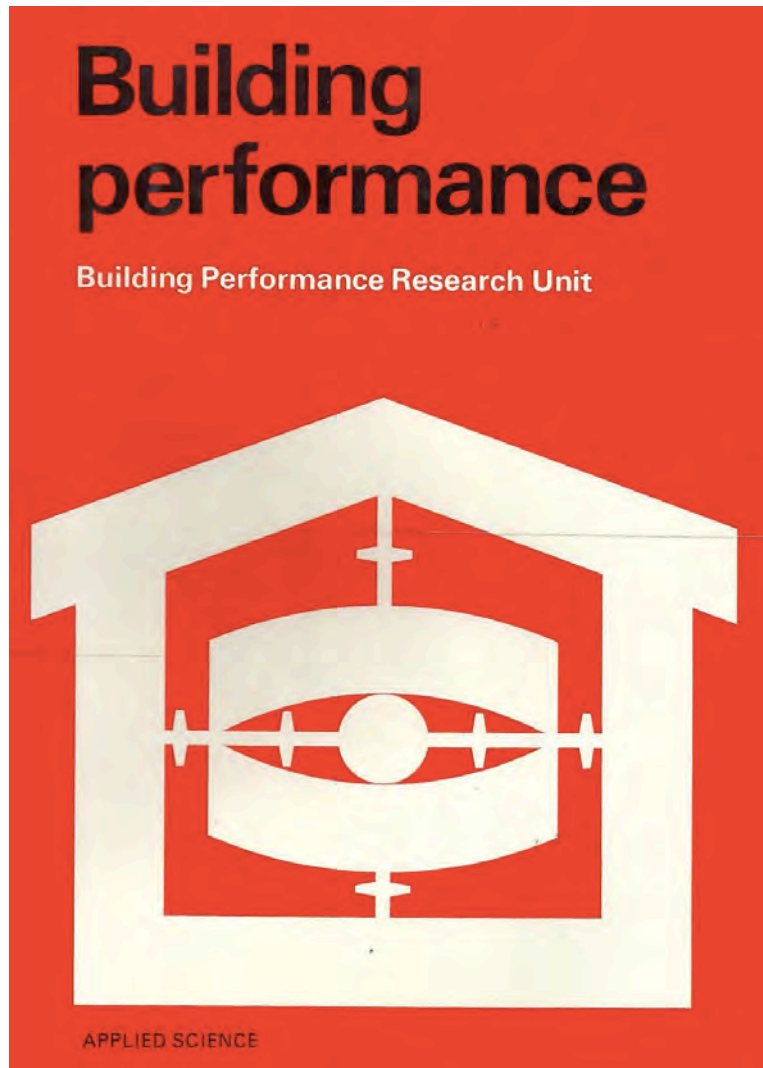
Inspections of completed building.

Studies of building in use.

PEOPLE DIRECTLY INVOLVED

Architect, engineers, QS, contractor, client.

Building performance evaluation started in some universities in the 1960s



Pioneers included the University of California, Berkeley and the Building Performance Research Unit at Strathclyde (BPRU).

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

“Unfortunately, interdisciplinary subjects have a way of escaping from any discipline whatever.” ... ERIC DREXLER

In 1972 the RIBA removed Stage M: Feedback from its publication *Architect's Appointment*.

the tide also turned in government ...

