RIBA

CPD Birmingham
27 November 2014
PART 1

UBT
Usable Buildings Trust

Design intent to reality: Closing the performance gaps

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the Usable Buildings Trust
www.usablebuildings.co.uk

Part 1

1. **Overview**
2. **Flying Blind?**
3. **How did we get here?**
4. **Strategic findings from case studies of building performance in use – BPE and POE**

1

OVERVIEW

Overview

- After decades studying building performance in use and attempting to embed the implications in government policy and client and industry practices, we have concluded that *the way society procures building work is not capable of tackling the problems we now face.*
- The industrial revolution led to a similar mismatch:
  This eventually led to the growth in building professions, starting with architecture.
- Over the past 40 years, the role of building professionals has been eroded, being seen as just another business … ***However,***
- Regulations and markets alone are proving insufficient to respond to the challenges of sustainability and the protection of the commons:
  we get left with mismatches and performance gaps.
- **We need to re-examine professionalism. This must include a shared ethic and much more awareness of outcomes.**

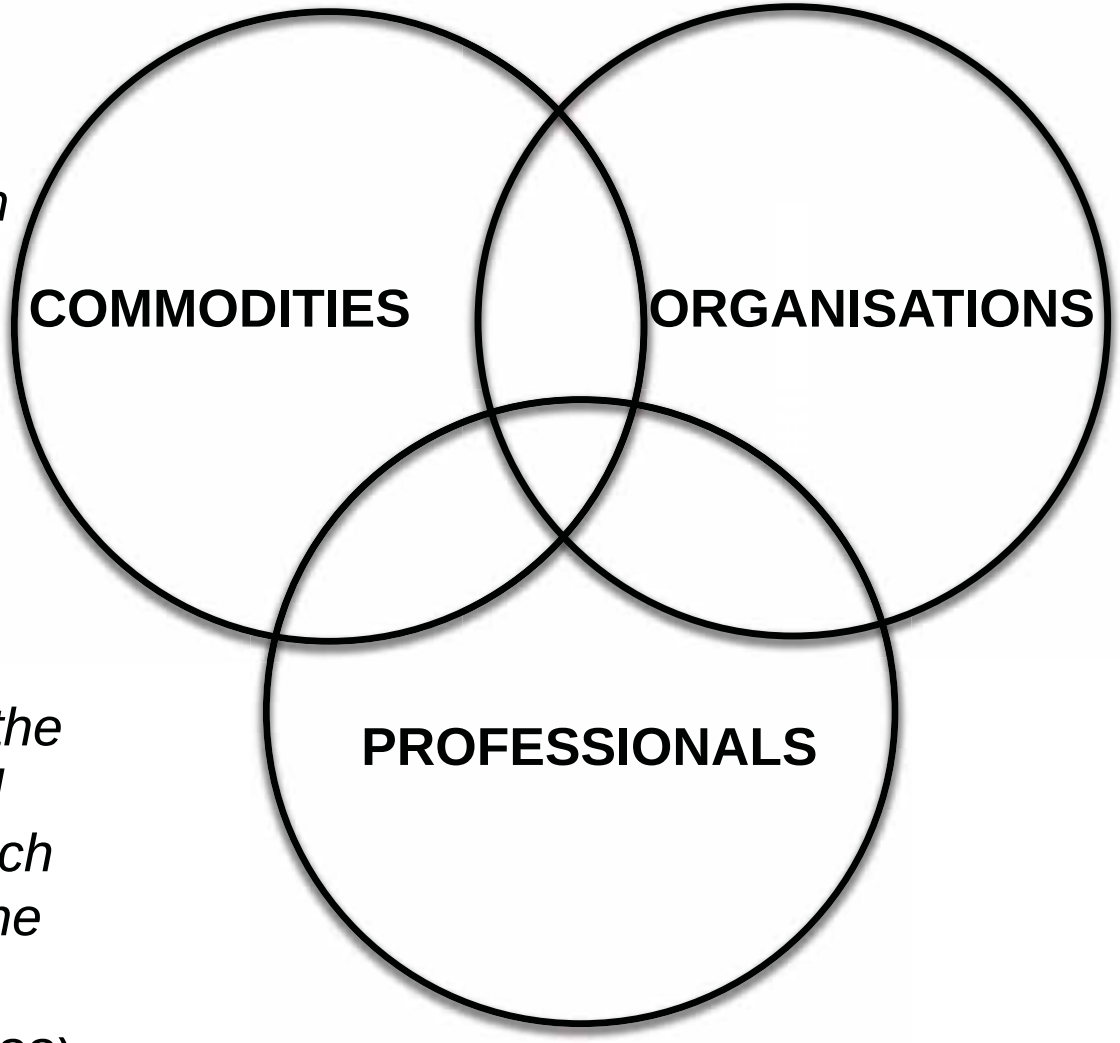
How societies structure expertise

"At present, professionalism seems to hold its own.

"It has stayed ahead of commodification … but may ultimately lose out to organisations …

