CAT Machynlleth

Building Performance Assessment and Evaluation 15 May 2015

PART 2.1

COMING TO TERMS WITH BUILDING PERFORMANCE IN USE

Building performance evaluation: Methods and lessons

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the Usable Buildings Trust

www.usablebuildings.co.uk

Part 2.1
Methods and lessons

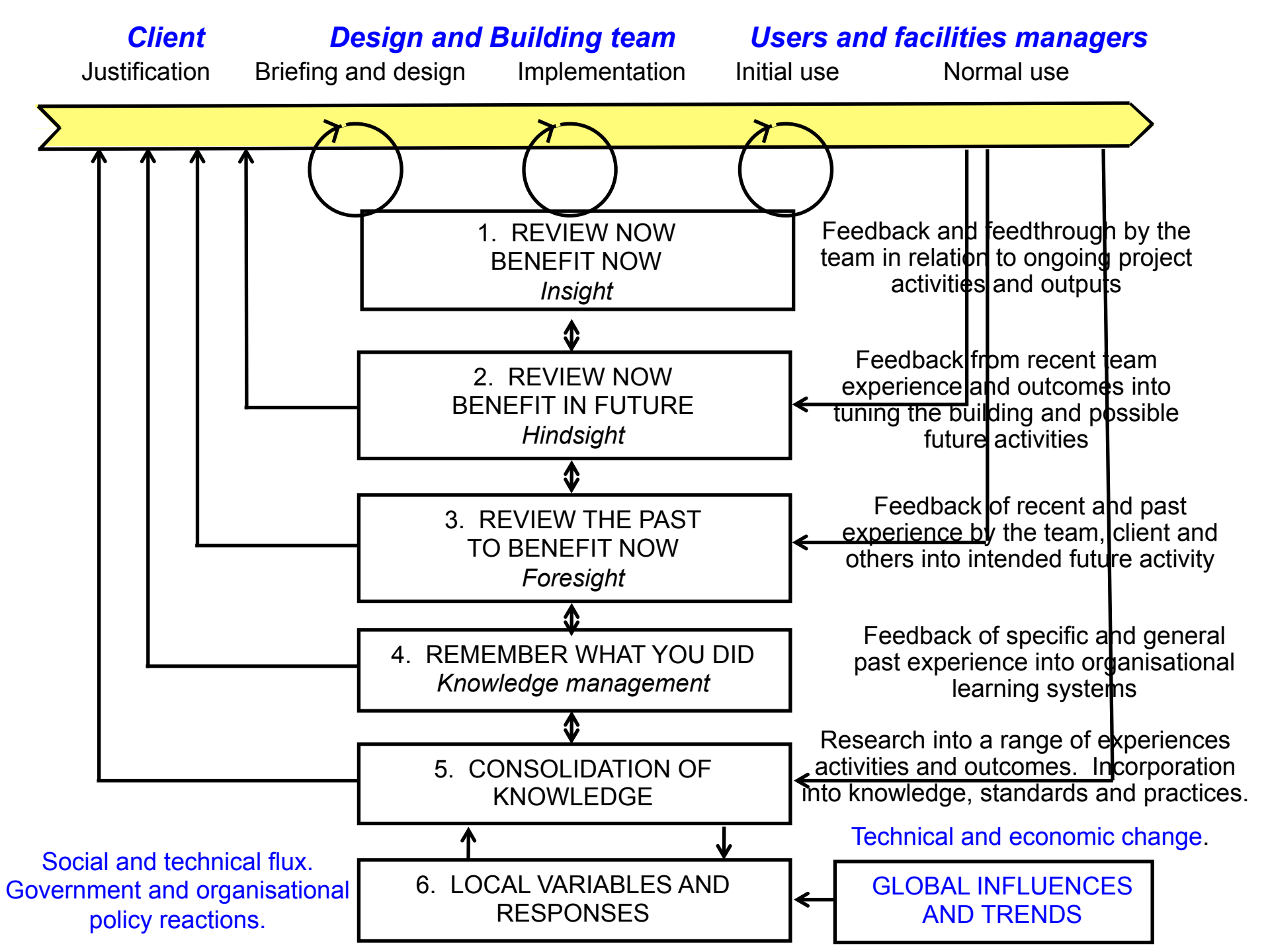
1. **Background**
2. **Methods: getting started**
3. **Strategic lessons**

1

BACKGROUND

What is BPE about?