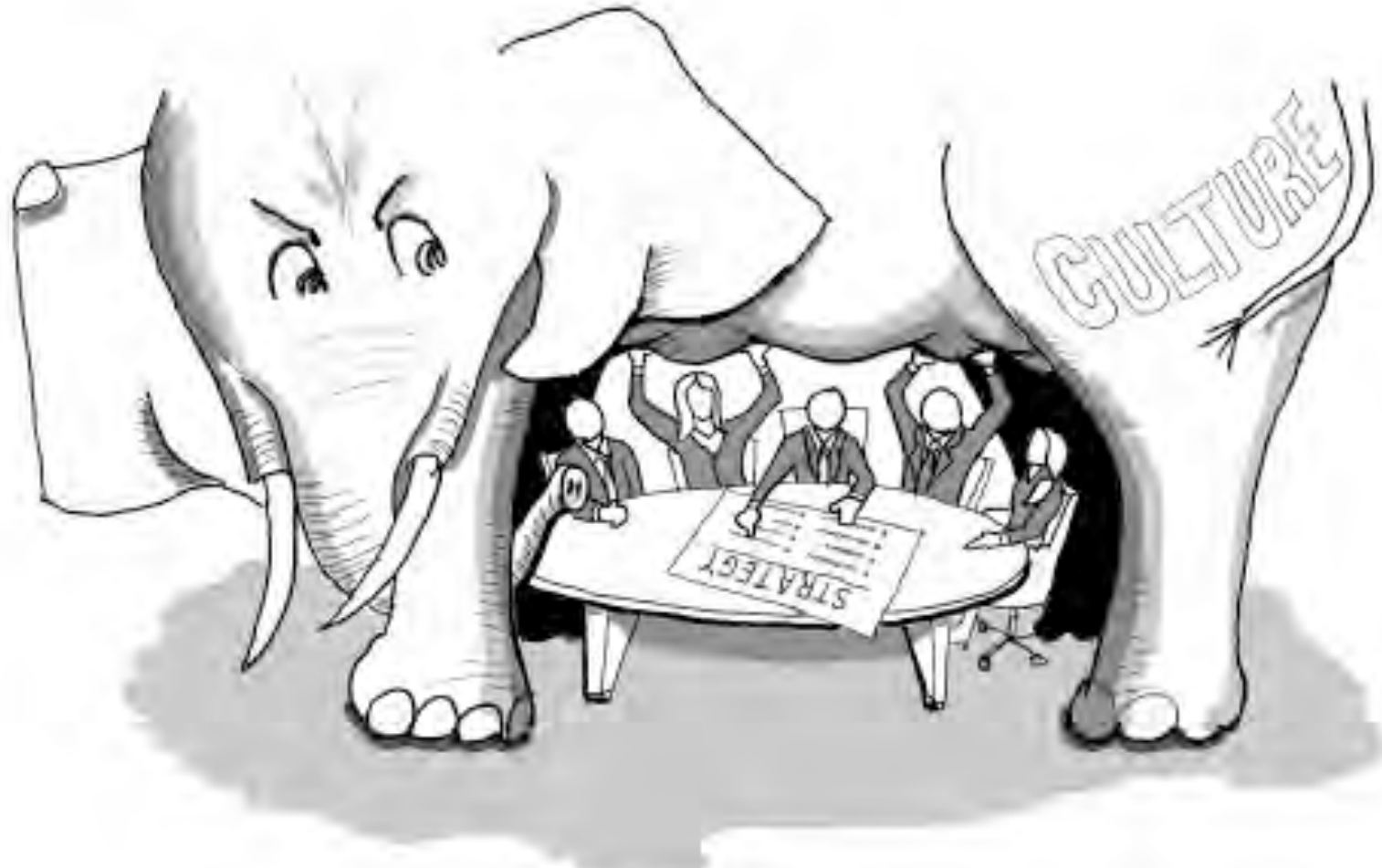
- Widespread disruption and disillusionment in the 1970s.
- Ascendancy of ideas about free markets, competition and choice; a *de facto* inefficient public sector, and “*no such thing as society*”.
- Professionals began to be seen as an elitist conspiracy against the public, and treated by government as just another business.
- 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?
- Outsourcing and privatisation of professional skills and in-house research from government, including Building Research Establishment.
- Dismemberment of the Department of the Environment 1997-2002.

WHERE IS THE INSTITUTIONAL MEMORY?

Nobody else (e.g. professional institutions), has helped enough to fill this gap and provide continuity, so policy is based more on hope, predictions, & lobbies, than experience of what works and what really needs attention.

“The social contract has been fractured by outsourcing” ... AL GORE

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

A glimmer of hope: Stage M is back! *now as Stage 7 in the RIBA Plan of Work 2013*

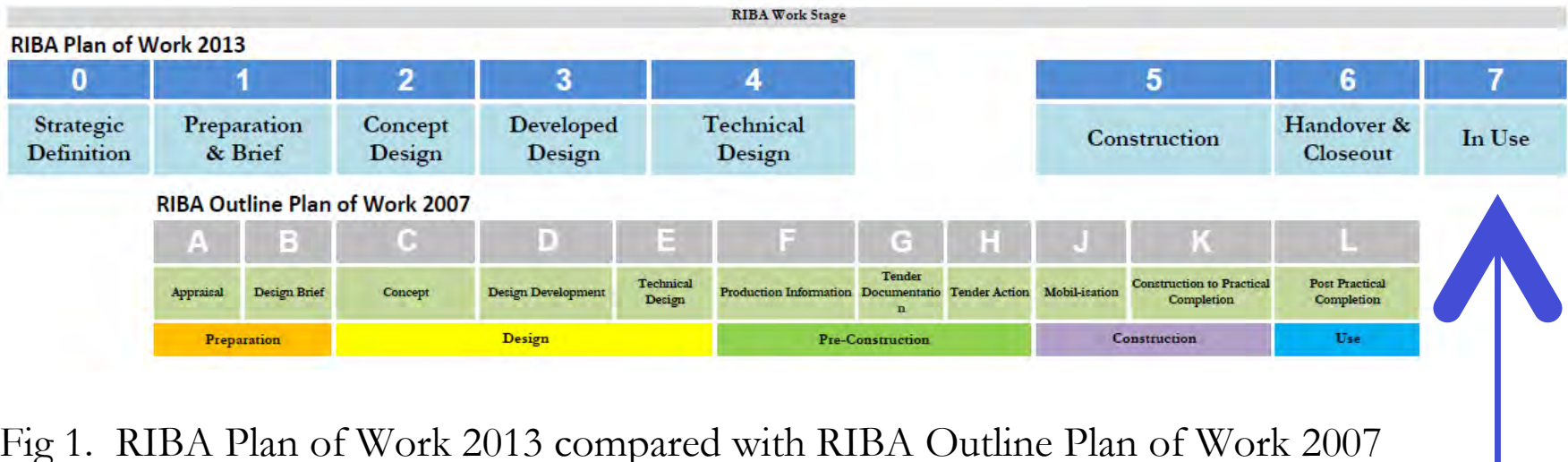


Fig 1. RIBA Plan of Work 2013 compared with RIBA Outline Plan of Work 2007

In all your projects, are you able to follow through from design into operation and feed back the insights?

