University of Nottingham
30 April 2014

IMPROVING BUILDING PERFORMANCE:

Sparing no expense to get something on the cheap?

Bill Bordass

the **USABLE BUILDINGS TRUST**
www.usablebuildings.co.uk

Summary

1. Where are we now?
2. How did we get here?
3. What was I up to while this was happening?
4. Where do we need to be?
   How might we get there?

1

WHERE ARE WE NOW?

Building performance in use is in the public interest

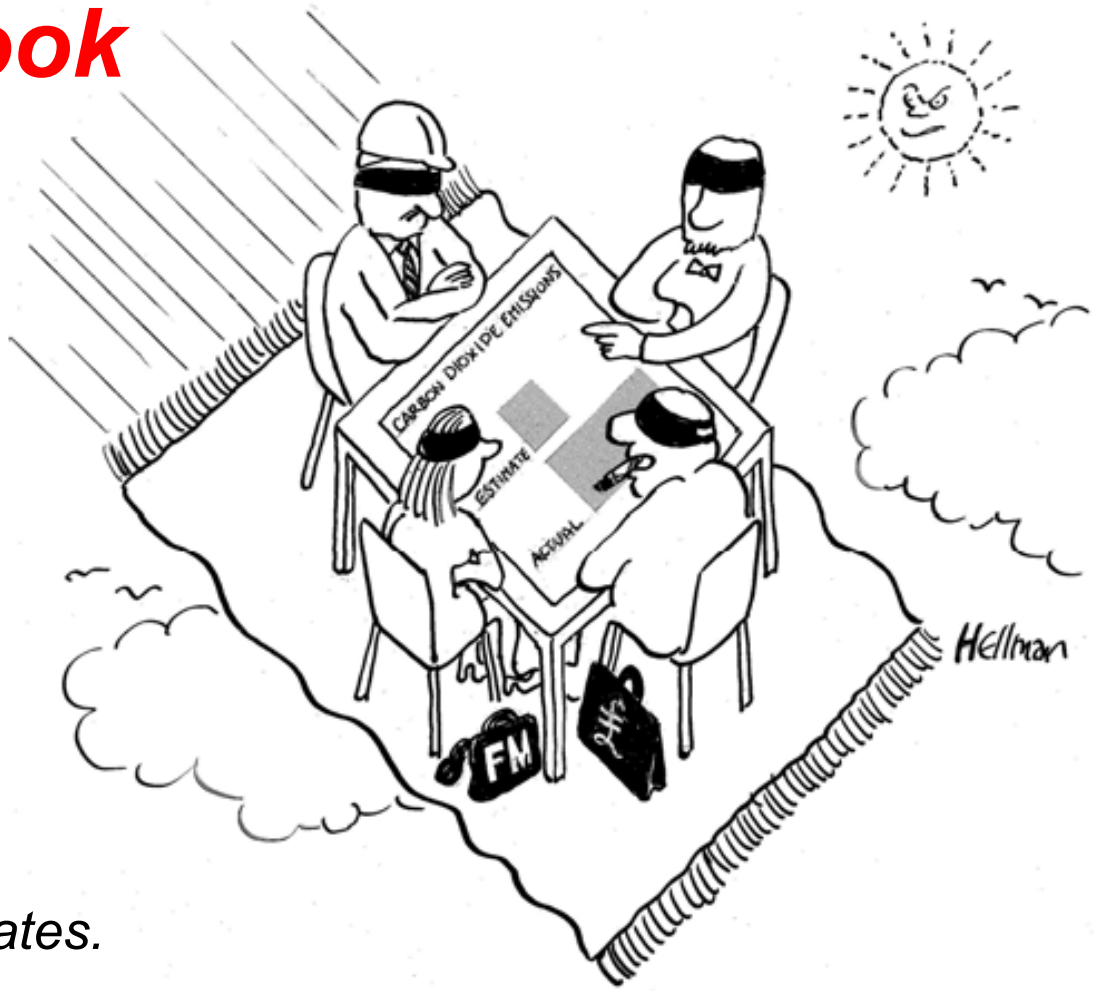
- Buildings last a long time, well beyond the time horizons of their creators, with many players involved in different roles.
- As building users, the whole population has an interest in them working better in every respect.

- **Now we want to improve the performance of the stock,** *especially (not only) in terms of energy and carbon …* ***BUT***
- The feedback loop from performance in use to construction and policymaking is poorly closed, *a disastrous oversight.*

BUT DO WE UNDERSTAND WHAT WE ARE DOING?

In the 1990s, there were often big gaps between design claims for low-energy buildings and in-use performance

but nobody took much notice

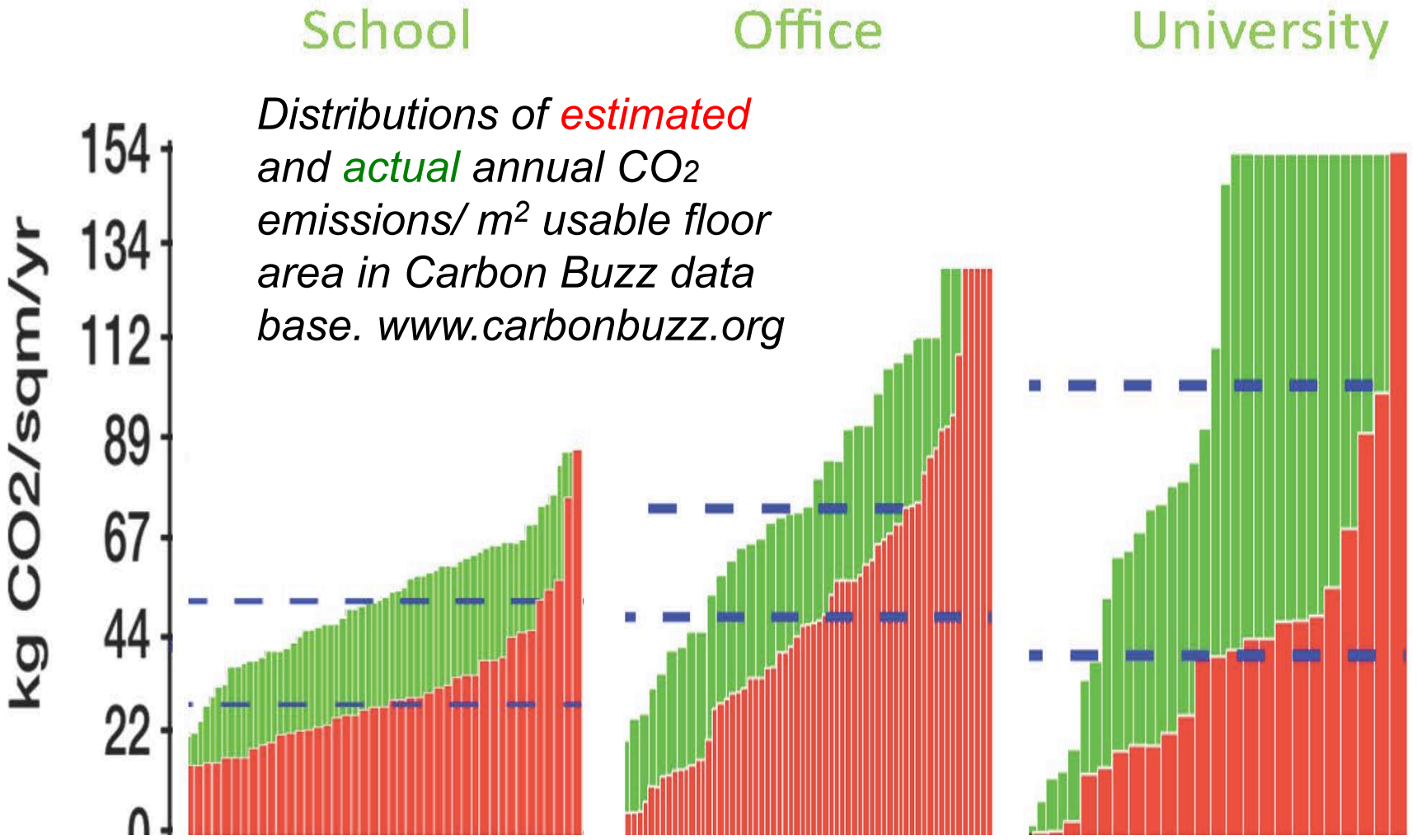


Cover of the 2001 report "Flying Blind", that advocated making in-use performance visible and actionable, starting with energy certificates.

Graph based on an energy survey in 1998 of an office building that won a major sustainability award in 1997.

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

The evidence is now overwhelming: *slide from Carbon Buzz*



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

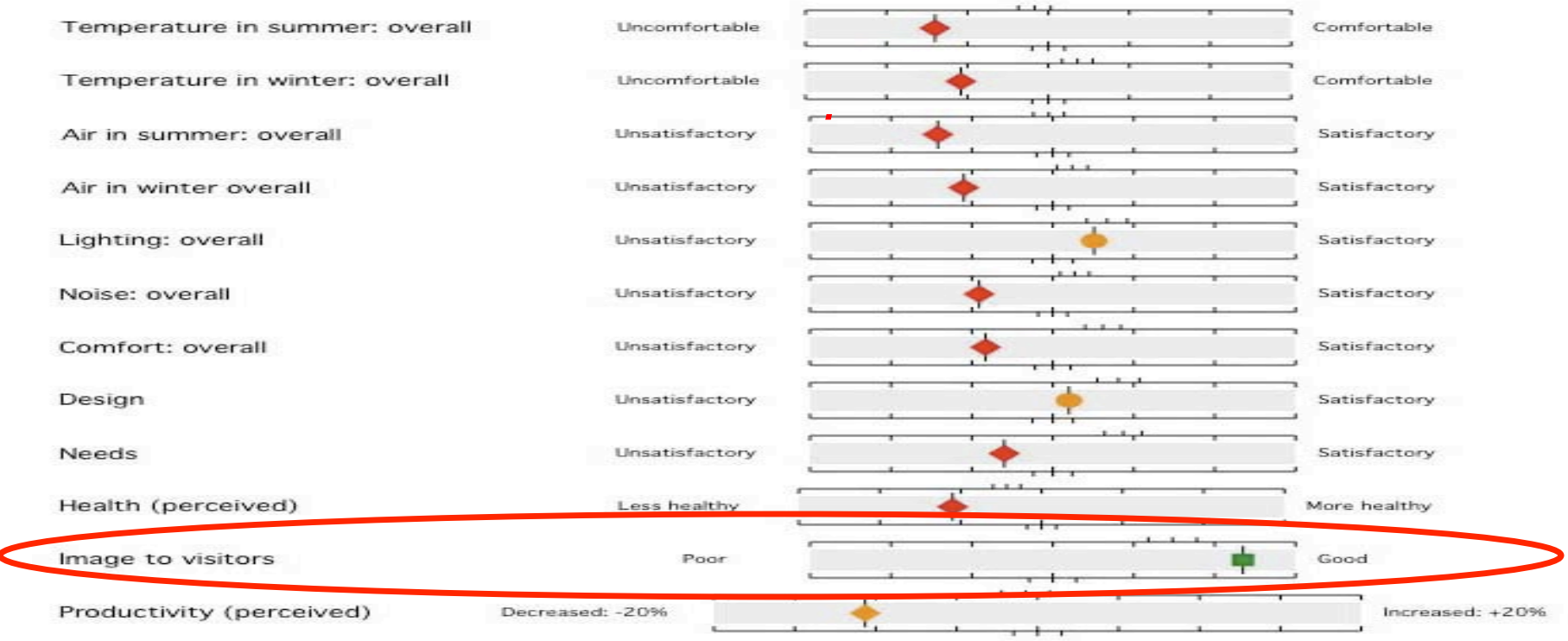
The gaps occur in housing too:
40 years after the 1973 oil crisis

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 only for energy: *occupant survey, multi-award-winning school*

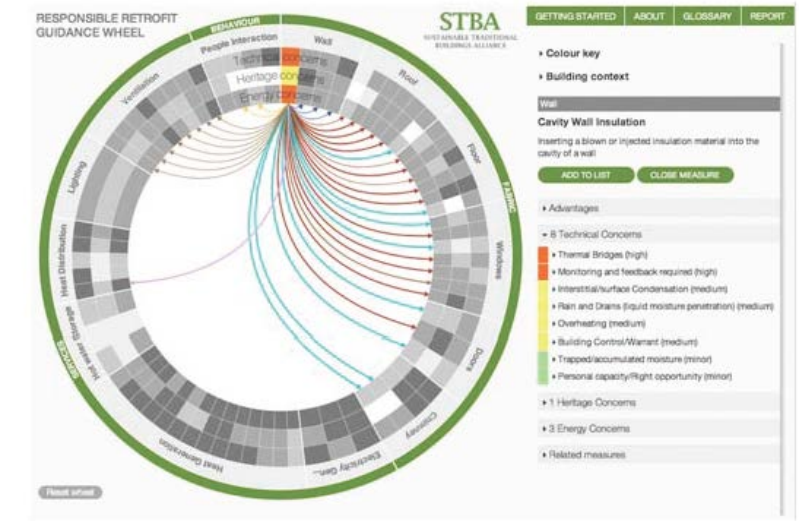
<< RED: below average *AMBER: Average* *GREEN: Above average >>*



" … 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

Why aren't designers and builders better tuned into outcomes?