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


Client
Design and Building team
Users and facilities managers
Justification
Briefing and design
Implementation
Initial use
Normal use
1. REVIEW NOW
BENEFIT NOW
Insight
2. REVIEW NOW
BENEFIT IN FUTURE
Hindsight
3. REVIEW THE PAST
TO BENEFIT NOW
Foresight
4. REMEMBER WHAT YOU DID
Knowledge management
5. CONSOLIDATION OF
KNOWLEDGE
6. LOCAL VARIABLES AND
RESPONSES
Feedback and feedthrough by the team in relation to ongoing project activities and outputs
Feedback from recent team experience and outcomes into tuning the building and possible future activities
Feedback of recent and past experience by the team, client and others into intended future activity
Feedback of specific and general past experience into organisational learning systems
Research into a range of experiences activities and outcomes. Incorporation into knowledge, standards and practices.
Technical and economic change.
GLOBAL INFLUENCES AND TRENDS
Social and technical flux.
Government and organisational policy reactions.

Evaluation into action:
What teams can do with BPE information

- **Improve the performance of the building in use:**
  Nearly always possible, but needs motivation, from occupiers too.
- **Improve the goods and services of those who provided it.**
  Always possible. Needs connection, motivation, and organisational knowledge management; and of course paying for!
- **Improve their procurement and delivery processes.**
  e.g. using Soft Landings procedures.
- **Learn personally from the experience**
  Nothing has greater impact than first hand exposure.
- **Contribute to the wider knowledge base,**
  In the past, BPE information was often not well communicated, or regarded as anecdotal, so people didn't take the lessons to heart.
- **Save money** *by spending on the things that really make a difference*
- **Build relationships, retain customers, build reputations**
  Leading firms have often used marketing budgets to get started.

All involved in building production and management need to get involved in BPE

- There's a big job to do, *in making new and existing buildings more sustainable.*
- We're short of money:
  we can't afford to spend it on the wrong things.
- Our current procurement systems are not fit for purpose:
  we need to do things very differently.
- We can't change everything tomorrow …
  but we can change our attitudes to what we do.

2

METHODS: Getting started

BPE: it's not that difficult … BUT

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

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

Solving problems **NOT** Just gaining knowledge

Predicting effects **NOT** Just finding causes

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

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

Field **NOT** Laboratory

Outside organisation **NOT** Research institution

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

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

Multiple methods **NOT** Single method

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

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

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

Case studies of individual buildings tell stories

and establish hypotheses that can be tested elsewhere.

SOURCE: After H Robson, *Real-World Research* (Butterworth-Heinemann, 1993)

Some appropriate techniques

- **INITIAL SCREENING**
  Pre-visit questionnaire – before visiting the building.
- **PROCESS IMPROVEMENT** *TO ENGAGE WITH OUTCOMES*
  Soft Landings – more on this after the break.
- **EXPECTATIONS MANAGEMENT**
  CIBSE TM54 helps to collect and manage design intent for energy and CO_2.
- **WALK-THROUGH SURVEYS**
  Design Quality Method.
- **COLLECTING ENERGY USE DATA**
  CIBSE TM22 can help to organise this, and is coordinated with TM54.
- **OCCUPANT SATISFACTION SURVEY**
  "People are the best measuring instruments, they are just harder to calibrate" … G RAW. So use well-established questionnaires where possible.
- **STRUCTURED DISCUSSIONS** WITH THE PLAYERS
  Learning from Experience, HEDQF and BUS methods.
- **OTHER POE TECHNIQUES**
  UBT's Techniques Portfolio contains some of these, *see next slide.*

The UBT Feedback Portfolio is at *www.usablebuildings.co.uk/pf/index.html*

UBT Feedback Portfolio: Techniques

This page: Sector [Where used in life cycle] [Development, Publication and Practical Details] →

	Defence	Education		Health	Offices		Leisure	Housing	Other
	Defence	Higher education	Schools	Health	Public sector	Private sector	Sports	Housing	Other
Showing: All [Facilitated_discussions] [Packages_of_techniques] [Process_improvement] [Questionnaires_and_interviews] [Technical_assessment] ↓									
AMA Workware Toolkit		Y	Y		Y	Y			
ASTM Standards									Generic
AUDE & UW Guide		Y							Generic
BRE Design Quality Method		To some extent	Y	Y	Y		To some extent	To some extent	Y
BREEAM	Sometimes	Y	Y	Y	Y	Y	Y	Y	Y
BUS Occupant Survey	Partial	Y	Y	Partial	Y	Y	Possible	Partial	Possible
CIBSE TM22 energy survey	N	Y	Y	Y	Y	Y			
CIC DQIs	Partial	Y	Y	Partial	Y	Y	Y	To some extent	

Summarises some of the techniques available. Outlines their suitability for different types of building and at different stages in the life cycle.

