

Building performance evaluation in the UK: So many false dawns

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INTRODUCTION

The authors came into buildings in the 1970s from different backgrounds: one (BB) from physical science research into an architectural and engineering practice; and the other (AL) from geography and science policy into architectural research and education, initially at RIBA – the Royal Institute of British Architects.

In the 1980s, we both left these larger organisations to head up small consultancies involved in building evaluation: BB for technical and environmental performance and AL on human factors. In the early 1990s, we worked together on building performance research, helping to put together the “hard” and “soft” aspects and draw strategic conclusions. This led on to involvement in the Probe series of twenty published building performance evaluations between 1995 and 2002.

In the late 1990s, we began to set up the Usable Buildings Trust not-for-profit charity, which aimed to make building performance evaluation and feedback routine for the construction industry, designers and clients. We have made small advances, but have singularly failed in our overall ambitions. This chapter examines why, and what we think could be done about it.

DEVELOPMENTS IN THE UK FROM 1960-2002

The history of post-occupancy evaluation (POE) in North America is outlined in Chapter 16. In the UK, POE also emerged in the 1960s, as part of a policy to move architecture onto a more scientific footing. The RIBA’s review of architectural practice (Derbyshire and Austin-Smith, 1962) led to its Plan of Work for design team operation (RIBA, 1963): this included Stage M – Feedback, where architects would

return to their projects after a year or so to review their performance in use.

In 1967, to provide academic support, the Building Performance Research Unit (BPRU) was set up at the University of Strathclyde, Glasgow. BPRU would undertake feedback, bring together research, teaching and design on building performance, and publish the results. In 1968, it started a major project, sponsored by the Ministry of Public Building and Works, the RIBA, the Architects' Journal, and twenty architectural and engineering practices.

BPRU's major work was largely on newly-built comprehensive schools, for ages 11-18. The results were published in the book *Building Performance* (Markus et al, 1972). Today the book's findings still ring true, for example an obsession with first cost; repeated mistakes (e.g. windows failing and being replaced by the identical product); poor strategic fits between buildings and the activities inside them (e.g. classroom sizes); and single issues – particularly daylight factors - dominating the design, preventing effective integration, while the required daylight factors were often not achieved anyway.

Building Performance should have been required reading for participants in the UK's recent *Building Schools for the Future* programme, where eye-catching architectural design (and sometimes banal contractor-design) has too often trumped functionality, while environmental performance can be poor (Partnerships for Schools, 2011) and capital and running costs high. Yet again these have exposed the differences between architectural criticism and the evaluation of in-use performance. A former student at one award-winning school summed it up (Anon, 2012): “... *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.*” The comment was supported by POE results.

Building Performance included a plea for architects to get more involved in Building Performance Evaluation (BPE) and feedback, and provided strong arguments why. Unfortunately, this did not happen – the first false dawn. In 1972, the year it was published, the RIBA took Stage M out of its *Architects Appointment* document, reportedly because clients would not to pay for feedback as an additional service; and the RIBA did not want to create the impression that architects would do it for nothing. While Stage M remained in the *Plan of Work*, architects did very little feedback subsequently, as has been reviewed by Duffy (2011). Fortunately, the latest version of the *Plan of Work* (RIBA, 2013) includes more about activities beyond physical completion, including Stage 6 (handover and closeout) and a new Stage 7 (in use). However the contents of these stages, and particularly Stage 7, are not yet well defined.

The publication of *Building Performance* also marked the end of BPRU's government-industry-academe-publisher collaboration, which might have been expected to have been the first step on a journey; a firm foundation stone for BPE as a discipline, connecting research, practice and clients. A statement in the book may reveal why: “*BPRU was more interested in research than in developing devices, however practical, without a sound theoretical framework*”. Developing theory at the expense of practical

opportunities for improvement may fit the priorities of academe, but may well have distanced BPRU from the designers, clients, operators and users it had originally aimed to serve. Time and again we find a mismatch between the priorities and practices of academe and the interests and demands of clients, industry and government.