"Any system without feedback is stupid." … AMORY LOVINS

- Not what clients or government have asked them to do: *"hand over and walk away" is systemically embedded in standard procedures and contracts, so follow-through is not part of the standard offering*.
- The industry and the associated professions didn't fill the vacuum created while central and local government progressively outsourced its technical expertise, research and performance feedback work.
- The policy emphasis has been on construction, not performance in use, *even when feedback information has been revealing problems.*
- Government has often preferred to bury any bad news, *or go contractual, seeking to blame rather than to learn.*
- Rigid divisions between funding of capital and operational costs – *getting worse if anything, in spite of all the talk.*
- "Post-Occupancy Evaluation" (POE) is a construction industry perspective, with handover seen as the end, not the beginning!

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.

… but in 1972 the RIBA removed Stage M from its publication *Architect's Appointment.*

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

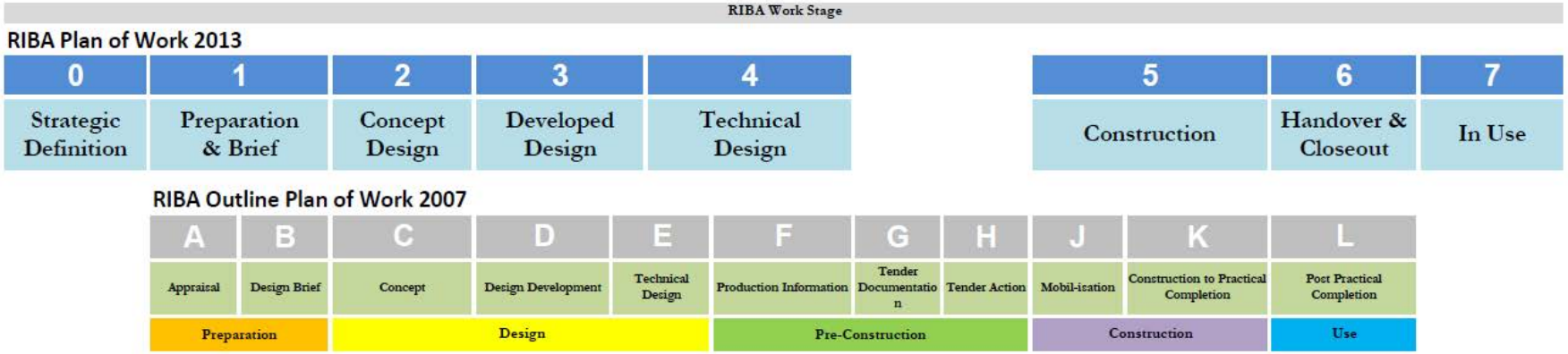


Fig 1. RIBA Plan of Work 2013 compared with RIBA Outline Plan of Work 2007

***For the practitioners here**, do you follow through from design into operation and feed back the insights?*

***For teachers**, how much building evaluation do students do?*

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

And why does the spreadsheet that accompanies the RIBA Plan of Work 2013 allow sustainability to be switched off ?

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

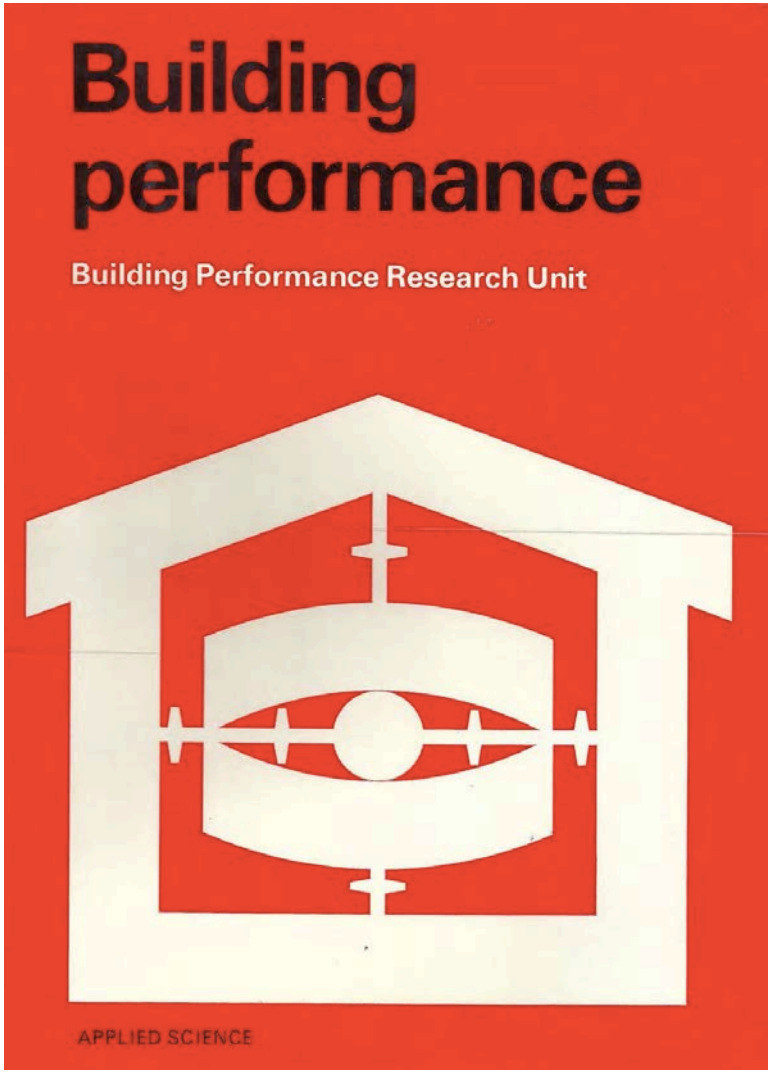
2

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, professions emerged to help ensure fairness and protect public interest.
- In the 1920s, and as building was becoming more science-based, 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 other 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 they were useful sources of guidance and feedback.*

In the late 1960s, building performance evaluation started in some universities



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 industry support (this was the same year RIBA abandoned Stage M).

"*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)

In the 1970s and 80s, the tide also turned in government …

- Widespread disruption and disillusionment in the 1970s.

- The ascendancy of ideas about free markets, competition and choice; and a *de facto* inefficient public sector.
- Professionals being seen as an elitist conspiracy against the public, and becoming treated as just another business.
- The Rothschild Report 1972, advocated a customer-contractor relationship for government applied research.
  But where are the intelligent customers now?

- Following the oil crises, good work was done on energy performance through government programmes and private efforts, *but …*
- the energy demonstration programme was technically focused, and tended to look for shining examples *and to bury bad news.*

"Few things are harder to put up with than the annoyance of a good example" … MARK TWAIN

Subsequently, the government disconnected many of its feedback loops about building performance

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

"Missing feedback is a common cause of system malfunction" … DONELLA MEADOWS

Some examples:

- Property Services Agency
- Central Electricity and British Gas Research Laboratories
- Research and technical units in Ministries
- Central and local government design and works departments
- Building Research Establishment
- Energy Efficiency Best Practice programme
- Partners in Innovation research programme

  but from 2010 we have had work by the Technology Strategy Board

Dismemberment of the Department of the Environment 1997-2002

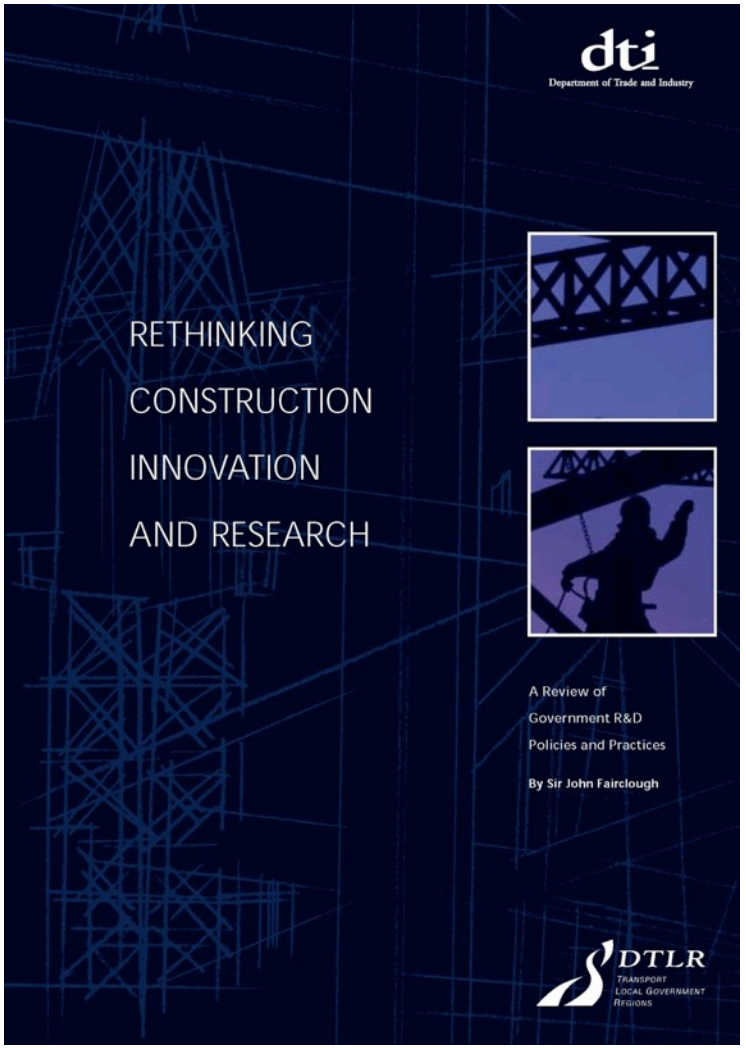
WHERE IS THE INSTITUTIONAL MEMORY?

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.