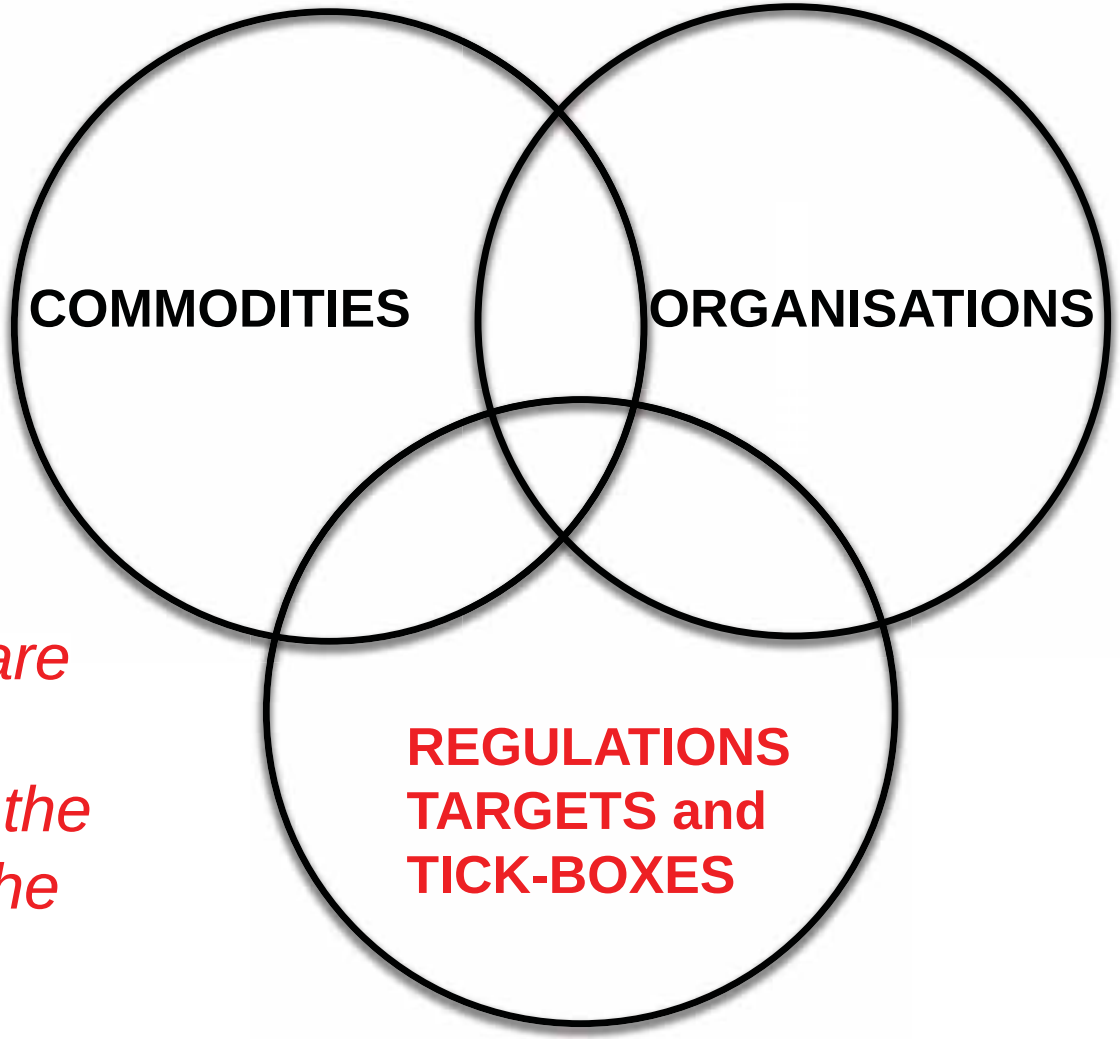
"new hiring patterns… and the loose form of organisational professionalism point to much weaker control of work by the professions themselves."

ABBOTT (1988)



SOURCE: A Abbott, *The system of professions,* University of Chicago Press, 1988, page 325.

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"?

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

So how come the RIBA Plan of Work 2013 allows the sustainability checkpoints to be switched on and off ?

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

What are professionals and their institutions for?

The word derives from the notion of an occupation that the practitioner "professes" to be skilled in.

Essential attributes *(after Davies & Knell, 2003)*

- **A body of knowledge**, *not just codified knowledge: a professional's tacit knowledge is unique, the know-how (and who) as well as know-what.*
- **Trustworthiness**, integrity and independence as intermediaries, *establishing levels of behaviour in markets where there are extreme information asymmetries.*
- **Formal association**, to help wield power and influence. *To earn the role above the market, the association needs to maintain a sound body of knowledge and a secure reputation for itself and members.*
- **Protection of public interest.** *There is a tension between the ethos and the market mechanisms within which members work. Hence the need for codes of conduct and regulatory frameworks.*

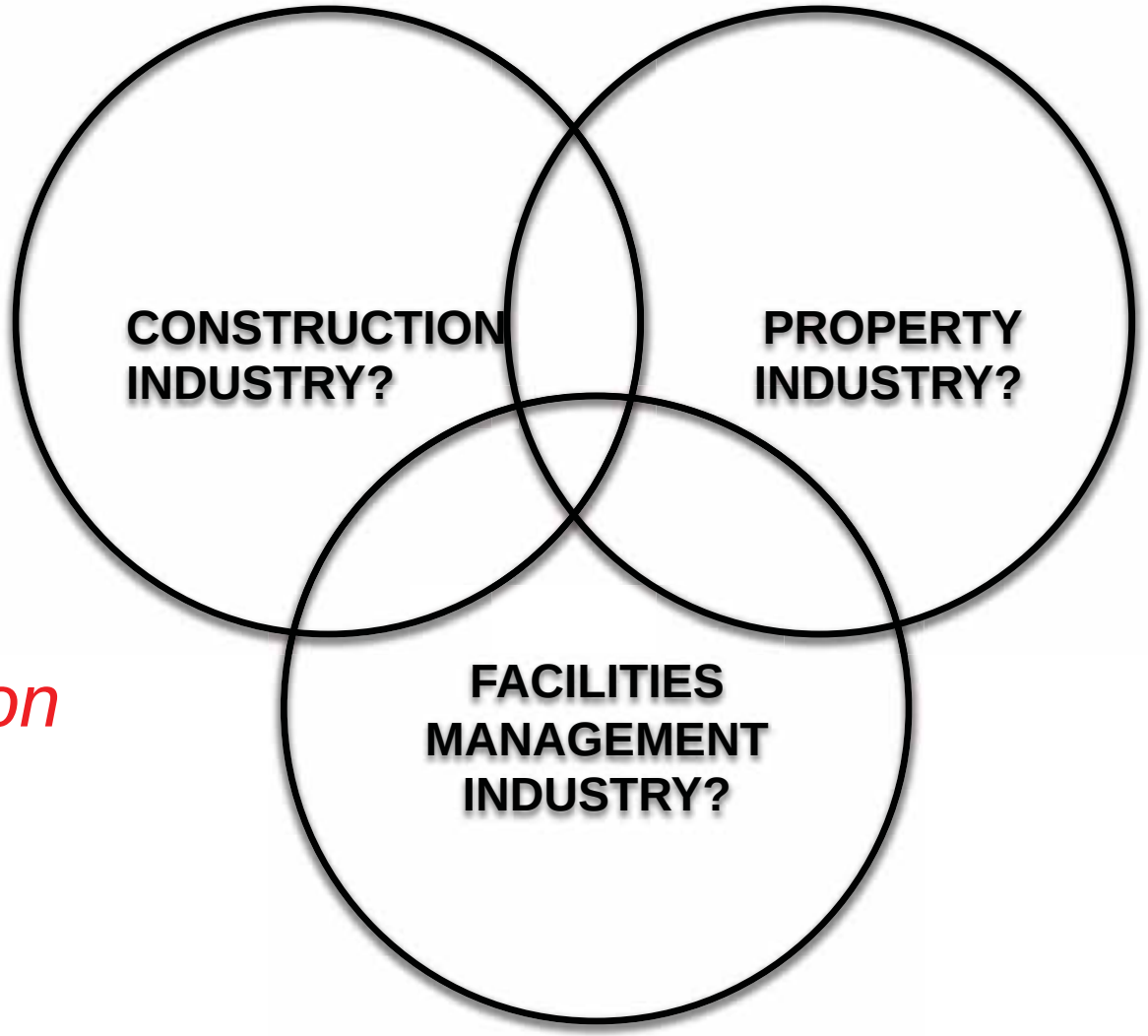
How well is all this working today?