If not, why not? What's getting in the way?

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GOVERNMENTS, MARKETS AND BUILDING PROFESSIONALS

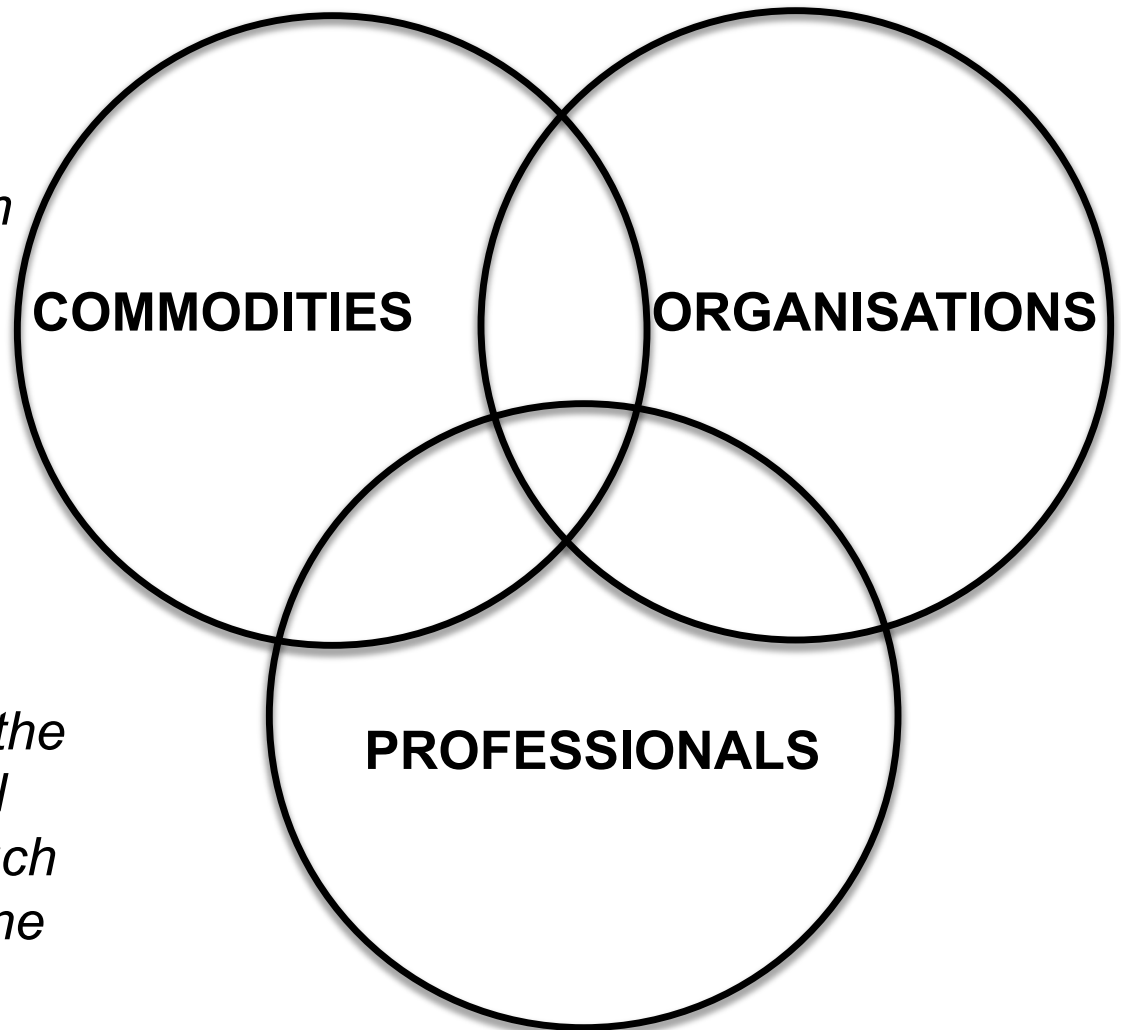
How societies structure expertise

“At present, professionalism seems to hold its own.