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

RETHINKING CONSTRUCTION

THE REPORT OF THE CONSTRUCTION TASK FORCE

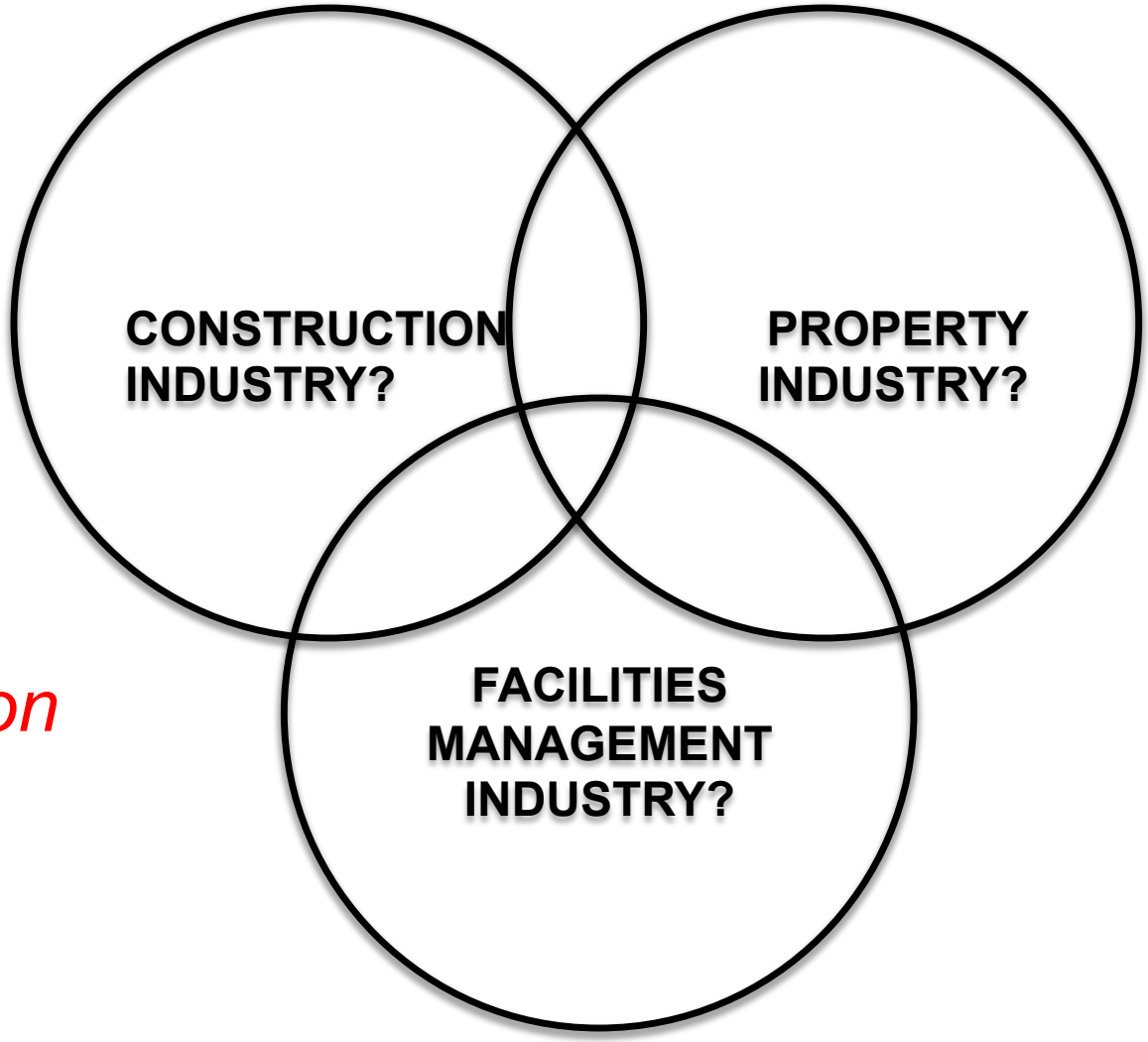


REFERENCES: The Egan Report (DTI, 1998), the Fairclough Report (DTI and DTLR, 2002)

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!



This is just one of many category errors:
seeking answers in the wrong places

- The construction industry understands building performance.
  ***No**, it designs, builds & alters buildings. It doesn't follow through.*
- The energy supply industry understands the demand side.
  ***No**, it just supplies the energy and wants to make money.*
- Markets and regulations will solve the problems.
  ***No**, it also needs integration, insight, leadership and judgment.*
- Improvement is about capital investment.
  ***No**, it is more about commitment and management.*
- Innovation in buildings is all about new technology.
  ***No**, it is about bringing people, processes and things together.*
- Better energy efficiency will always decrease overall energy use.
  ***No**, this creates a risk of rebounds (e.g. Jevons Paradox). The social goal should be saving: we can't transform the system by stealth.*
- Statistics, databases and "big data" will tell us all we need to know.
  ***No**, we need the stories and insights, tacit knowledge, not just data.*

Onto the bonfire? *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)

AND MUCH EARLIER …

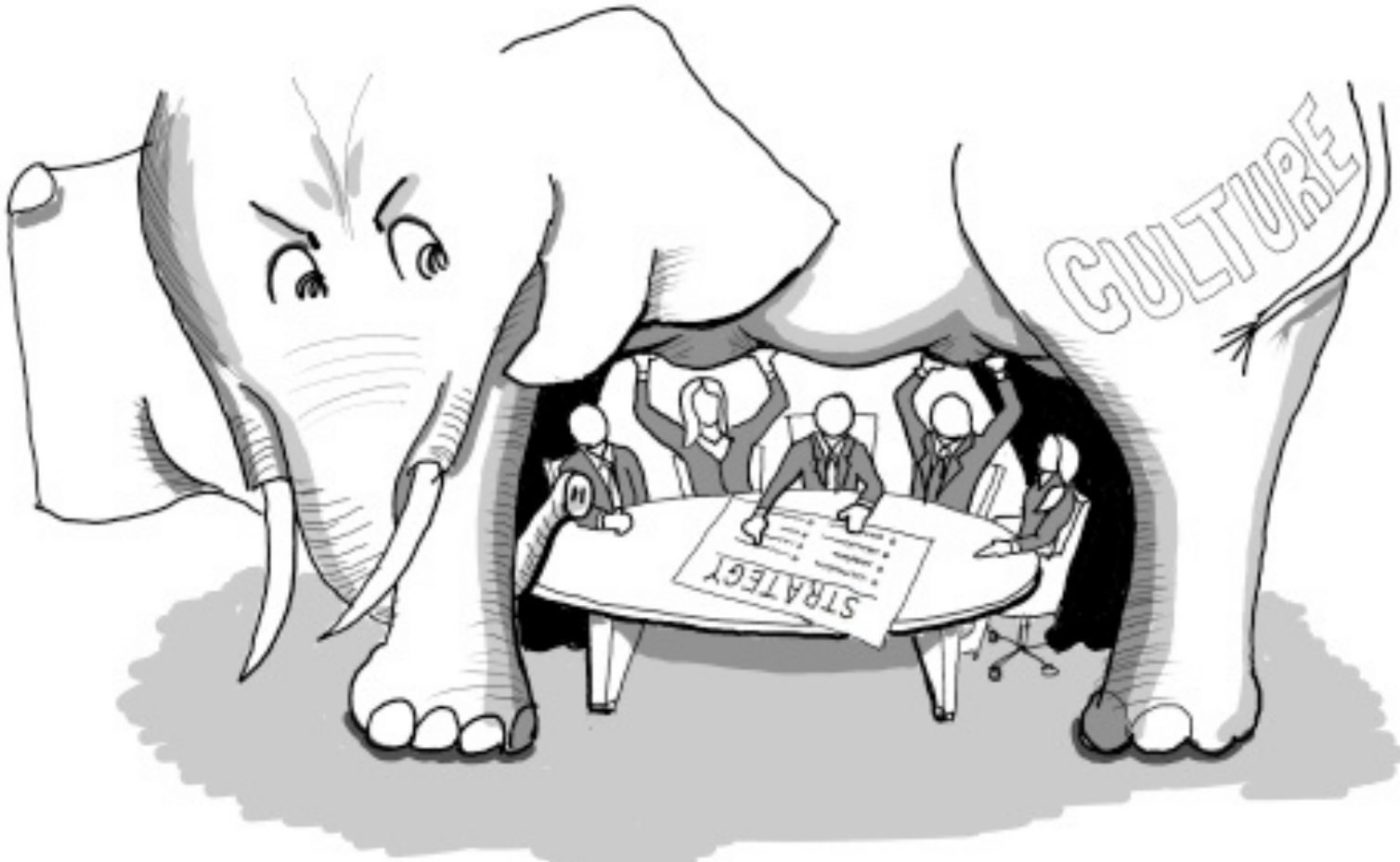
"The English will spare no expense to get something on the cheap." NIKOLAUS PEVSNER (circa 1960)

How do we maintain the chain of progress?

Where are the disinterested professionals?

SOURCE: John Ashton, former FCO Climate Spokesman, RSA Lecture (16 May 2013)

A societal problem: *The elephant isn't in the room, IT IS THE ROOM!*



Where is the public interest infrastructure that can focus all players on improving building performance in use?

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

3

WHAT WAS I UP TO WHILE THIS WAS HAPPENING?

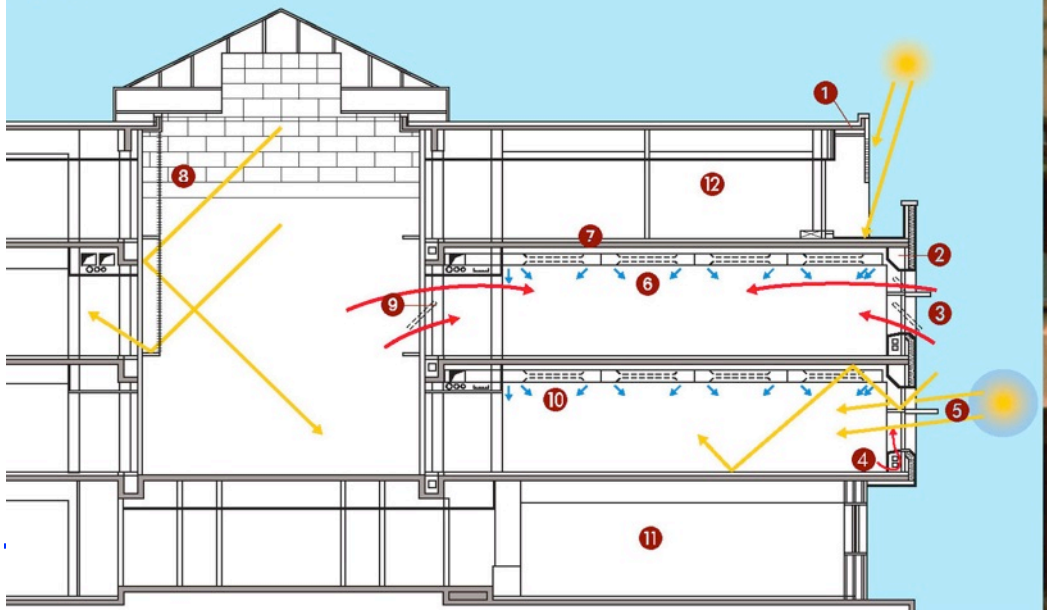
1972-84, in a multi-skilled design office

NFU Mutual and Avon Group HQ, mixed-mode head office, completed 1983, designed when at RMJM
Refurbished by others, 2006, without adding air conditioning. *© Building Services Journal*

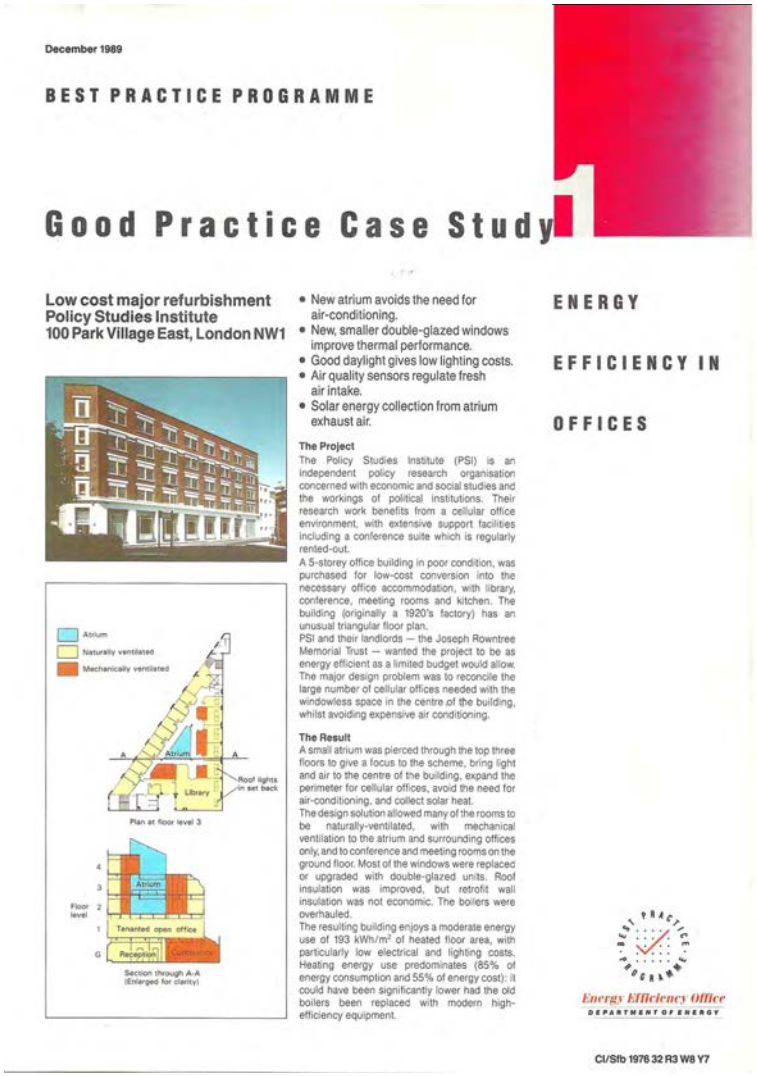
FIGURE 1: Section through the building's south side showing the main office floors and courtyard