Some principles of BPE

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

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

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

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

Start simple, add detail

- Adopt a drill-down approach where practicable:
  1. BASIC (indicative): *the wet finger*
  2. INTERMEDIATE (investigative): *get some useful data*
  3. ADVANCED (diagnostic): *deeper investigation.*
- None of these levels is academic research in the traditional sense – we see that as Level 4.
- Ideally, beyond the Basic level, work should be both:
  - ***Separate*** from the client, design and building team, to provide objectivity and a wider view. *This can involve a mentor, consultants, or academic input.*
  - ***Connected****,* so the people and organisations directly involved learn through personal experience, and take this back into their organisations and the wider world.

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

LEVEL 1 – Basic

Half to one day on site for 1 or 2 people

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

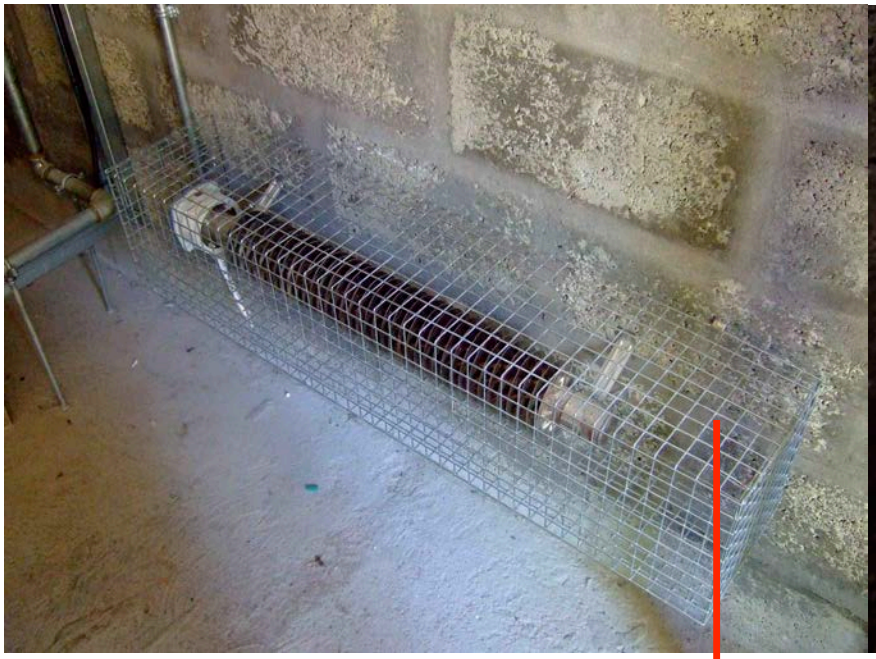
LEVEL 2 - A general purpose BPE package *as used in Probe and elsewhere*

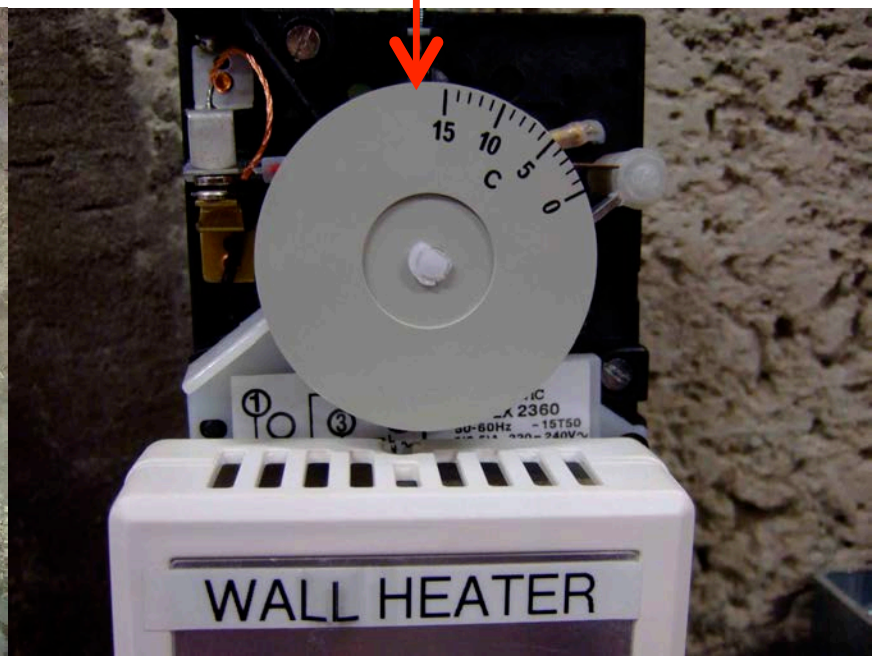
- **LEVEL 1 WALK-THROUGH SURVEY**
  Gives rapid insights, but beware professional bias.
- **DISCUSSIONS WITH OCCUPIERS AND MANAGEMENT**
  Along with the walk-through survey.
- **MEASURE SOME HARD DATA,** *e.g. CIBSE TM22 energy survey.*
- **COLLECT SOME SOFT DATA,** *typically an occupant questionnaire.*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