SOURCE: W Davies & J Knell, in *The professionals' choice,* Building Futures, ed S Foxell, RIBA & CABE,18-34 (2003).

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!



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.

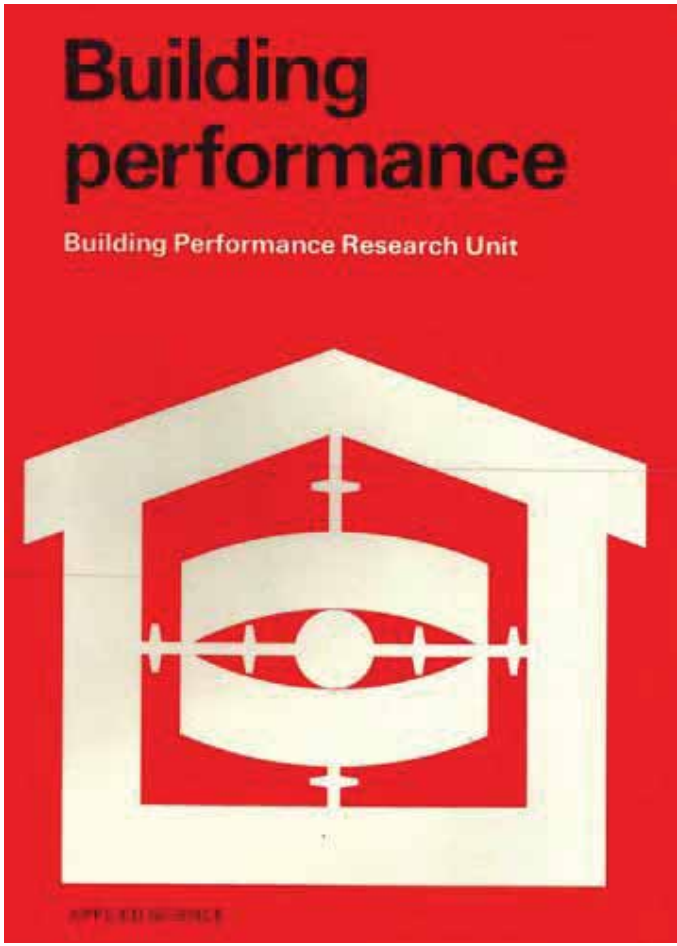
A false dawn: What went wrong?

In 1972:

The seminal book *Building Performance* was published by BPRU, the Building Performance Research Unit at Strathclyde University.

The very same year:

RIBA took STAGE M out of its publication ***Architect's Appointment.***



REPORTEDLY BECAUSE:

- *Difficult to define what should be done.*
- *Clients wouldn't pay for it.*
- *RIBA did not want to create the impression architects would do it for nothing.*
- *Concerns about legal and insurance implications.*

FEEDBACK ALSO WITHERED IN ACADEME:

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

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

Half a century later, it's back!
RIBA Plan of Work 2007 and 2013

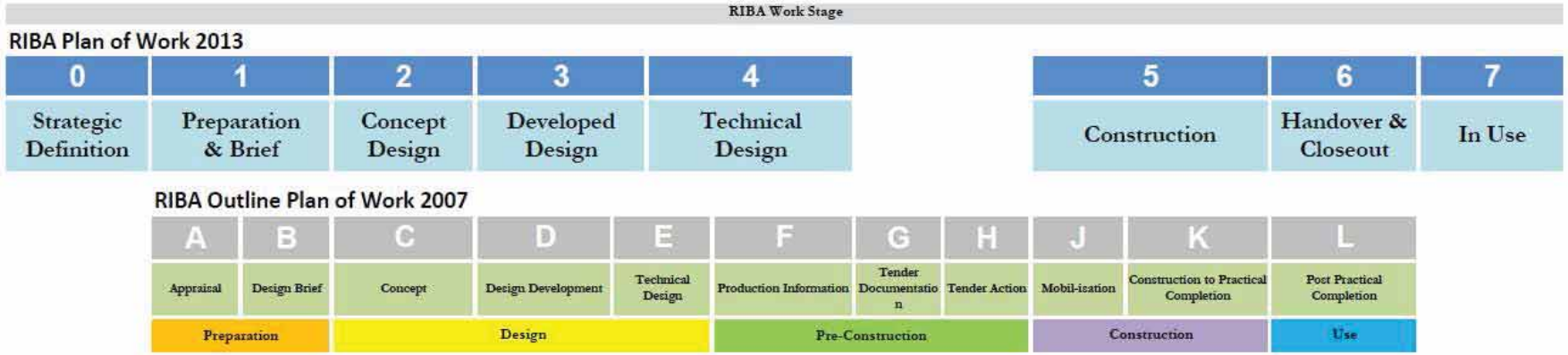


Fig 1. RIBA Plan of Work 2013 compared with RIBA Outline Plan of Work 2007

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

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

SOURCE: RIBA Plan of Work overview (March 2013). See also www.architecture.com/planofwork

2

FLYING BLIND?