Original design features

1. Overhang for solar control
2. Splayed reveals for glare control
3. Double-glazed windows with mid-pane blinds that are openable for summer ventilation
4. Perimeter radiators with thermostatic radiator valves
5. Light shelves to reduce glare and throw daylight deep into the space
6. Multiservices beams incorporating fresh air delivery, lighting, lighting control and smoke detectors
7. Heavyweight exposed structure to utilise thermal mass
8. External electrical solar control blinds in exposed positions



1985-88 review of demonstration projects 1988-91 office case studies etc.



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 rented-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.

Atrium
Naturally ventilated
Mechanically ventilated
Atrium
Roof lights in set back
Library
Plan at floor level 3
Floor level
Atrium
Tenanted open office
Reception
Conference
Section through A-A (Enlarged for clarity)

Energy Efficiency Office
DEPARTMENT OF ENERGY

CI/SfB 1976 32 R3 W8 Y7

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

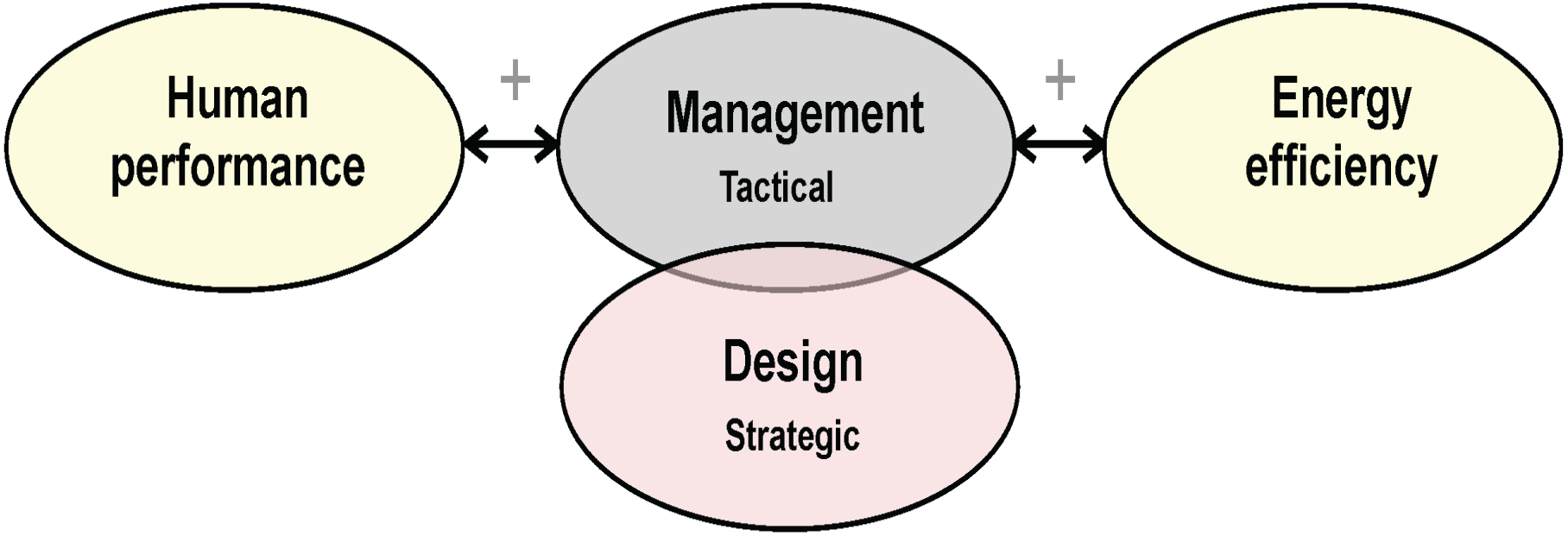
Case Study 1 performed well in terms of its energy use, particularly electricity.

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 out opportunities to combine occupant and energy surveys.

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

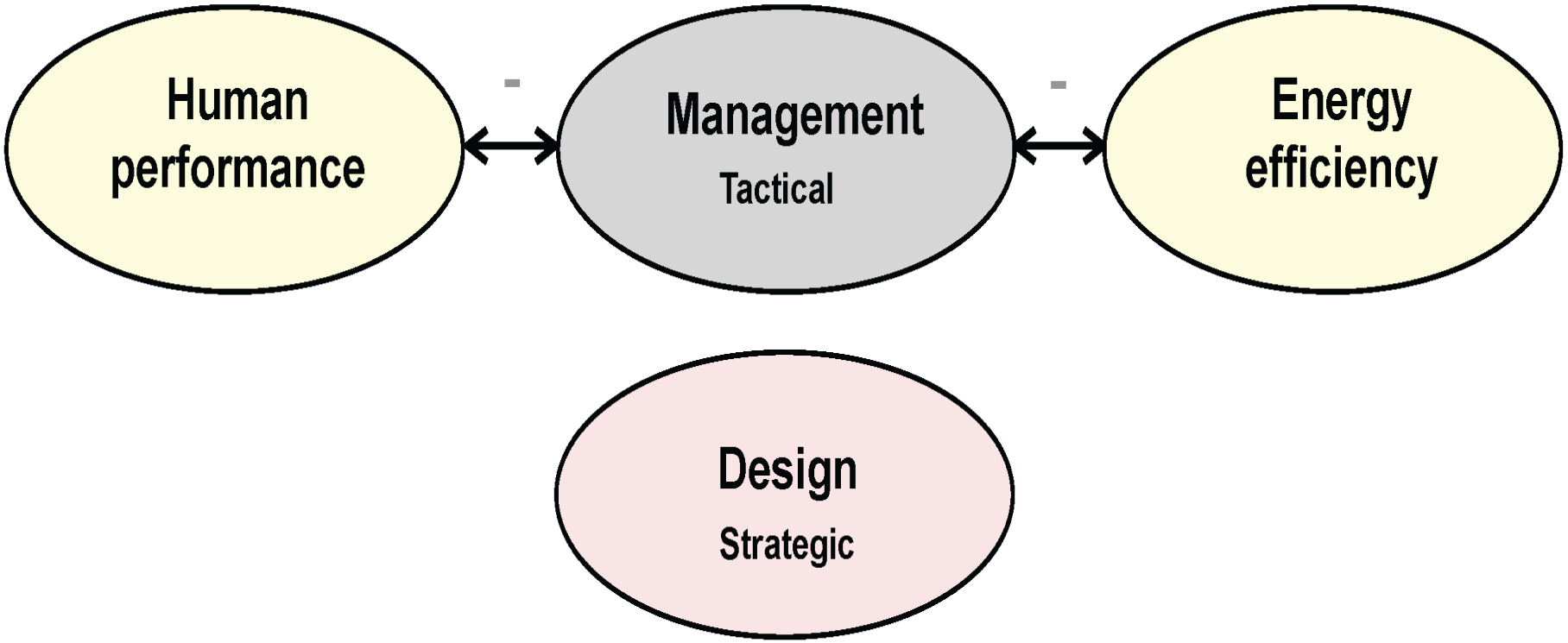
Where good things happened …
associations of low energy with happy occupants



The better-performing buildings tended to be those 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*.

We encouraged people to brief and design for usability and manageability

Physical variables

A **Fit and forget** *Make invisible*	**B** **Implement and manage** *Make usable*
Make habitual **Implement and internalise** **C**	*Make acceptable* **Risk, freedom and robustness** **D**

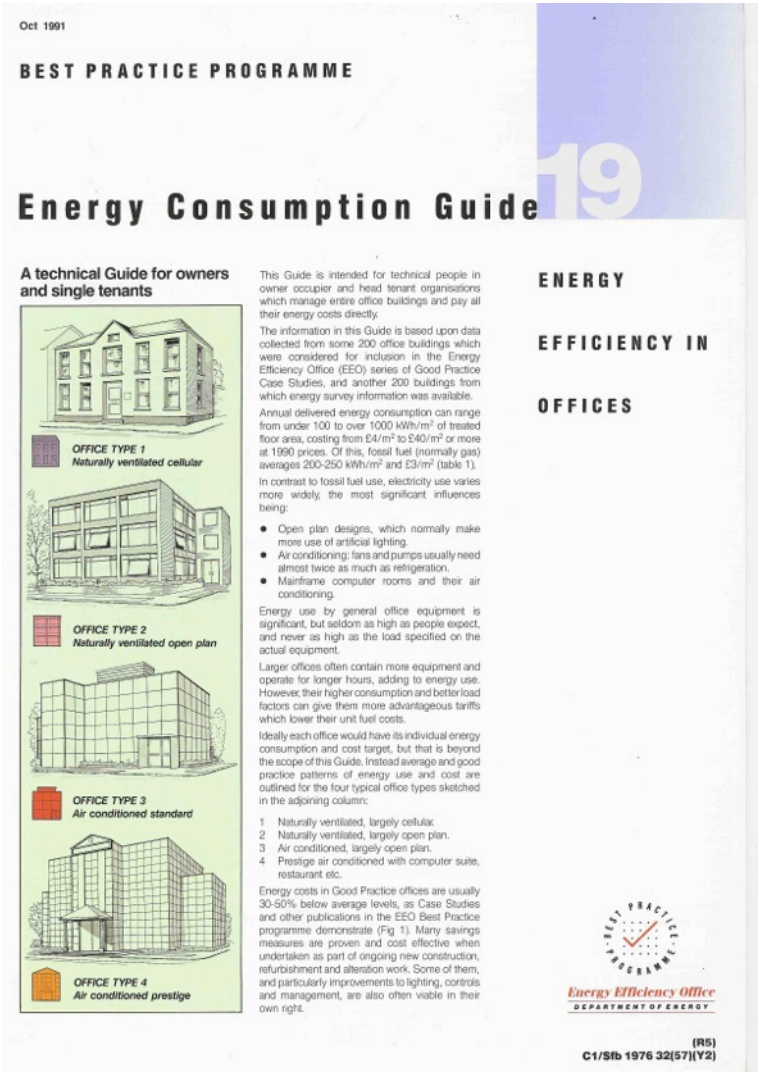
Context-free

Context-dependent

Behavioural variables

SOURCE: After W Bordass and A Leaman, *Design for manageability,* BR&I, **25** (3) 148-157 (May/Jun 1997)

1991 Office Energy Consumption Guide *revised 1998*


Oct 1991

BEST PRACTICE PROGRAMME

19

Energy Consumption Guide

A technical Guide for owners and single tenants

ENERGY EFFICIENCY IN OFFICES

This Guide is intended for technical people in owner occupier and head tenant organisations which manage entire office buildings and pay all their energy costs directly.

The information in this Guide is based upon data collected from some 200 office buildings which were considered for inclusion in the Energy Efficiency Office (EEO) series of Good Practice Case Studies, and another 200 buildings from which energy survey information was available.