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

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

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





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

Keep things in proportion

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

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

Less can often do more

FOR EXAMPLE:

BUS Method occupant survey

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

CIBSE TM22 energy survey *(1999 Excel version)*

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

3

STRATEGIC LESSONS

Team members need to follow design intent through into reality

- Understand what is needed — *strategic briefing*
- Be clear what is wanted, and communicate it plainly — *strategic design*
- Be ambitious, but realistic — *question all assumptions, understand users*
- Follow things right through — *e.g. using **Soft Landings** procedures – discussed later*

- Review what they are doing — *manage expectations, undertake reality checks*
- Make others aware of what they are after — *specify: what, why and how*
- Check that things will work — *technical feasibility, usability and manageability*

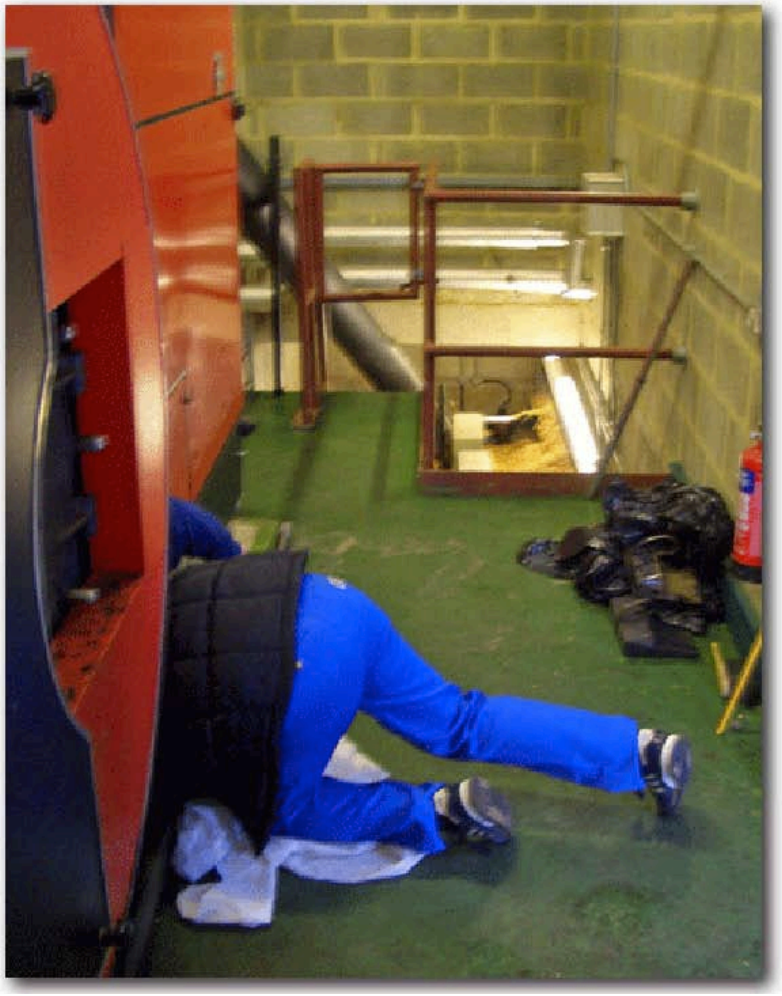
- Get things done well, with attention to detail — *communicate, train, inspect*
- Finish them off — *commission, operational readiness, handover, dialogue*
- Help users to understand and take ownership — *provide aftercare support*

- Review performance in use — *including **post-occupancy evaluation***
- Work with occupiers to make things better — *monitoring, review and fine tuning*
- Anticipate and spot unintended consequences — *revenge effects*
- Learn from it all — *reflective practice, sharing of experiences*

KEEP THINGS AS SIMPLE AS PRACTICABLE AND DO THEM BETTER

Only make things complicated where it is really necessary.

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).