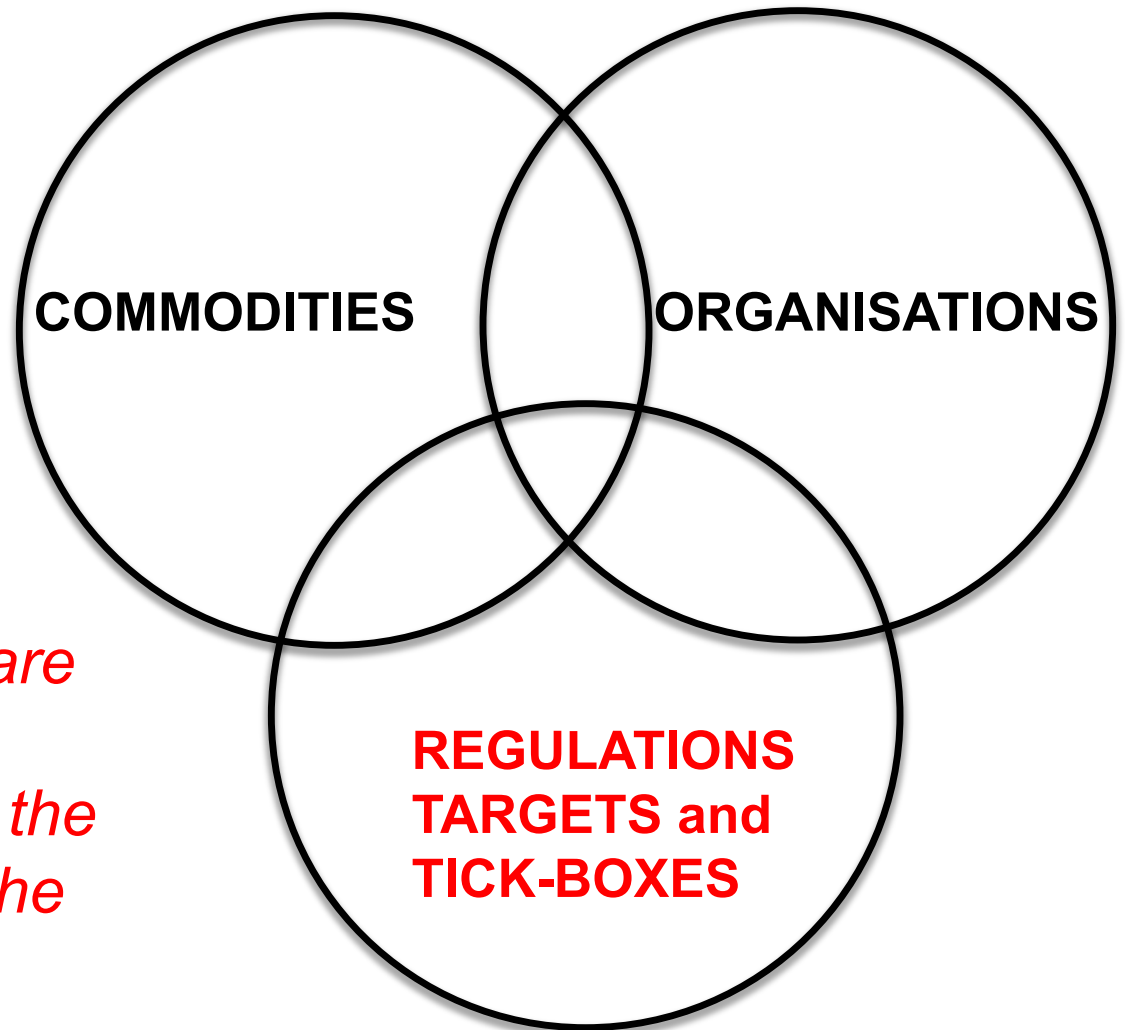
“It has stayed ahead of commodification ... but may ultimately lose out to organisations ...

“new hiring patterns... and the loose form of organisational professionalism point to much weaker control of work by the professions themselves.”

ABBOTT (1988)



Where we now seem to be in the UK



But do the regulators understand what they are doing? With so much outsourced, where are the vision, the integration the public interest, and the “intelligent customer”?

Are we too concerned with markets and trading, not long-term public interest?

“Market fundamentalism has taken root in the machinery of government”