Annual delivered energy consumption can range from under 100 to over 1000 kWh/m² of treated floor area, costing from £4/m² to £40/m² or more at 1990 prices. Of this, fossil fuel (normally gas) averages 200-250 kWh/m² and £3/m² (table 1).

In contrast to fossil fuel use, electricity use varies more widely, the most significant influences being:

- Open plan designs, which normally make more use of artificial lighting.
- Air conditioning: fans and pumps usually need almost twice as much as refrigeration.
- Mainframe computer rooms and their air conditioning.

Energy use by general office equipment is significant, but seldom as high as people expect, and never as high as the load specified on the actual equipment.

Larger offices often contain more equipment and operate for longer hours, adding to energy use. However, their higher consumption and better load factors can give them more advantageous tariffs which lower their unit fuel costs.

Ideally each office would have its individual energy consumption and cost target, but that is beyond the scope of this Guide. Instead average and good practice patterns of energy use and cost are outlined for the four typical office types sketched in the adjoining column:

1 Naturally ventilated, largely cellular.
2 Naturally ventilated, largely open plan.
3 Air conditioned, largely open plan.
4 Prestige air conditioned with computer suite, restaurant etc.

Energy costs in Good Practice offices are usually 30-50% below average levels, as Case Studies and other publications in the EEO Best Practice programme demonstrate (Fig 1). Many savings measures are proven and cost effective when undertaken as part of ongoing new construction, refurbishment and alteration work. Some of them, and particularly improvements to lighting, controls and management, are also often viable in their own right.

OFFICE TYPE 1
Naturally ventilated cellular

OFFICE TYPE 2
Naturally ventilated open plan

OFFICE TYPE 3
Air conditioned standard

OFFICE TYPE 4
Air conditioned prestige

Energy Efficiency Office
DEPARTMENT OF ENERGY

(R5)
C1/Sfb 1976 32(57)(Y2)

Consumption Guide 19 was based on case studies and related information.

This permitted transparency between annual fuel and electricity consumption totals and individual energy end-uses.

The approach allowed development of “tailored benchmarks” for any building.

The Energy Best Practice programme planned to develop a tailored approach to energy benchmarking for all sectors.

The Carbon Trust took over this programme in 2001, *but it was not interested in benchmarking, so missed the opportunity to build infrastructure.*

ACKNOWLEDGEMENT: 1998 revision with John Field and input from BRE

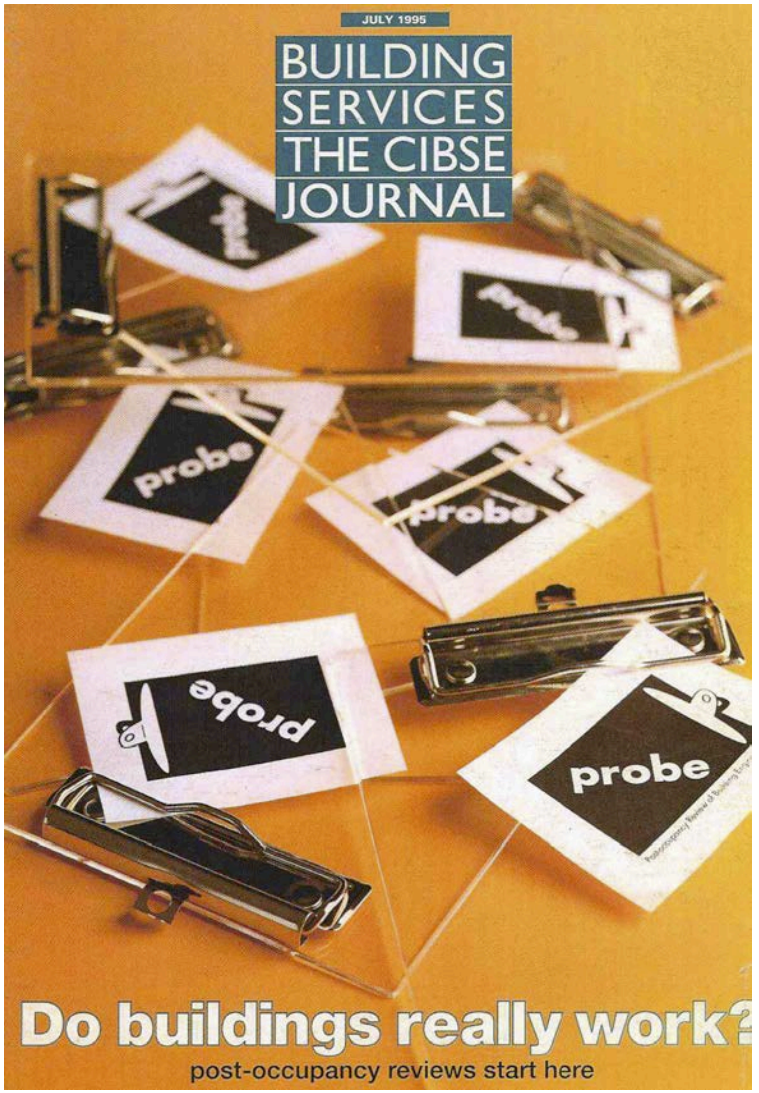
Probe: 20 published Building Evaluations *in Building Services Journal* 1995-2002

- Review of design intent and site documentation.
- Technical survey (walk-through and spot checks).
- Energy survey with CIBSE TM22.
- Envelope pressure test *(in Probes 2 and 3).*

- Occupant questionnaire survey.
- Management interviews.
- Designers' response.

- Extensive technical report
- Editing to 6-page article.

UK Government funding: DOE, then DETR, then DTI
TEAM: BSJ, HGa then ESD, BUS, WBA, TES
Rod Bunn, Paul Ruyssevelt, Adrian Leaman, Robert Cohen, Bill Bordass, Mark Standeven, John Field



Some general conclusions *from the Probe surveys (1995-2002)*

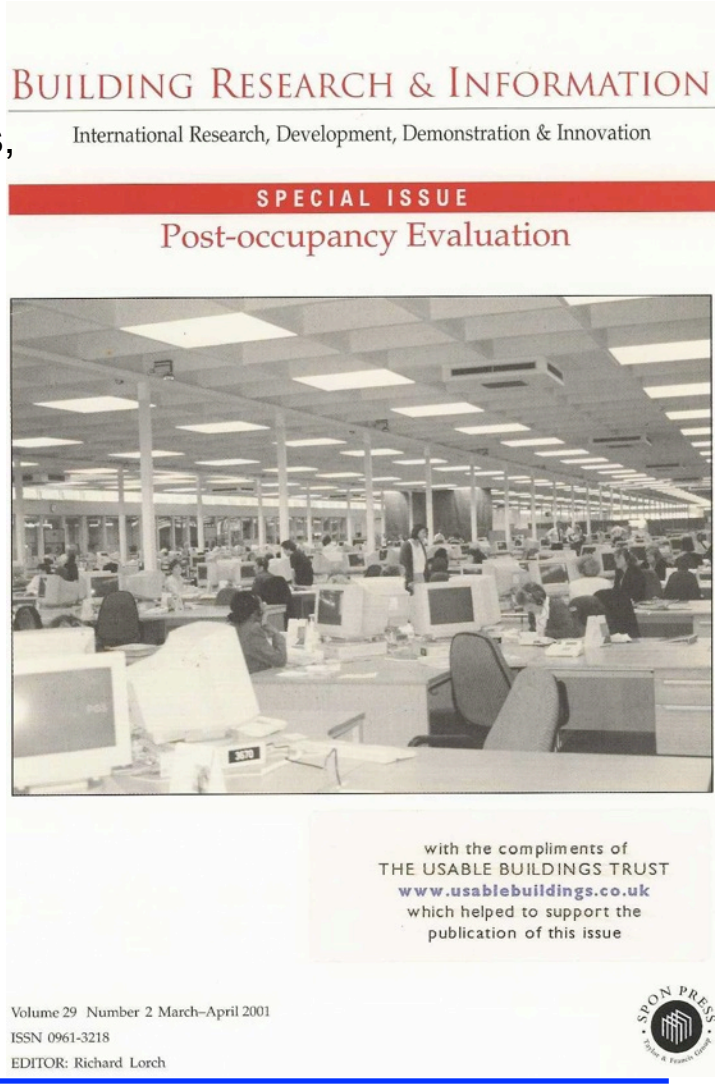
Good buildings, but recurrent problems:

- **Interfaces** between work packages.
- **Control systems**, management and user interfaces, system and management responsiveness.
- **Handover processes**, with insufficient preparation and little follow-through into occupancy.

- **User dissatisfaction** with environment, noise, and unwanted interruptions.
- **Energy use often much higher** that anticipated, *e.g. with far to much defaulting to ON or wasteful*.
- **Unmanageable complication**, once mostly in deep air conditioned buildings, was migrating into green buildings, with damaging results.

Some of the lessons:

Design intent needs to be clear.
Basic, essential features are often absent.
Keep things as simple as practicable and do them well.
Take account of unintended consequences.
Manage expectations to avoid credibility gaps between expectations and outcomes.



SOURCE: Overview published in a Special Issue of *Building Research & Information*, **29** (2), 179-174 (March-April 2001).

Technology - management interactions:

Strategic conclusions from the Probe studies of public and commercial buildings in use, 1999.

		Technological complexity	
		More	**Less**
Building management input	**More**	*Type A* ***High Performance***	***Will ordinary people be able to look after them?***
		Big danger, especially for public buildings	***Simple, well integrated*** ***Sense and Science*** *Type B*

Type A *can be fragile*
Seek more Type B
(and possibly Type D)
Avoid Type C -
unmanageable complication.

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

2002: since government was tuning out, *we set up a charity to help represent performance in use*

Usable BUILDINGS ... for feedback and strategy

... from the Usable Buildings Trust

- Password
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- One-liners
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New Professionalism

Soft Landings

Responsible Retrofit

Usable Buildings is a free resource for practitioners, managers, building owners, developers, students and anyone else who wants to make buildings more suitable for the people who use them, less damaging to the natural environment and a better long-term investment. Usable Buildings is run by the Usable Buildings Trust.

The Usable Buildings Trust is a UK educational charity, dedicated to improving the performance of buildings in use. We try to understand how buildings actually work in practice, and create a feedback loop from in-use performance to improved delivery by the organisations that can make a difference. We were set up in 2002, because buildings policy and research was becoming too focused on construction, and doing little on performance in operation in the hands of their users. UBT spreads findings through its website, user groups, collaborative working and input to postgraduate courses. UBT is also a home for approaches which are not quite ready for widespread application and an incubator for their development. Aims Background

Who we are and what we do: Trustees' Report summarises activities and plans. What Do We Do?

Latest posted: RIBA CPD sessions | A New Professionalism? Summary of Debate | Usability of Control Interfaces in Low-carbon Housing | A New Professionalism: remedy or fantasy? | Evaluating Housing Performance | Responsible Retrofit of Traditional Buildings |The Building Performance Sketch | Test Of Time | Even Bad News Can Be Beneficial |Built Environment Professionals in the UK: 40 years back; 40 years on. |

Topical Oldies: Architecture, Science and Feedback | Building In Ignorance. Demolishing complacency: improving the energy performance of 21st century homes | Strategies For Better Occupant Satisfaction

Basics: POE and Feedback: Getting Started | Probe 9 | A Guide to Feedback and Post-Occupancy Evaluation |

One liners: "We are like tenant farmers chopping down the fence around our house for fuel when we should be using Nature's inexhaustible sources of energy — sun, wind and tide ... I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that." Thomas Edison (1931). | "My heart was bigger than my head." Ray Gosling | "The things to do are: the things that need doing, that you see need to be done, and that no one else seems to see need to be done." Buckminster Fuller | "What we want is a quiet life except when there are problems, when we want good information quickly." Ian Walmsley | "This is a very, very bad question." Renzo Piano | More

Hosting : We host the Feedback Portfolio: Techniques and the Probe archive.