For the remainder of the 1970s, Britain's economic difficulties, exacerbated by the oil crises in 1973 and 1979, suppressed the amount of new building and the appetite of clients and government for BPE, in spite of the constant lessons that better feedback from building performance in use could make future buildings both cheaper and better.

During the 1970s, one aspect of building performance - energy use - did however receive considerable attention - leading to developments in regulation (mostly for insulation), energy management (including benchmarking and subsidised energy surveys) and new techniques and technologies (with grants for demonstration projects). In 1974 the UK set up the Department of Energy (DEn) to deal with both the supply side (in particular North Sea oil) and to some extent the demand side. In 1977 demand management obtained a similar status. The UK's energy efficiency policies from 1973-2013 are reviewed by Mallaburn & Eyre (2013).

In 1974 DEn set up the Energy Technology Support Unit (ETSU) at the Harwell national laboratory to provide technical and research support, manage external R&D contracts and bring together the results. In 1978, the Department of the Environment (DoE) established a companion unit (BRECSU) in its Building Research Establishment (BRE). After some turf wars about building-related programmes, from 1983 onwards, ETSU, BRECSU and other demand side activities reported to a subsidiary unit of DEn, the Energy Efficiency Office, EEO.

THE 1980s

In the early 1980s, useful feedback was emerging from energy demonstration and other projects. Interesting low-energy buildings had been constructed, some of which were monitored. However, this proved to be another false dawn. Later in the decade, progress slackened, owing to falling fuel prices, a political belief in the efficiency of the marketplace, plans to privatise the gas and electricity industries, and a shift in emphasis from conservation to efficiency. So many opportunities for improving building performance remained unrecognised or undeveloped. A generic problem also emerged: a preference to celebrate successes (which were often overplayed) but not to learn from failures, which seldom proceeded to publication, allowing mistakes to be repeated indefinitely.

In the late 1980s, DEn's prime focus was to privatise the gas and electricity industries and extinguish itself (which it did in 1992). In 1989 EEO (with a reduced budget) was moved to DoE, the Department of

the Environment - the Ministry responsible for many aspects of buildings including regulation, the government estate, construction industry sponsorship and BRE. DoE replaced the energy demonstration and survey schemes with the Energy Efficiency Best Practice programme, to stimulate adoption of energy-saving techniques and technologies, and the related design, installation and operating practices. This had four interrelated elements: Energy Consumption Guides, with benchmarks and action items; Good Practice guides and case studies to help stimulate adoption; New Practice guides, case studies, events and visits; and Future Practice. R&D under the New and Future banners was more about liaising and disseminating results than funding research itself. BRECSU support to the programme became more managerial than technical, weakly connected to BRE's work as a national laboratory.

In the 1980s, there was also some private sector interest in BPE, in particular to support the energy-related work, the growth of facilities management, and in a few design practices. For example, in 1979, four architectural firms got together to help create Building Use Studies Ltd. (BUS), largely to work on briefing/programming, human factors and occupant surveys. In the event, most of BUS's commissions were not from architects but for research projects, construction clients, and building managers. One major commission, the *Office Environment Survey* (Wilson & Hedge, 1986) analysed responses to a 20-page questionnaire on occupant health, comfort and productivity by a total of 5000 respondents in 50 office buildings. This provided a foundation for further work in the 1990s and beyond, including Raw, Roys & Leaman (1990) and the Probe studies (Building Research & Information, 2001).

Following the Bruntland Report (World Commission on Environment and Development, 1987), climate change came to the fore in UK government policy. Key milestones were Margaret Thatcher's speech to the United Nations on the global environment in November 1989 and the Rio Earth Summit in 1992. From two decades, the UK then took a leading role on climate leadership internationally, though the rhetoric tended to run well ahead of the action. Under our current government, both the leadership and the action is collapsing.