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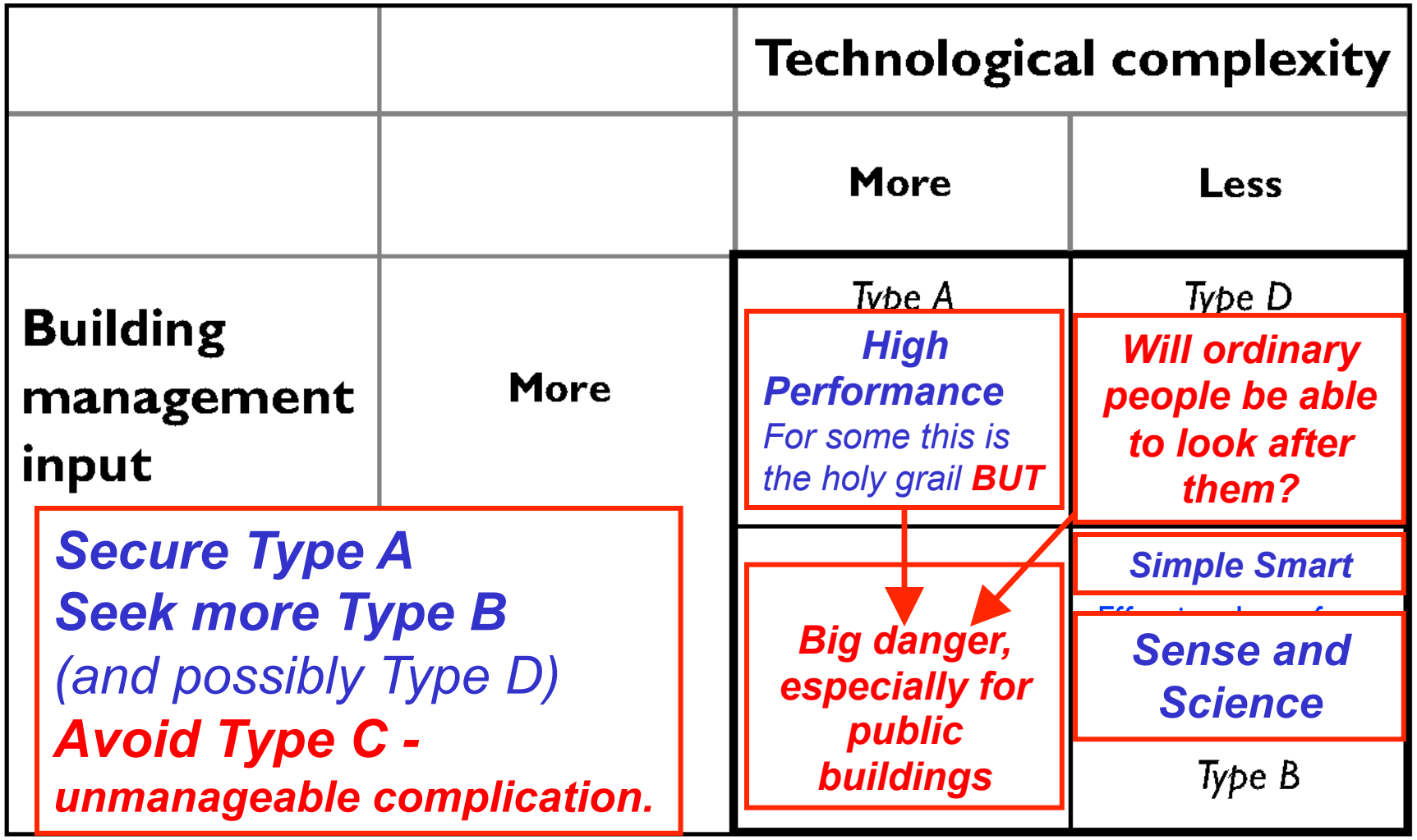

Diagram first appeared in: *Probe 19: Designer Feedback,* Building Services, the CIBSE Journal, page E21 (March 1999).

Fit and forget? *Or not?*

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 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)

Will different behaviour become habitual?

Visitors to hi-tech £1bn Glasgow hospital keep getting stuck in lifts with no buttons

By Mary-Ann Russon
May 10, 2015 17:39 BST

f 8 14 8+

"It's an amazing building but I've spent the majority of my time in the lift so far." … *HOSPITAL WORKER*

SOURCE: www.ibtimes.co.uk/visitors-high-tech-1bn-glasgow-hospital-keep-getting-stuck-lifts-no-buttons-1500606

Some 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 an outputs, but in-use outcomes.
- We need to close the feedback loop and initiate virtuous circles.
- Building performance in use needs to become an independent and properly-resourced knowledge domain, in the public interest.

www.usablebuildings.co.uk