What Building Performance Evaluation tells us: *the evidence under our noses*

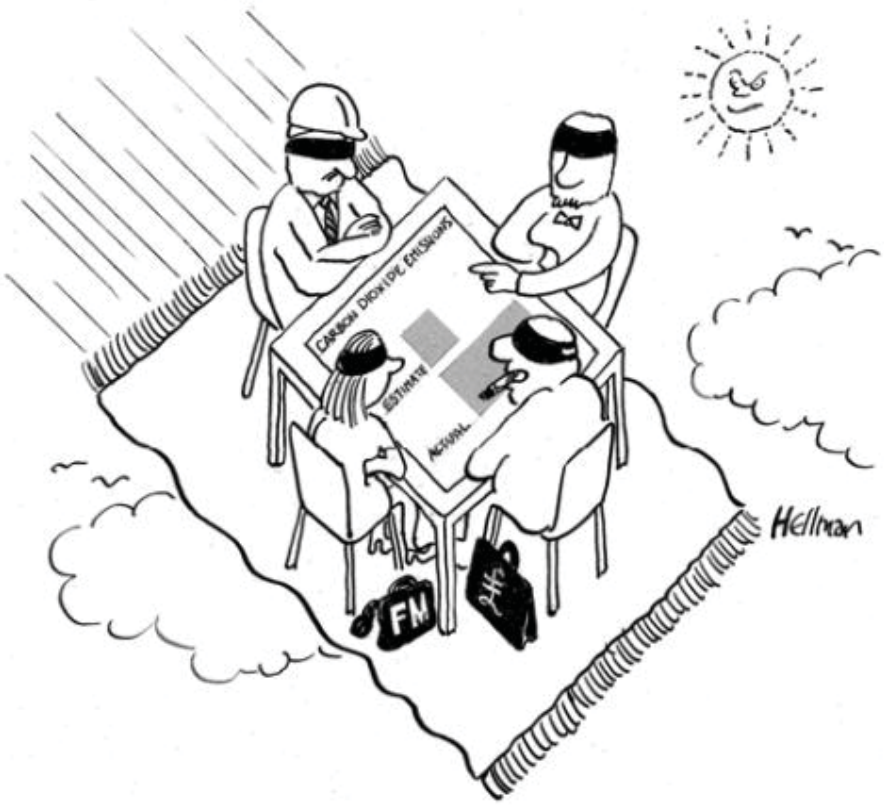
For most of the construction and property industry, *performance in use has been another country …*

"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

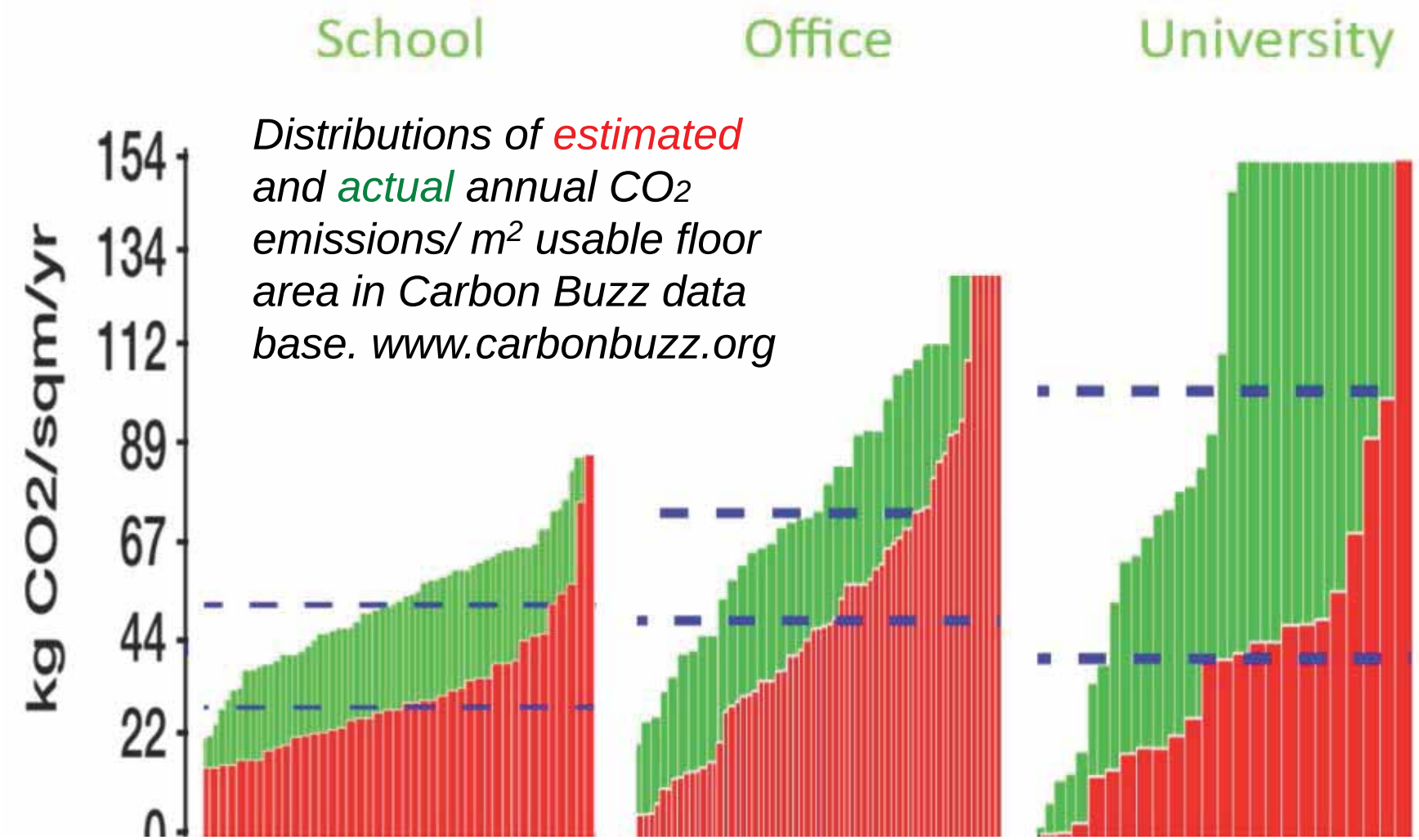
"designers seldom get feedback, and only notice problems when asked to investigate a failure."
ALASTAIR BLYTH
CRISP Commission 00/02

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



SOURCE: Hellman cartoon for W Bordass, *Flying Blind,* Association for the Conservation of Energy & OXEAS (2001)