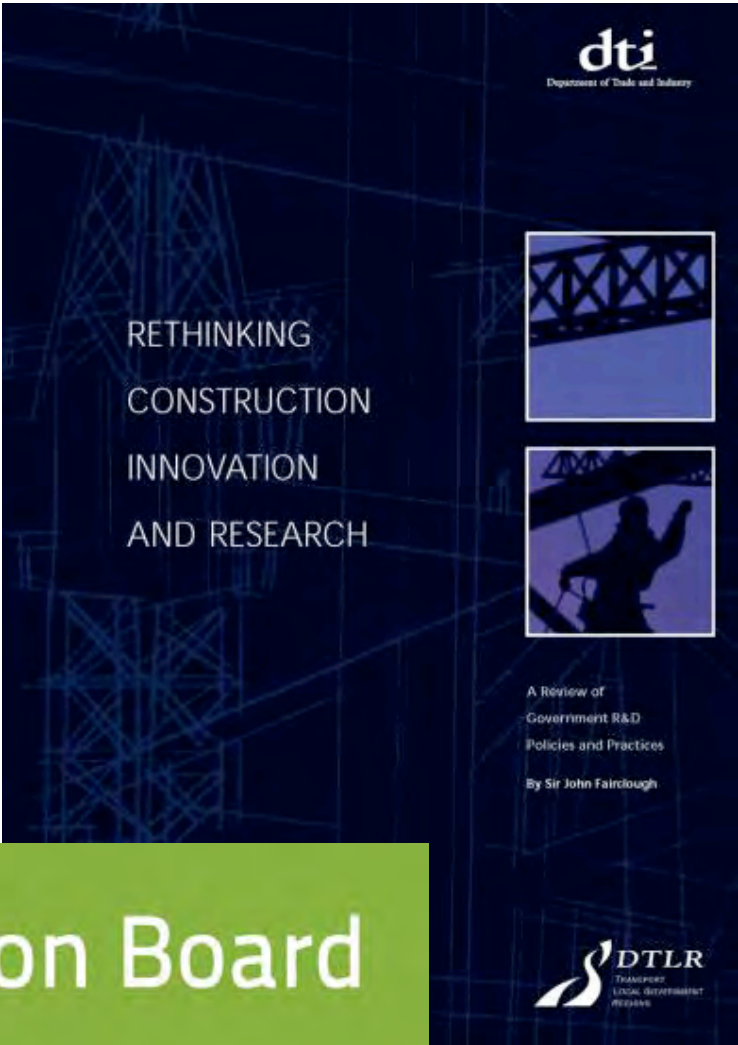
JOHN ASHTON, former UK Climate Spokesman (2013)

How do we maintain the chain of progress?

Where are the disinterested professionals?

Where is the public domain infrastructure for improving building performance in use?

Buildings policy has also tended to focus on construction, *not performance in use ...*



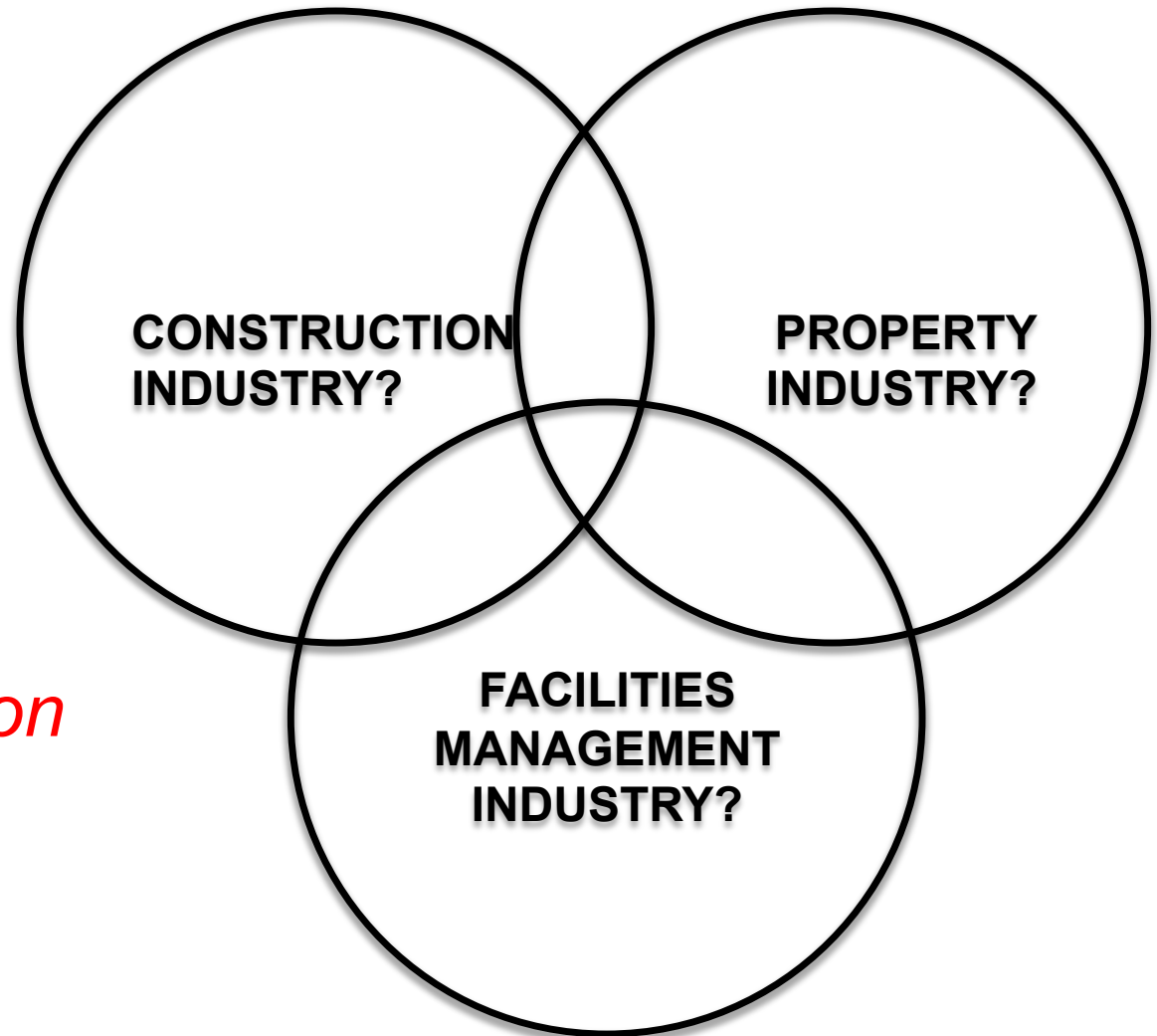
And it goes on ...