Support : We developed and support Soft Landings.

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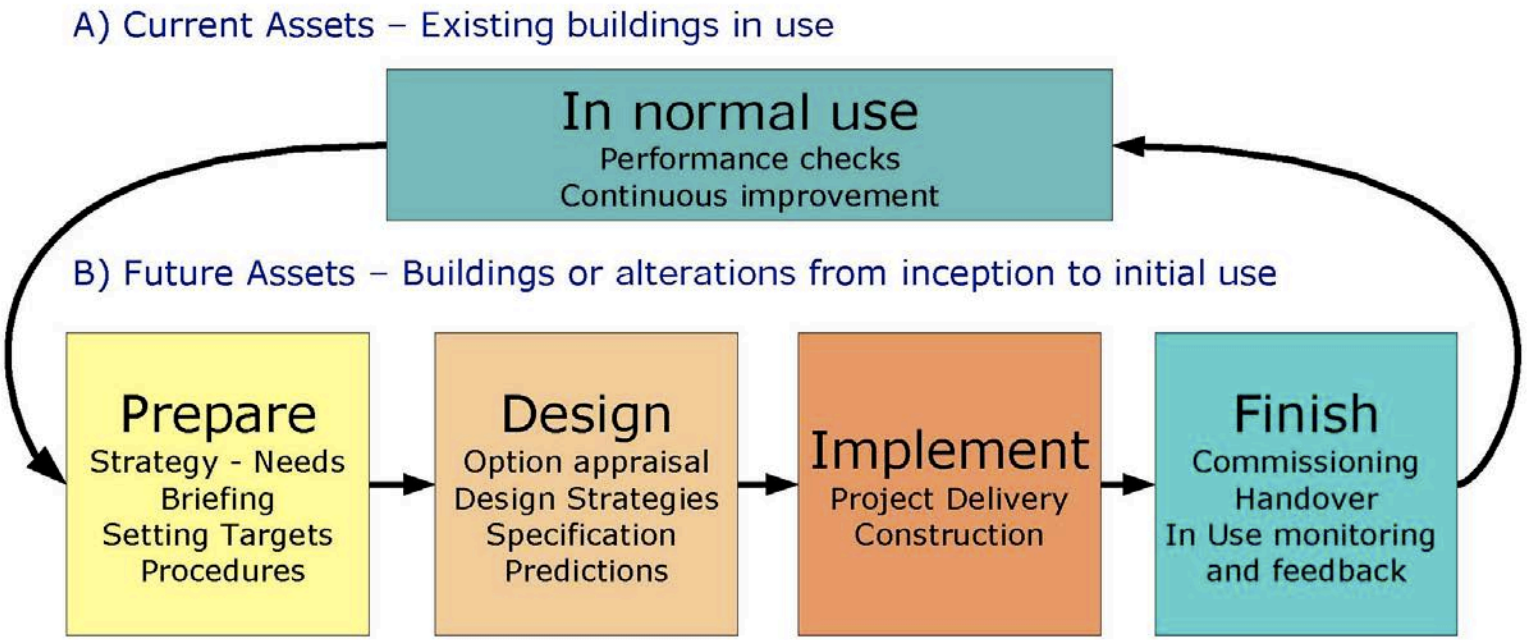
www.usablebuildings.co.uk

Seeking to close the loop, to make follow-through, feedback and learning routine



You can review performance at all stages in the life cycle

FORESIGHT: Before you do something new *(existing situation and analogues)*
INSIGHT: At any time *(reality checking, managing expectations)*
HINDSIGHT: After you've completed a project *(learning and fine tuning)*

SOURCE of hindsight-foresight-insight classification: D Bartholomew, *Building on Knowledge,* Wiley-Blackwell (2008).

Some things the Usable Buildings Trust has been doing

Raising awareness of building performance in use:

- Seeking to make building evaluation and feedback routine.
  But we got a surprise when we worked with large clients.
- Drawing attention to the gaps between intentions and outcomes.
- Providing information and bringing people together.

Helping to make energy performance visible:

- Advocating Display Energy Certificates (DECs) based on actual energy use *and helping to demonstrate how they could be implemented.*
- Developing a Landlord's Energy Statement to assist DECs in commercial buildings, *for which DECs sadly are not yet mandated.*

Encouraging client, design & building teams to focus on outcomes:

- Advocating a *New Professionalism* for the building professions.
- Helping to develop *Soft Landings,* to improve the focus of all building procurement processes on performance in use.

But we have had limited success: *complication has burgeoned in the same period*

- 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

Insights on housing provided by Prof F Stevenson, Sheffield University, Z Grant, Eng D, Bristol University and others.

… so the generic conclusions from the 1990s work continue to echo in more recent studies

2006-10 LOW CARBON BUILDINGS PROGRAMME

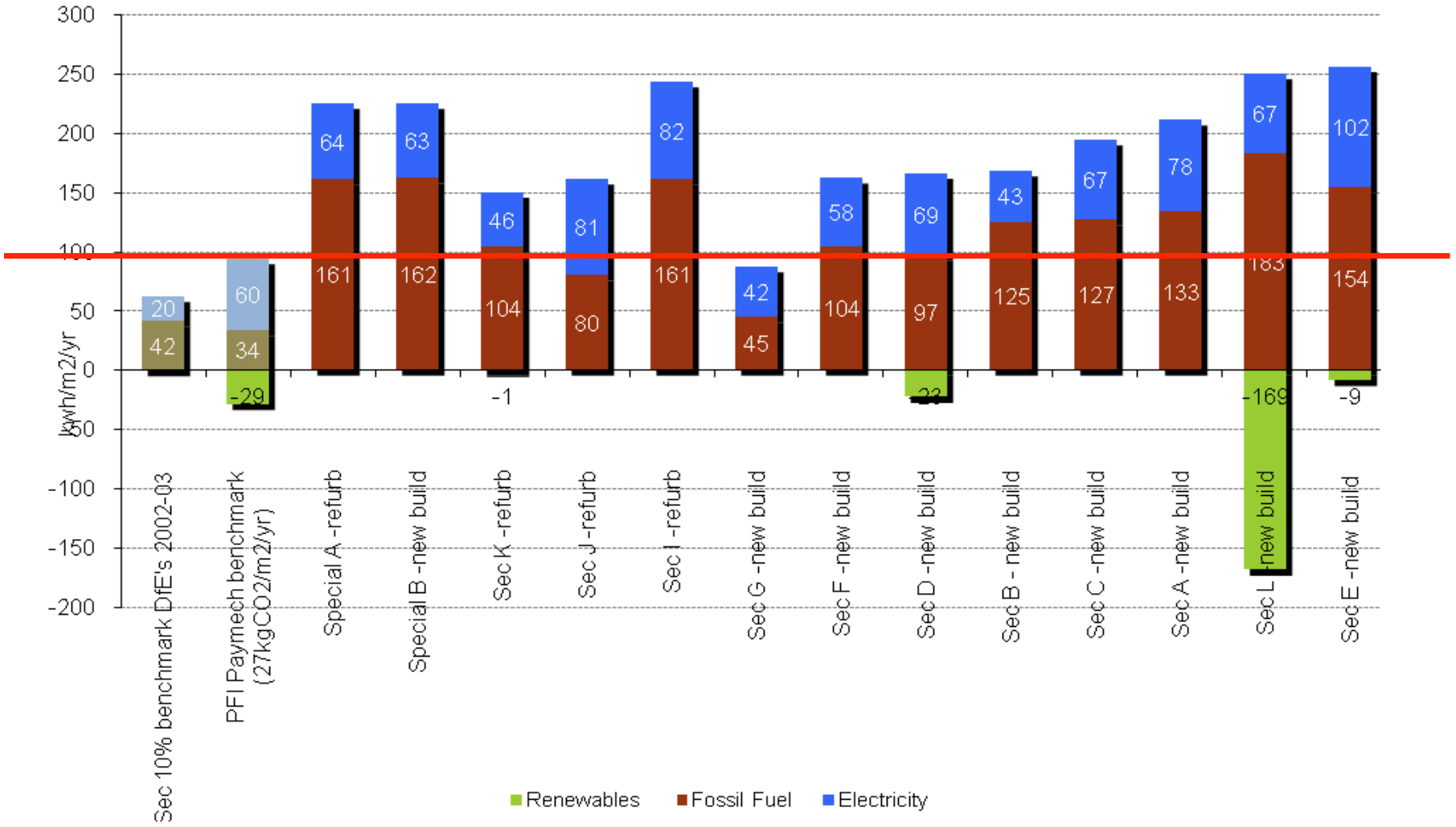
- Basics still not right, e.g. fabric performance.
- Even more complicated systems, *including renewables.*
- Complicated, unusable controls, *now even in simple buildings.*
- Poor commissioning, handover and follow-through.

2011-15 TSB BUILDING PERFORMANCE EVALUATION

Similar results seem to be emerging, with the same weak links, plus:

- Unsuitable procurement processes.
- Dysfunctional sub-metering systems. MVHR in housing.
- Systems that weren't really needed *(partly the result of conservative reactions to performance specifications).*
- Poor communication and benchmarking of intended performance.
- But some relative successes too.

Energy use in new secondary schools …
more renewable energy, but less efficient?



SOURCE: Partnerships for Schools, 2011

4

WHERE DO WE NEED TO BE?
HOW MIGHT WE GET THERE?

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 in the hope that building performance will improve …?

Why are we doing things the long way round?

Why is actual performance the hole in the middle?

Places to intervene in a system
after Donella Meadows

10. Parameters, standards, targets.

HANG ON A MOMENT … WE NEED TO CHANGE THE GAME !

SOURCE: Adapted from Donella Meadows, *Places to intervene in a system,* Whole Earth (Winter 1997).

Places to intervene in a system
after Donella Meadows

1. The underlying mindset or paradigm. *But is it appropriate?*
2. How are goals set? *And by and for whom? Are contradictions highlighted?*
3. Are they actually met? *And compromises identified?*

4. What skills and resources are required to meet them?
   Are they realistically available over time? Scope for self-organisation?
5. What rules and constraints emerge in the particular context?
   Scope, boundaries, degrees of freedom. And who sets the rules?
6. What are the required information flows?
   e.g. what feedback is needed and how can it get leverage in the population?

7. What are the positive / 'virtuous' feedback processes?
   Promoting things that make significant improvements to the system.
8. What are the negative / 'vicious' feedback processes?
   Avoiding things that lead to chronic, and more seriously, acute, failures.
9. What are the stocks (people, energy, goods) and flows in the system?
   Where are the buffers, constraints and bottlenecks?

10. **Parameters, standards, targets.**

So why does so much activity occur at Level 10, and not question the context?

SOURCE: Adapted from Donella Meadows, *Places to intervene in a system,* Whole Earth (Winter 1997).