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



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

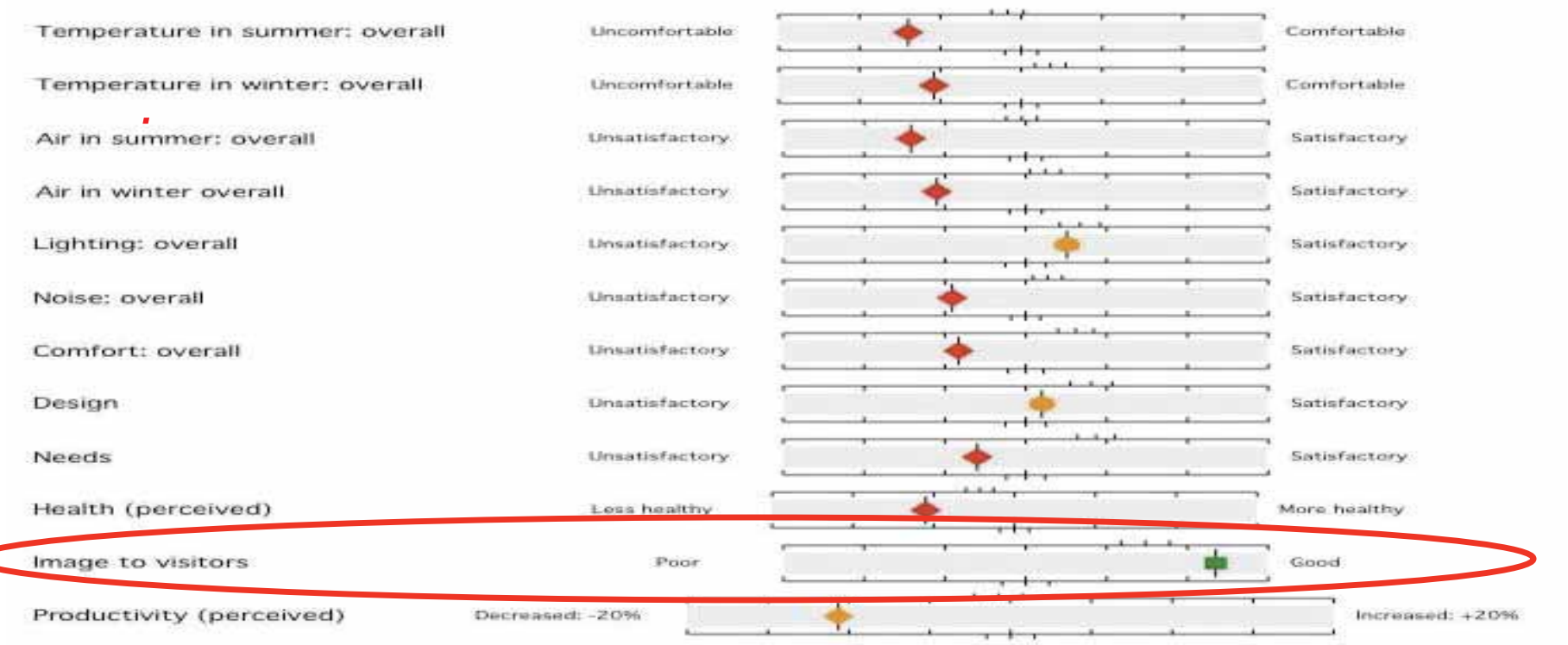
The gaps occur in housing too:
40 years after the 1973 oil crisis

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*

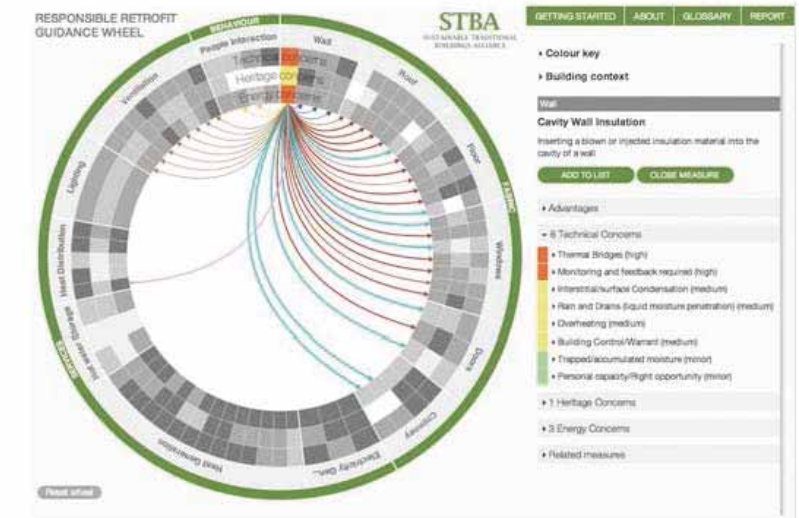
RED: below average; AMBER: Average; GREEN: Above average



" … 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

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

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.

SOURCES: Report (Sept 2012) downloadable from www.stbauk.org Guidance Wheel at www.responsible-retrofit.org/wheel

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

BCIA
Building Controls Industry Association

Controls for End Users

a guide for good design and implementation

by Bill Bordass, Adrian Leaman and Roderic Bunn

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.

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 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.

Compiled for the BCIA by BSRIA UBT Usable Buildings Trust

Funded by CARBON TRUST

"we sell dreams and install nightmares"
– CONTROLS SUPPLIER

SOURCE: www.usablebuildings.co.uk/Pages/Publications/UBPubsControlsForEndUsers.html and BSRIA

3

HOW DID WE GET HERE?

Buildings last a long time
so good performance is in the national interest

- With traditional construction, feedback was slow and evolutionary.
- In the 18th and 19th Centuries, with burgeoning industry, powerful clients, and government struggling to keep up, the building professions began to emerge, *to help ensure fairness and protect public interest.*
- In the 1920s, the government set up the Building Research Station (*later BRE)* to provide guidance in the national interest. *Its initial focus was on basic science and providing advice to government and the construction industry. It later broadened out into a wide range of performance issues.*
- As the public sector grew, so did the number of building-related staff in design, construction, property, maintenance and management.
- Many Ministries had information services, research and technical units supporting their buildings-related activities. *They were far from perfect, but obtained both explicit and tacit feedback from their activities, produced a wide range of guidance material, and acted as "intelligent customers".*

Then the tide 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.

- 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?