The Green Construction Board

But which industry and market is really responsible for building performance?

None of these:
it's much more
complicated
than that.

*The lack of traction
is not a market
failure, but a
category error!*



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

5

MOVING FORWARD

*Stop diverging from design intent:
Converge onto operational reality*

If you wanted to improve building performance in use, *what would you do ...*

A. Focus on building performance in use?

OR

B. Do lots of other things and hope that performance will improve ...?



Why are have we been barking up the wrong tree?

Why is actual performance not the proper target?

UBT's proposed sticky interventions:

seeding things with potential to snowball over time

Cultural adaptations, not just technical “solutions”.
To create virtuous circles of continuous improvement.

MAKE IN-USE PERFORMANCE CLEARLY VISIBLE

In a way that motivates people to strive to improve it.
This needs a well-informed technical infrastructure to help the plethora of different systems to converge, particularly for energy and carbon.

CONSOLIDATE THE KNOWLEDGE DOMAIN

Develop building performance as an independent knowledge domain, to gain the evidence and authority to inform practice and policymaking.

REVIEW PROFESSIONAL ETHICS AND PRACTICES

A shared vision for building-related professionals to work in the public interest and engage properly with outcomes: *NEW PROFESSIONALISM*

Changing the way we do things

- 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 HOW ABOUT?

- Changing attitudes to the nature of the job.
 - Re-defining perceptions of the professional's role, to follow-through properly and to engage with outcomes.
 - Closing the feedback loop – rapidly and efficiently.
 - Making much more immediate, direct and effective links between research, practice and policymaking.
-

Getting more sense into procurement

Soft Landings can help

1. **Inception and Briefing**
*Appropriate processes, better relationships.
Assigned responsibilities, including client.
Well-informed targets related to outcomes.*
2. **Design and construction**
Including expectations management.
3. **Preparation for handover**
Better operational readiness.
4. **Initial aftercare**
*Information, troubleshooting, liaison,
fine tuning, training.*
5. **Longer-term aftercare**
*monitoring, review, independent POE, feedback
and feedforward.*

Can run alongside any construction process

***It has proved important to bring out the Champions,
leaders who can maintain the focus on outcomes and
the “golden thread” from design intent to reality.***