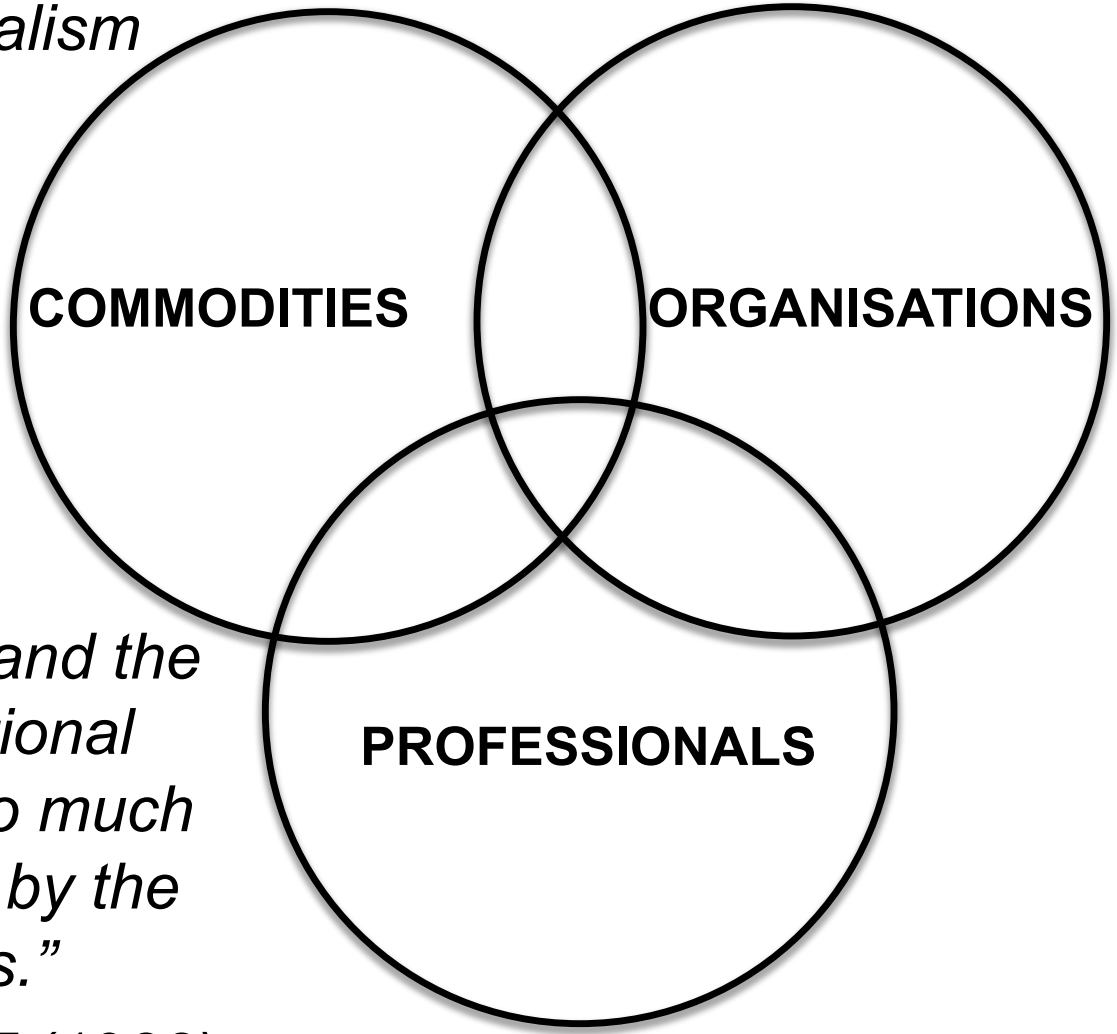
How societies structure expertise

"At present, professionalism seems to hold its own.

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

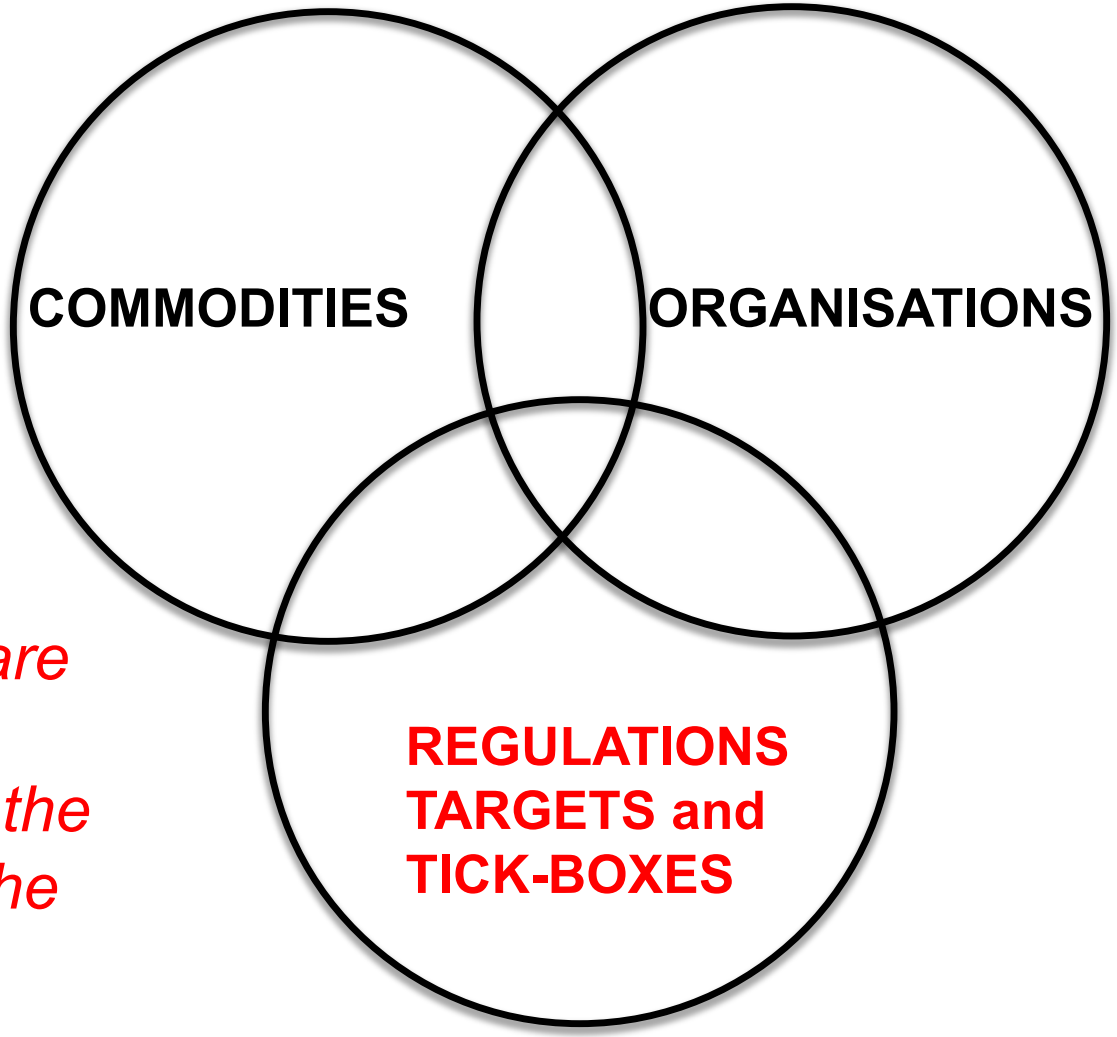
new hiring patterns … and the loose form of organisational professionalism point to much weaker control of work by the professions themselves."

ABBOTT (1988)



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

Where we seem to be now 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 complex moral and ethical dilemmas

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

It needs vision, imagination, reflection and commitment: *what professionals are supposed to be for!*

“[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

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

Re-asserting the proper role of the building professional

- Many construction-related institutions require their members to understand and practice sustainable development.
- How can they 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 …
- **in other words, not acting in a fit manner for a professional ! ***
- And are they getting the right institutional and educational support?

SO WHY NOT?

- Change attitudes to the nature of the job and procurement routes.
- Re-define perceptions of the professional's role, to follow-through properly and to engage with outcomes.
- Close the feedback loop – rapidly and effectively.
- Make much more immediate, direct and effective links between research, practice and policymaking.

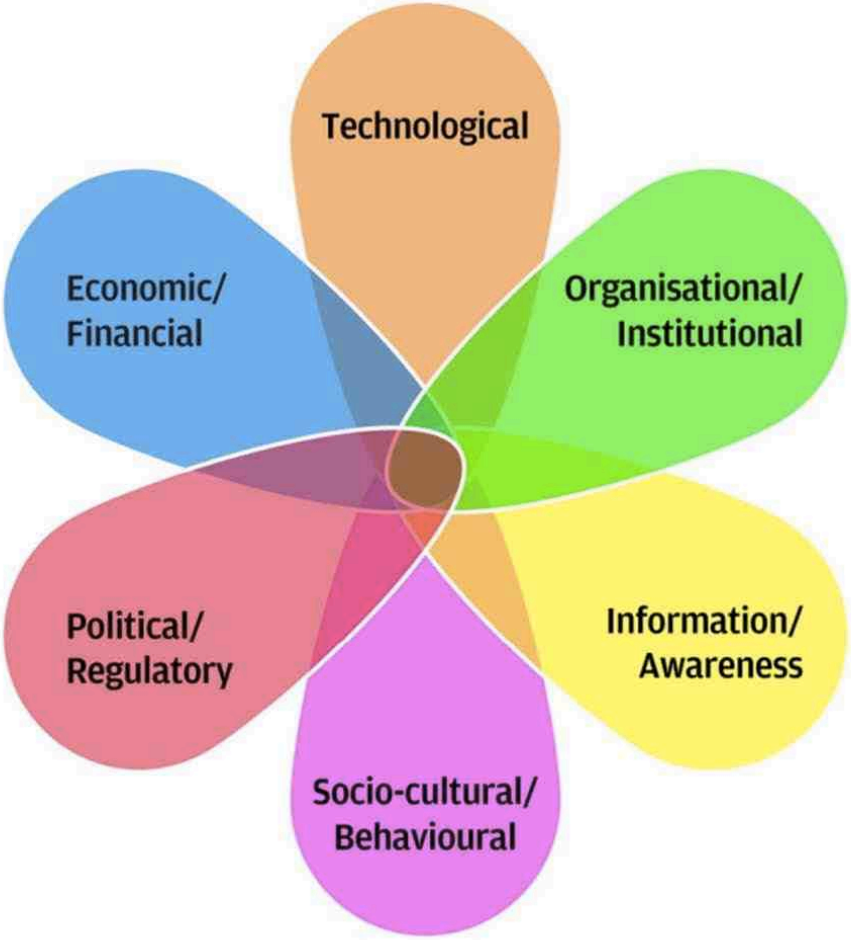
* see Royal Academy of Engineering and Engineering Council, *Statement of Ethical Principles.*

Energy Efficiency in the Built Environment *(EEBE - Cambridge)* Barrier Categories

… and that's just for energy!

So many barriers to surmount …

what could we do that could enable people to come together in the middle, quickly?



SOURCE: Cambridge Centre for Sustainable Development, *Barriers to energy efficiency in the built environment* (2012)

Climate change: *a* ***super-wicked problem***

K Levin, B Cashore, S Bernstein & G Auld (2012)

CHARACTERISTICS:

- Time is running out.
- Those who seek to provide a solution also cause the problem.
- Central authority is weak or non-existent.
- Policy responses discount the future irrationally.

RESULT: A POLICYMAKING TRAGEDY

THEIR DIAGNOSIS:

- Trigger ***sticky interventions*** that *by progressive incremental trajectories*
- ***entrench support*** over time, while
- ***expanding*** the population they cover.