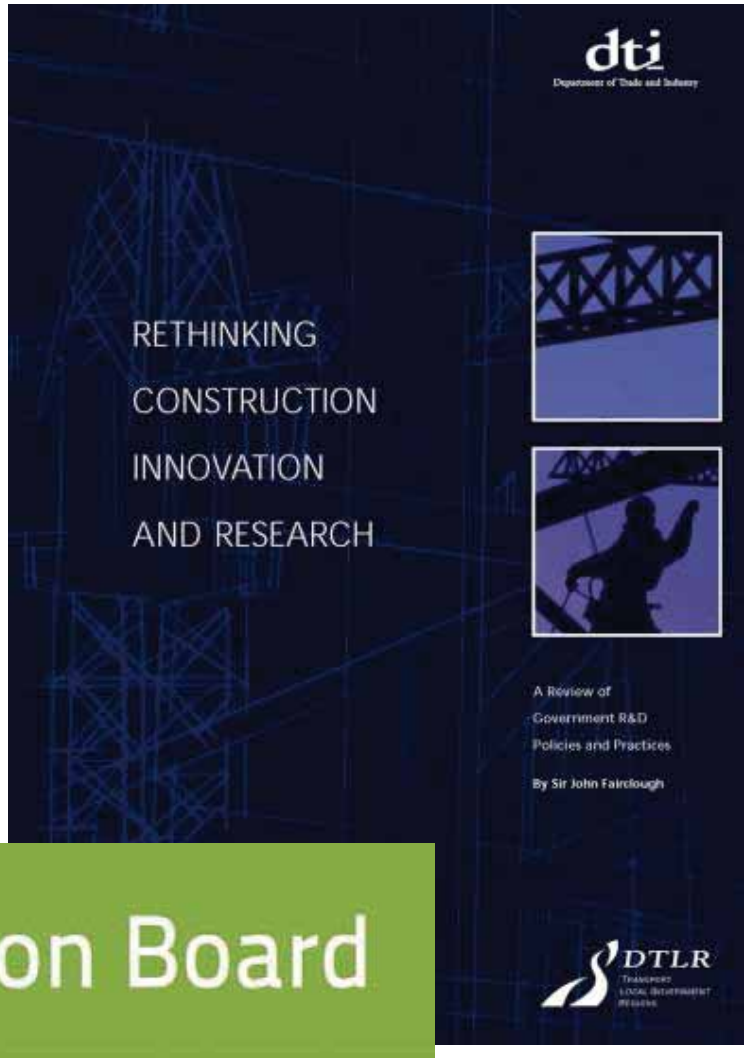
Nobody else (e.g. professional institutions), has helped enough to fill this gap and provide continuity, so policy is based more on hope, predictions, & lobbies, than experience of what works and what really needs attention.

"The social contract has been fractured by outsourcing" … **AL GORE**

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

RETHINKING CONSTRUCTION

ORT OF THE CONSTRUCTION TASK FORCE



And it goes on …

The Green Construction Board

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

4

STRATEGIC FINDINGS FROM CASE STUDIES OF BUILDINGS IN USE

BPE – Building Performance Evaluation
POE – Post-Occupancy Evaluation

New non-domestic buildings:
What have we tended to find, for many years now?

- 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 seldom communicated well to users and managers. *Designers and builders go away at handover.*
- Unmanageable complication is the enemy of good performance. *So why are we making buildings technically and bureaucratically complicated in the name of sustainability, when we can't get the simple things right?*
- They are seldom tuned-up properly. Controls are a mess. *If we have more to do, what chance do we have?*
- 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***

KEEP IT SIMPLE, DO IT WELL, FOLLOW IT THROUGH, TUNE IT UP, CAPTURE THE FEEDBACK

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

In spite of the warnings in 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

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

What put us on the track (1989)?

December 1989

BEST PRACTICE PROGRAMME

Good Practice Case Study 1

ENERGY EFFICIENCY IN OFFICES

Low cost major refurbishment
Policy Studies Institute
100 Park Village East, London NW1

- New atrium avoids the need for air-conditioning.
- New, smaller double-glazed windows improve thermal performance.
- Good daylight gives low lighting costs.
- Air quality sensors regulate fresh air intake.
- Solar energy collection from atrium exhaust air.

The Project

The Policy Studies Institute (PSI) is an independent policy research organisation concerned with economic and social studies and the workings of political institutions. Their research work benefits from a cellular office environment, with extensive support facilities including a conference suite which is regularly ranked-out.

A 5-storey office building in poor condition, was purchased for low-cost conversion into the necessary office accommodation with library, conference, meeting rooms and kitchen. The building (originally a 1920's factory) has an unusual triangular floor plan.

PSI and their landlords — the Joseph Rowntree Memorial Trust — wanted the project to be as energy efficient as a limited budget would allow. The major design problem was to reconcile the large number of cellular offices needed with the windowless space in the centre of the building, whilst avoiding expensive air conditioning.

The Result

A small atrium was pierced through the top three floors to give a focus to the scheme, bring light and air to the centre of the building, expand the perimeter for cellular offices, avoid the need for air-conditioning, and collect solar heat.

The design solution allowed many of the rooms to be naturally-ventilated, with mechanical ventilation to the atrium and surrounding offices only, and to conference and meeting rooms on the ground floor. Most of the windows were replaced or upgraded with double-glazed units. Roof insulation was improved, but retrofit wall insulation was not economic. The boilers were overhauled.

The resulting building enjoys a moderate energy use of 193 kWh/m² of heated floor area, with particularly low electrical and lighting costs. Heating energy use predominates (85% of energy consumption and 55% of energy cost). It could have been significantly lower had the old boilers been replaced with modern high-efficiency equipment.

Energy Efficiency Office

CI/SfB 1975 32 R3 W6 Y7

1998: Energy Efficiency Best Practice programme replaced the Energy Efficiency Demonstration Scheme, *where results had been disappointing.*

Case Study 1 performed well in terms of its energy use, particularly electricity.

It had also been studied as part of the Building Use Studies (BUS) *Office Environment Survey* of occupant satisfaction in 50 buildings, where it also performed unusually well.

Was there a link?

We sought opportunities to combine occupant and energy surveys.

SOURCE: Energy Efficiency Best Practice Programme, Case Study 1, *Policy Studies Institute* (December 1989)

What put us on the track (1991)?

May 1991

BEST PRACTICE PROGRAMME

Good Practice Case Study 21

ENERGY EFFICIENCY IN OFFICES

One Bridewell Street, Bristol

A new high quality air conditioned office with low energy costs

- Low fan energy consumption for an air conditioned office.
- High frequency lighting with effective central and local control.
- Naturally lit corner atrium.
- Effective energy management aided by electronic BEMS.

The Project

The Result

Energy Efficiency Office

DEPARTMENT OF ENERGY

[Y2]

C1/Sfb 1976 331/(S7) (R3)

This air-conditioned building had an energy performance similar to some of the good naturally-ventilated buildings.