***The most difficult things are post-handover:
finding the budget, and changing contractor attitudes.***

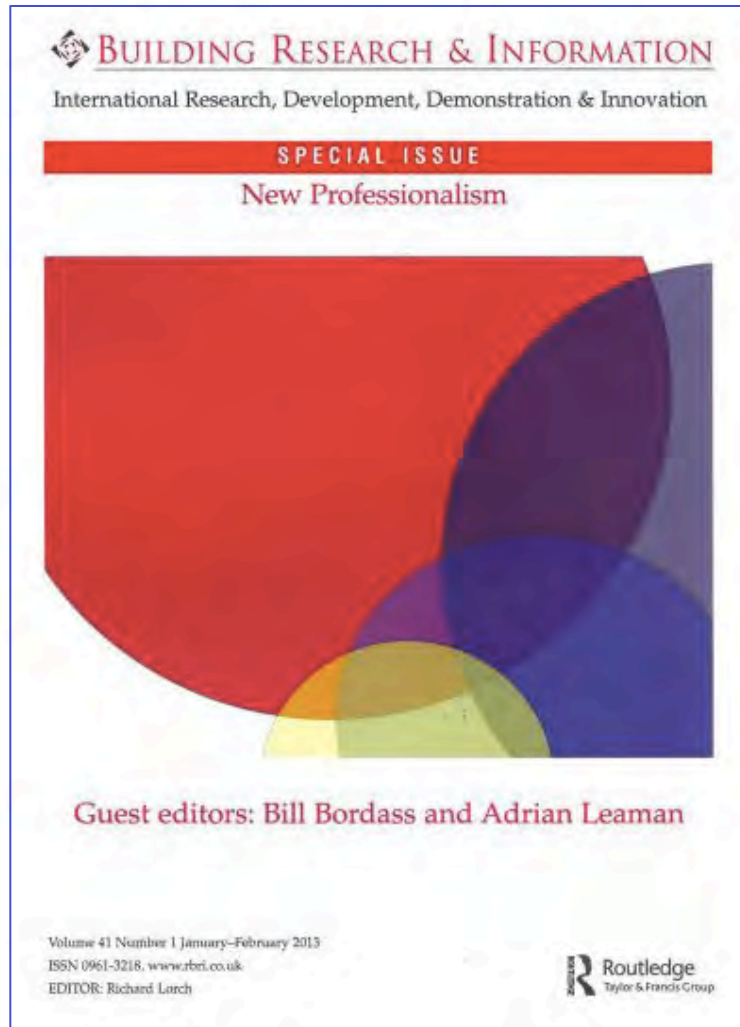


the **SOFT LANDINGS FRAMEWORK**
for better briefing, design, handover and building performance in-use



New Professionalism: getting started

Principles anyone can adopt tomorrow



PROVISIONAL LIST DEVELOPED WITH THE EDGE ***ETHICS AND PRACTICE:***

1. Be a steward of the community, its resources, and the planet. Take a broad view.
2. Do the right thing, beyond your obligation to whoever pays your fee.
3. Develop trusting relationships, with open and honest collaboration.

ENGAGEMENT WITH OUTCOMES:

4. Bridge between design, project implementation, and use. Concentrate on the outcomes.
5. Don't walk away.
Provide follow-through and aftercare.
6. Evaluate and reflect upon the performance in use of your work. Feed back the findings.
7. Learn from your actions and admit your mistakes. Share your understanding openly.

THE WIDER CONTEXT:

8. Seek to bring together practice, industry, education, research and policymaking.
9. Challenge assumptions and standards. Be honest about what you don't know.
10. Understand contexts and constraints. Create lasting value. Keep options open for the future.

New Professionalism: recent progress

Morrell report for Edge published May 2015

The report focuses largely on the role of the institutions: **Top Down**.

Key themes: *Ethics, Education, Knowledge, Collaboration.*

Two complementary approaches:

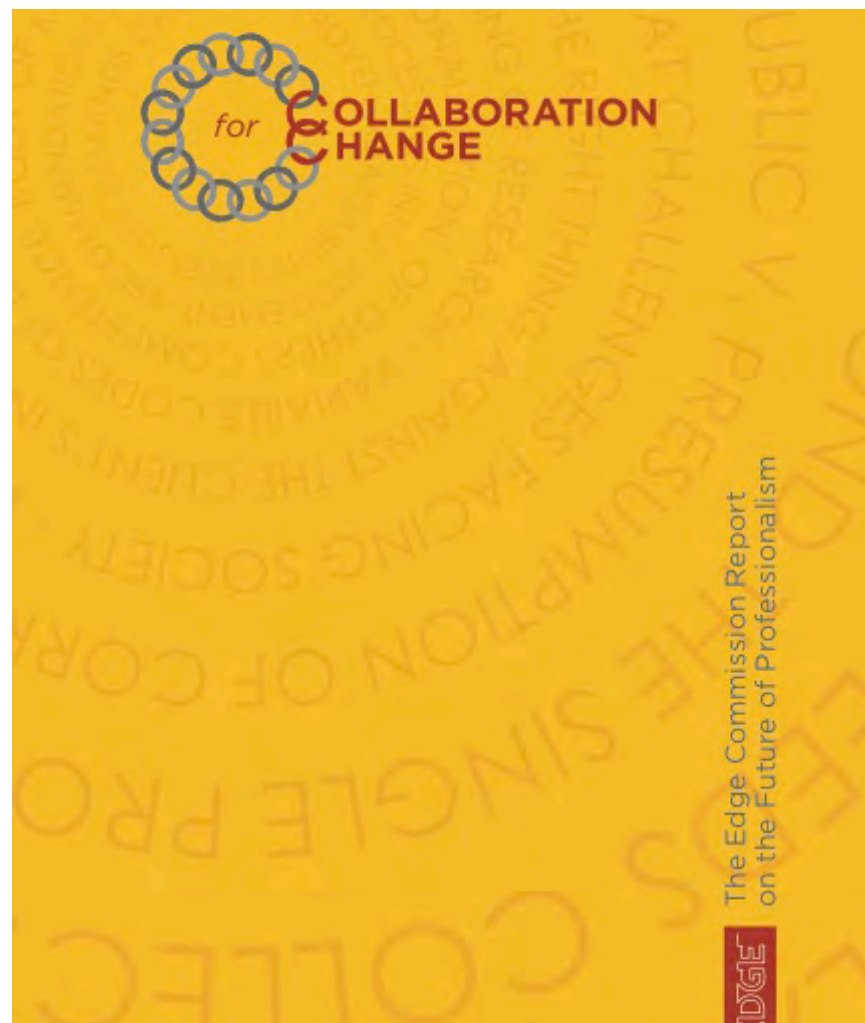
Bottom-up:

The individual,
e.g. adopting the ten points.