Or in other words:

PROMOTE VIRTUOUS CIRCLES OF PROGRESSIVE IMPROVEMENT

SOURCE: K Levin et al, *Overcoming the tragedy of super-wicked problems,* Policy Science **45**, 123-152 (2012)

UBT's proposed **sticky interventions**:
seeding things with potential to snowball over time

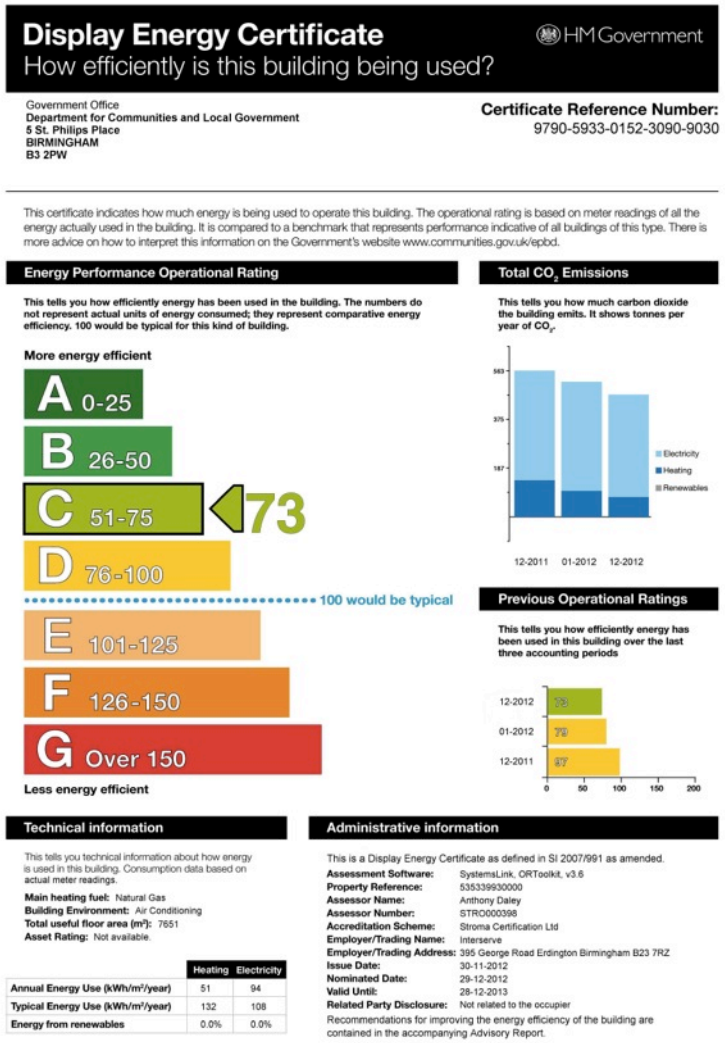
Cultural adaptations, not just
"technical innovations" and "managerial solutions"

1. MAKE IN-USE PERFORMANCE CLEARLY VISIBLE
In ways that motivate people to strive to improve it.

2. REVIEW PROFESSIONAL ETHICS and PRACTICES
Help building-related professionals work in the public interest and engage properly with outcomes.

3. CONSOLIDATE THE KNOWLEDGE DOMAIN
Develop building performance as an independent knowledge domain, with the authority to inform practice and policymaking.

STICKY 1. Make performance visible
Display Energy Certificates were a start



Display Energy Certificate
How efficiently is this building being used?

HM Government

Government Office
Department for Communities and Local Government
5 St. Philips Place
BIRMINGHAM
B3 2PW

Certificate Reference Number:
9790-5933-0152-3090-9030

This certificate indicates how much energy is being used to operate this building. The operational rating is based on meter readings of all the energy actually used in the building. It is compared to a benchmark that represents performance indicative of all buildings of this type. There is more advice on how to interpret this information on the Government's website www.communities.gov.uk/epbd.

Energy Performance Operational Rating

This tells you how efficiently energy has been used in the building. The numbers do not represent actual units of energy consumed; they represent comparative energy efficiency. 100 would be typical for this kind of building.

More energy efficient

A 0-25
B 26-50
C 51-75 73
D 76-100
100 would be typical
E 101-125
F 126-150
G Over 150

Less energy efficient

Total CO_2 Emissions

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO_2.

Electricity
Heating
Renewables
12-2011 01-2012 12-2012

Previous Operational Ratings

This tells you how efficiently energy has been used in this building over the last three accounting periods

12-2012
01-2012
12-2011
0 50 100 150 200

Technical information

This tells you technical information about how energy is used in this building. Consumption data based on actual meter readings.

Main heating fuel: Natural Gas
Building Environment: Air Conditioning
Total useful floor area (m^2): 7651
Asset Rating: Not available.

	Heating	Electricity
Annual Energy Use (kWh/m^2/year)	51	94
Typical Energy Use (kWh/m^2/year)	132	108
Energy from renewables	0.0%	0.0%

Administrative information

This is a Display Energy Certificate as defined in SI 2007/991 as amended.

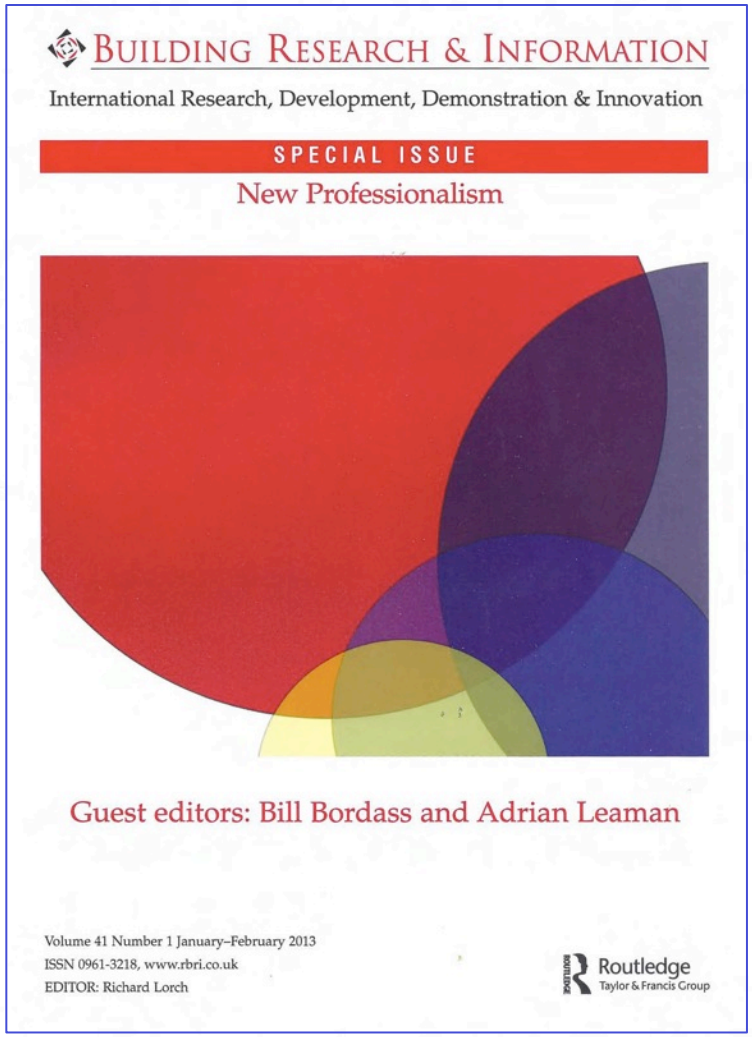
Assessment Software: SystemsLink, ORToolkit, v3.6
Property Reference: 53533930000
Assessor Name: Anthony Daley
Assessor Number: STRO000398
Accreditation Scheme: Stroma Certification Ltd
Employer/Trading Name: Interserve
Employer/Trading Address: 395 George Road Erdington Birmingham B23 7RZ
Issue Date: 30-11-2012
Nominated Date: 29-12-2012
Valid Until: 28-12-2013
Related Party Disclosure: Not related to the occupier

Recommendations for improving the energy efficiency of the building are contained in the accompanying Advisory Report.

- We already have DECs.
- In some cases *(as here)* they have been motivating improvement by management & focused investment.
- But they are poorly supported, their potential hopelessly under-realised:
  - *Not extended to private sector buildings, in spite of wide support, including CBI.*
  - *No government investment at all in developing the benchmarking.*
  - *Seem to be regarded by officials as a bureaucratic procedure, not THE window on performance, and a means of integrating many related activities.*

We need to build a solid technical infrastructure and contact point for development. Who will do it, as government doesn't see the need?

STICKY 2. Review professional ethics and practices, *starting with individuals*



PROVISIONAL LIST DEVELOPED WITH THE EDGE

ETHICS AND BEHAVIOUR:

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.

SOURCE: The Editorial of BR&I **41**(1), Jan-Feb 2013 can be downloaded at tandfonline.com/toc/rbri20/41/1#.UbBwiusawVs

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.

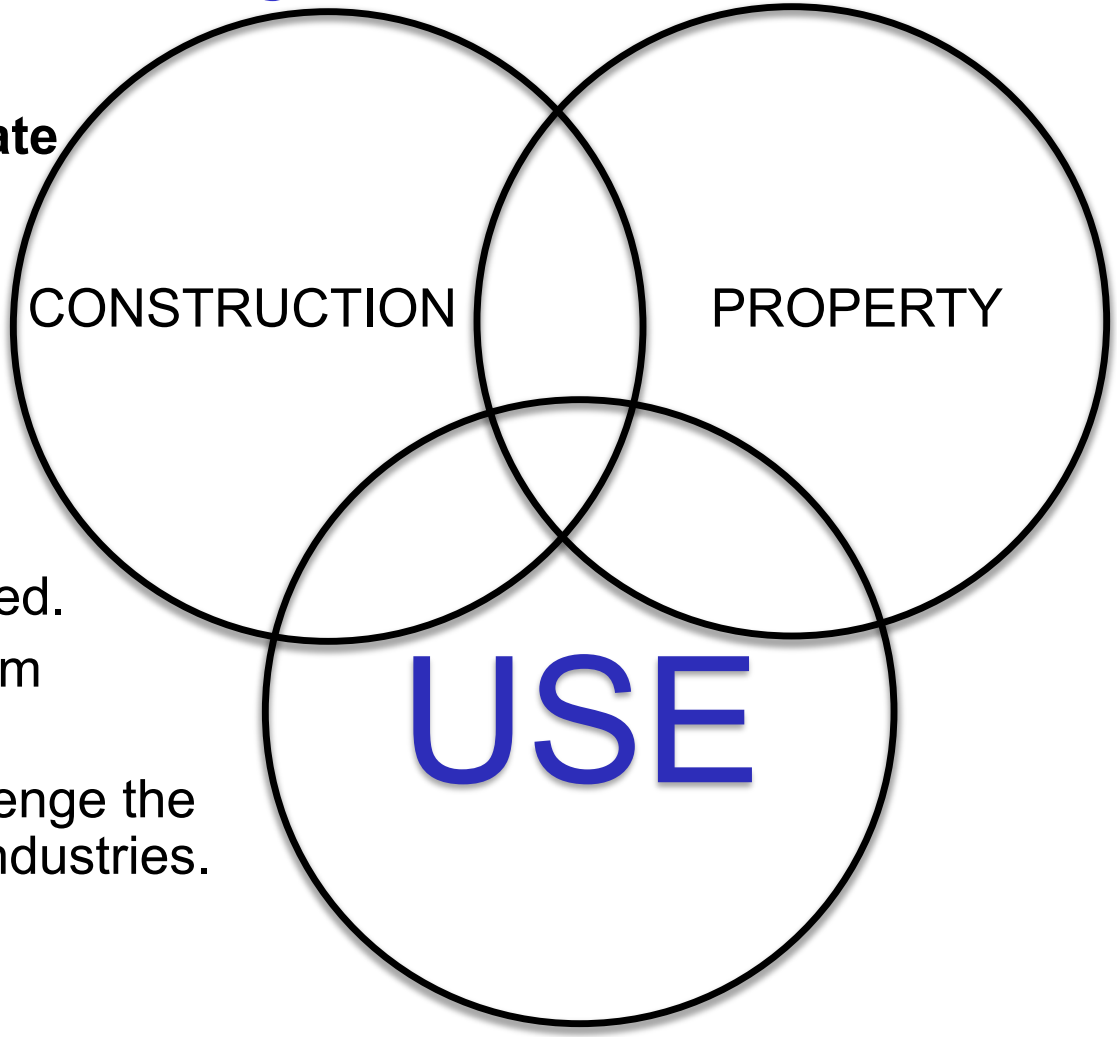
Can run alongside any construction process

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.*

SOURCE: downloadable from www.usablebuildings.co.uk and www.softlandings.org.uk

STICKY 3. How about an independent *Institute of Building Performance?*

Strengthen representation of BUILDING USE. Help create demand-side leadership.



- Public interest.
- Independent.
- Interdisciplinary from the start. No historic silos.
- Authoritative, evidence based.
- Can bring together work from many different sources.
- Can both support and challenge the construction and property industries.
- Connects research, practice and policymaking.
- Institute for Fiscal Studies is a possible analogue.

Big challenges for academe

- Shared vision for all building professionals.
- More attention to the ethical dimensions.
- Building performance in use a core subject for both education and research.
- More multi-disciplinary working.
- Closer working with professional practices.
- Support to Insitutions as learned societies.
- Effective development of the knowledge domain.
- More collaboration and influence on policy.

www.usablebuildings.co.uk