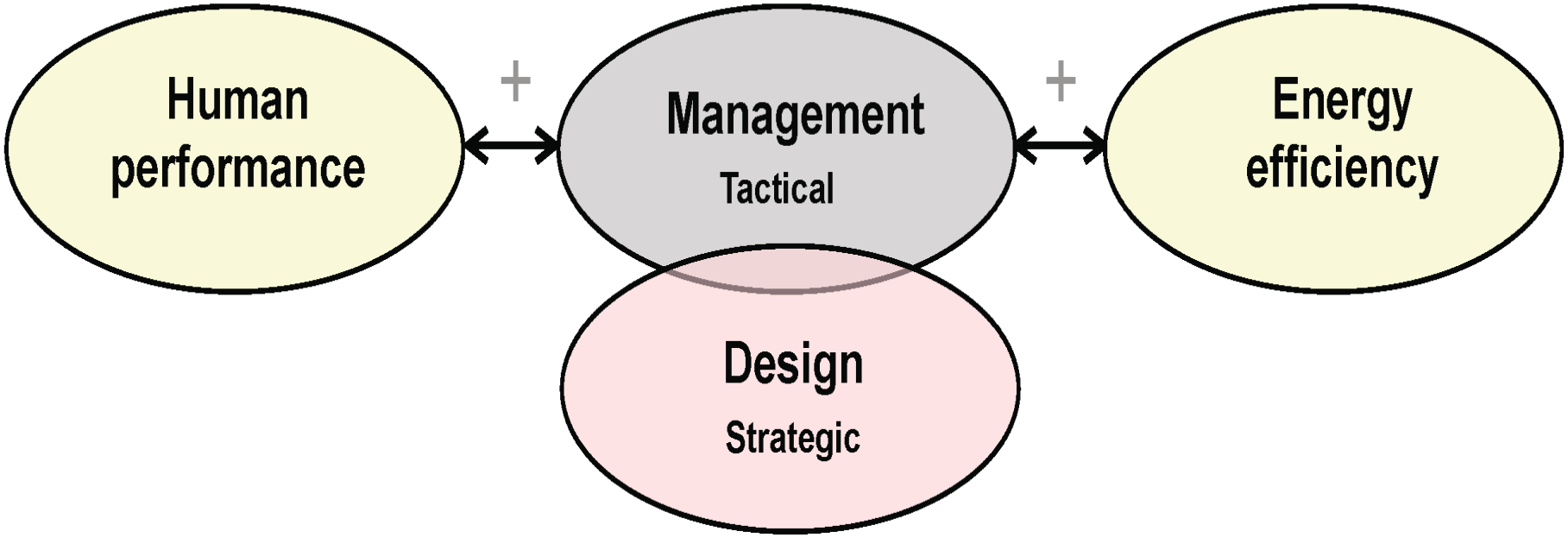
A building in London, with the same design team and a similar technical specification had three times the carbon footprint from annual energy use.

What was going on?

We sought opportunities to do a deeper investigation, including an occupant survey by Building Use Studies.

SOURCE: Energy Efficiency Best Practice Programme, Case Study 21. *One Bridewell Street* (May1991)

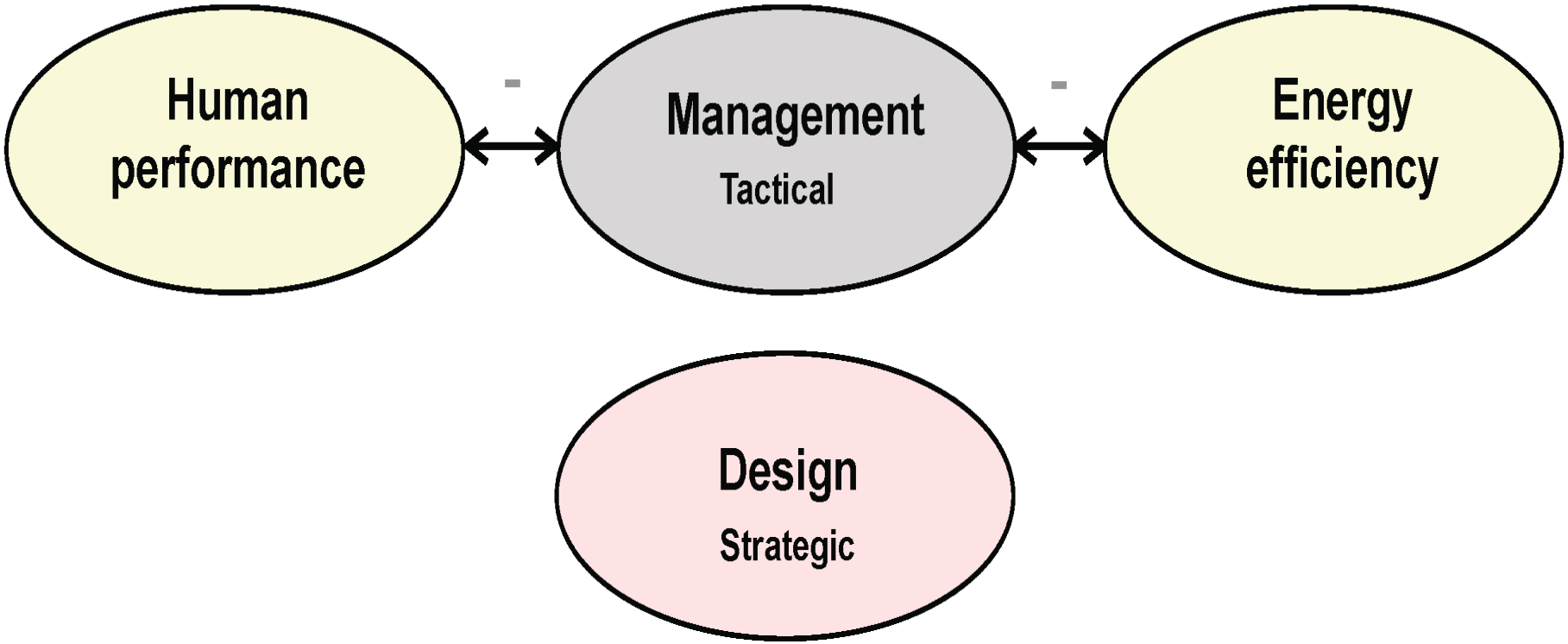
Where good things happened …
associations of low energy with happy occupants



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.