Middle-out:

At organisational and practice level.

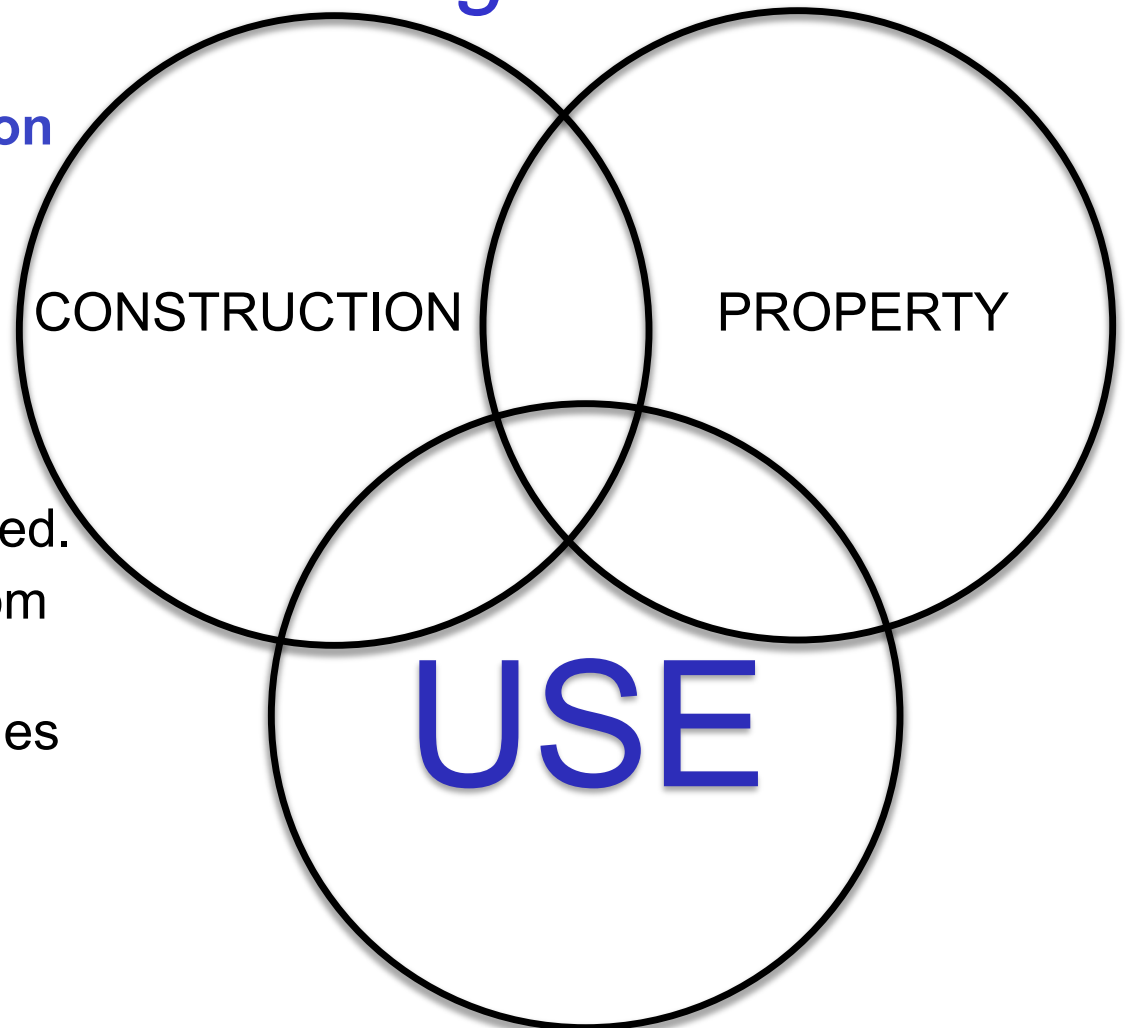
***Is this something EPA
might be interested in?***



Conclusions

- If we are to meet the challenges of sustainability, the role of the building professional must change.
 - We need to be concerned not just with inputs and outputs, but in-use outcomes.
 - We need to follow-through, reflect, close the feedback loop and initiate virtuous circles.
 - This all needs leadership, *not more rules and processes*.
 - Building performance in use needs to become an independent knowledge domain, properly resourced in the public interest. *It's too important to leave to the construction industry!*
-

How about an independent *Institute for Building Use?*



- **Strengthens representation of BUILDING USE**
 - Public interest.
 - Independent.
 - Interdisciplinary from the start. No historic silos.
 - Authoritative, evidence based.
 - Can bring together work from many different sources.
 - Both supports and challenges the construction and property industries.
 - Connects research, practice and policymaking.
 - Institute for Fiscal Studies is a possible analogue.
-

www.usablebuildings.co.uk