… 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.*

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

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 its 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).*

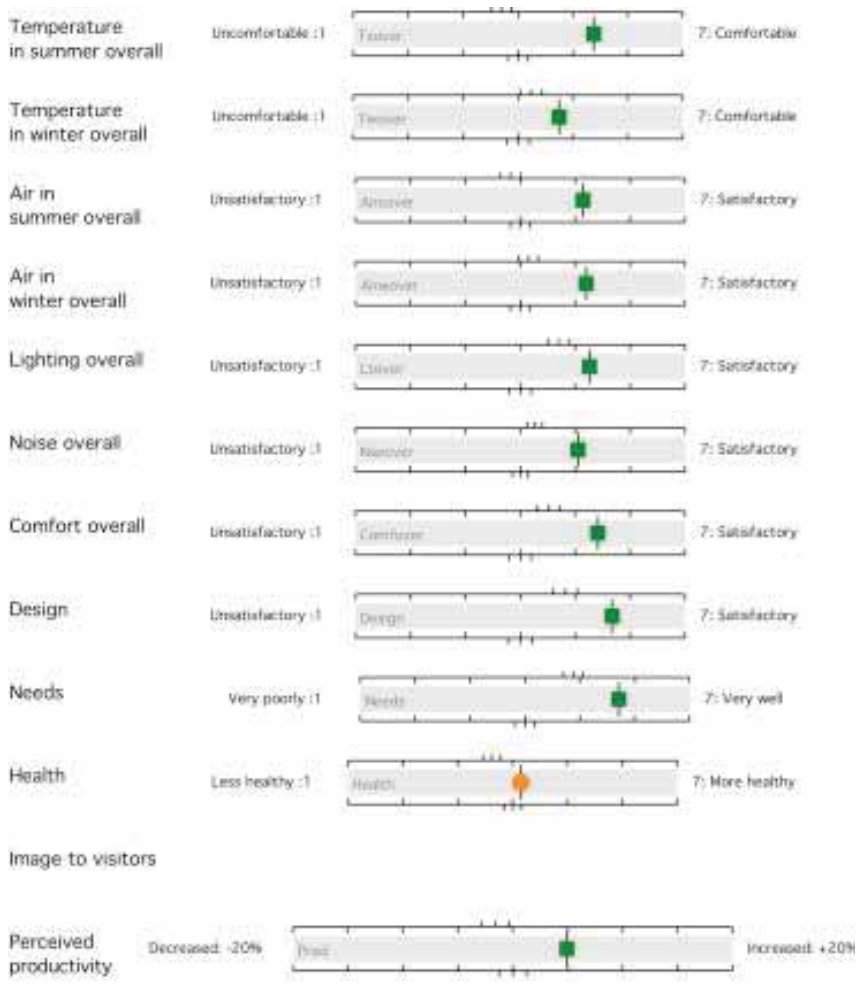
- A good, robust design, efficiently serviced *(mostly).*
- Enough time and money *(but to a normal budget).*
- An appropriate specification *(and not too clever).*
- An interested contractor *(with a traditional contract).*

- 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 *(which has been largely sustained).*

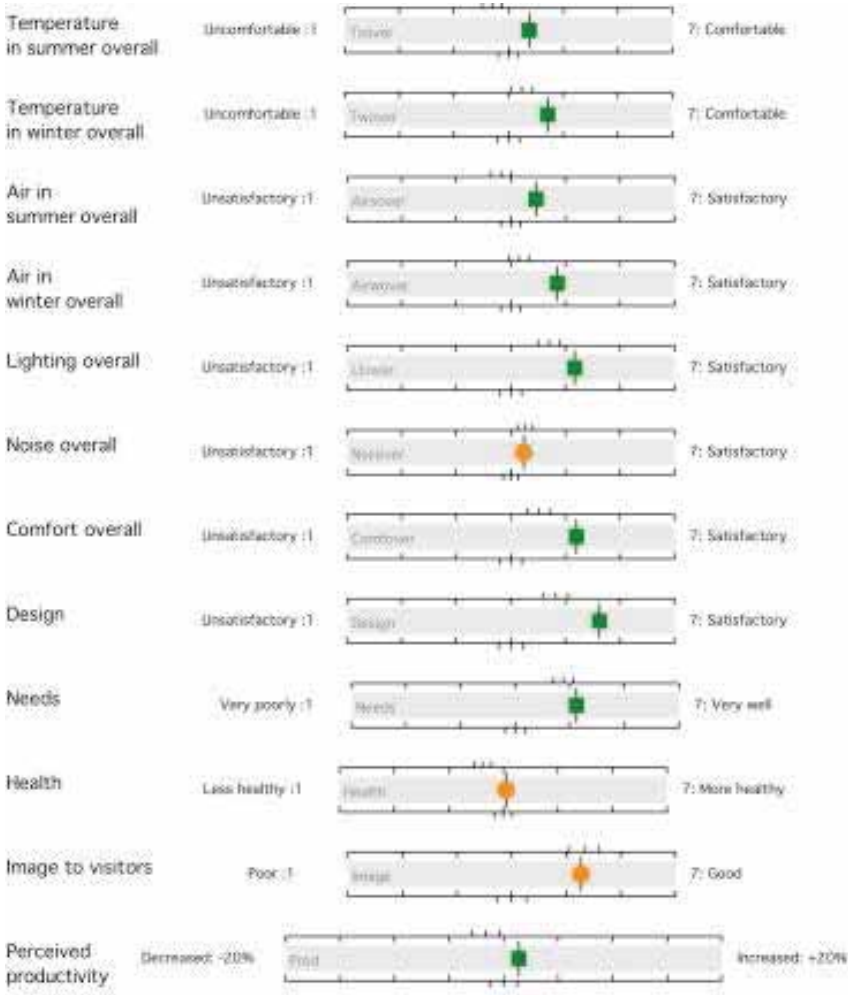
SOURCE: W Bordass et al, *Assessing building performance in use 5*, BR&I **29** (2), 144-157 (March-April 2001), Figure 6.

Elizabeth Fry Revisit - *Occupant Survey*

1996



2011



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

Some overall 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 must close the feedback loop and initiate virtuous circles of rapid improvement, involving all players.
- This is a systemic problem: we need to widen the perspective beyond buildings and construction.
- Building performance in use needs to become an independent and properly-resourced knowledge domain, in the public interest.

MORE IN PART 2

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