THE 1990s

Recognition of climate change at the highest policy level, together with other developments including the launch of BREEAM, the BRE Environmental Assessment Method (Baldwin et al, 1990) boded well for improving the performance of buildings in use. Good progress was made during the early 1990s, with energy joining other work on building and environmental performance at DoE and BRE, supplemented by a new Energy-Related Environmental Issues programme EnREI, triggered by Rio. More projects evaluated building performance from multiple perspectives, putting together the human, the technical and the environmental, for example Bordass et al (1994).

In 1995, DoE started a new programme - Partners in Technology (PiT), into which anyone could bid. PiT (later called Partners in Innovation, PiI), supported multi-disciplinary work on building performance,

including Probe - Post-occupancy Review Of Buildings and their Engineering, in which the authors were closely involved. Between 1995 and 2005, the Probe team undertook and published twenty POEs of recently-completed buildings. A special issue of Building Research & Information (2001) reviewed the process and the results from the first sixteen. It identified major problems in the way that buildings were procured, and the implications for briefing/programming, design, construction, commissioning, handover and management; and for government policy.

Sadly, over the same period, the government's own insights into building performance had leaked away, as it outsourced its design and property management skills and privatised its national laboratories: not just BRE, but Harwell (where ETSU was based); and the electricity and gas industry laboratories which had monitored performance of people, buildings and plant. DoE was also dismembered, its building-related activities dispersed to various ministries and agencies, with no common core.

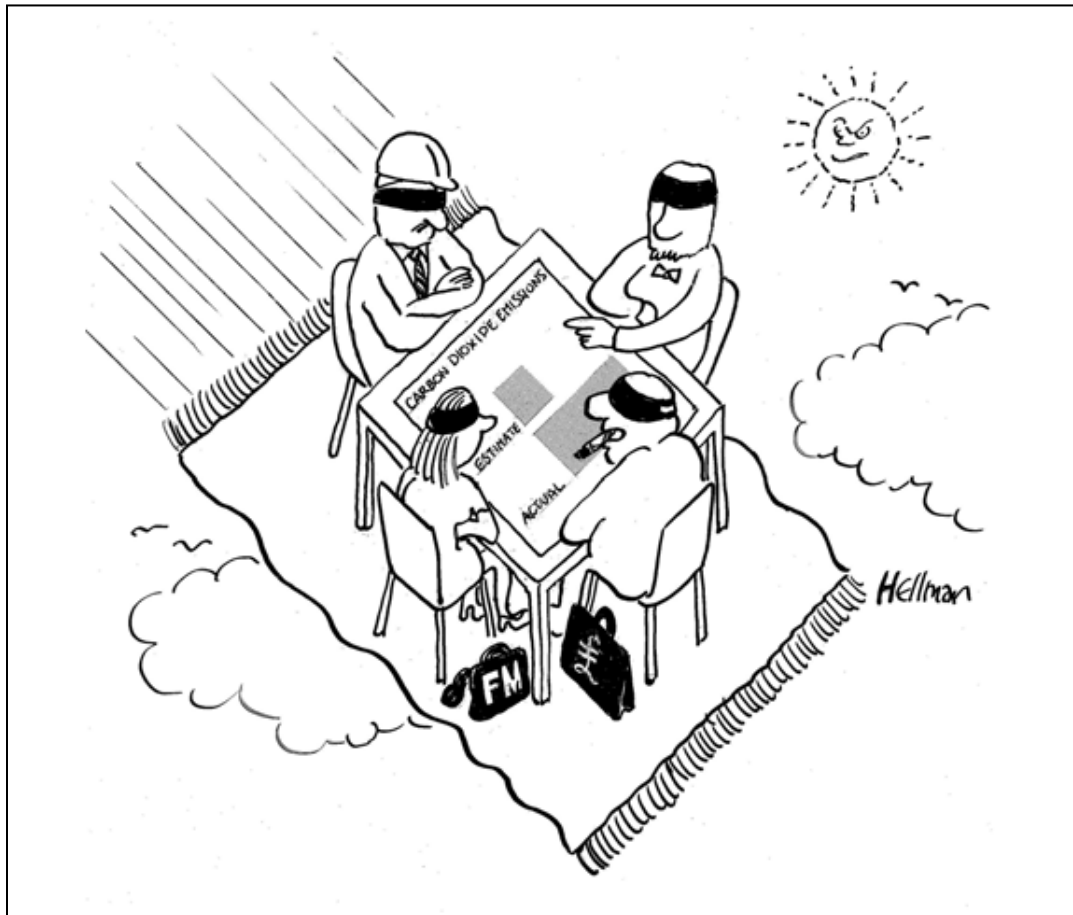
As a result, government increasingly turned to the construction industry for advice on building performance - something the industry knew little about, as it didn't routinely follow through from into use and capture the feedback (Blyth, 2000). As Duffy (2008, p 657), a former president of the RIBA wrote:

"... unlike medicine, the professions in construction have not developed a tradition of practice-based user research ... Plentiful data about design performance are out there, in the field ... Our shame is that we don't make anything like enough use of it".

The confusion of building performance with construction is clear from the titles and content of two government-sponsored reports, *Rethinking Construction* (Egan, 1998), *Rethinking Construction Innovation and Research* (Fairclough, 2002). Amongst other things, the Egan Report advocated customer focus, ambitious targets and effective measurement of performance. However, as implemented, the focus was almost entirely on construction time, cost and elimination of defects; not understanding fitness for purpose.

In 2001, the Association for the Conservation of Energy published two reports that pointed out the enormous gaps that had opened up between design intent and reality in energy performance: *Building in Ignorance* (Olivier, 2001) for housing and *Flying Blind* (Bordass, 2001) for commercial buildings. Figure 1, the cover illustration from *Flying Blind*, shows the designer, builder, facilities manager and owner of a recently-completed building all ignoring the evidence of a big difference between estimated and actual performance, what is now known as the Performance Gap. *[The data for the graph shown came from a building that had won a sustainability award]*. The publication advocated using energy certificates to disclose actual performance and motivate action. It also expressed its concern about the consequences of the fragmentation of the buildings and energy policy that had previously been concentrated in DoE.

FIGURE 1



CAPTION: The cover illustration from *Flying Blind* (Bordass, 2001).

SOURCE: © Louis Hellman Source: Illustration by Louis Hellman for the cover of Bordass (2001).

THE PAST DECADE

Fairclough (2002) considered the implications for government of the completion that year of the privatisation of BRE. It saw the construction industry as largely responsible for innovation and research, but did identify four areas where government might need to fund building research directly: as regulator, sponsor, client; and “for issues that go wider than the construction industry” mentioning climate change, energy, and unforeseen circumstances. It did not see building performance in use as one of these wider issues, regarding it as more a matter for regulation. As a result, PiI, the government’s specifically buildings-related research programme, was transferred to the Department of Trade & Industry and closed soon afterwards.

From 2000-2010, the UK had a major public buildings programme, especially for health and educational

buildings. However, the focus was on construction and design in the architectural sense, not outcomes, and a tick-box approach to sustainability. The result is too many buildings that were expensive to build, expensive to run, and with poor functionality. The problems have been exacerbated by buildings, environmental and energy policies which have also not been well-enough informed by performance outcomes, so have tended to favour added features over getting the basics right – a tick-box mentality. While these deficiencies are now more widely appreciated, it is little short of scandalous that so little was learned from the BPEs carried out in earlier days, given the social, economic and environmental pressures we now face.

Since about 2008, a number of developments reveal a growing interest in in-use performance, including the formation of a new ministry – the Department of Energy and Climate Change which has begun to put more emphasis on demand and not just supply, but unfortunately has little access to institutional memory owing to the loss of the UK's national laboratories. Starting in 2010, the Technology Strategy Board has also funded about 100 BPE studies of recently-completed buildings (about half domestic and half non-domestic), together with other projects on low-energy retrofit, design and decision-making, construction process and energy management. Universities and design practices are also showing more interest in POE. However, policymakers continue to regard building performance as a matter for the construction industry, for example in establishing the Green Construction Board.

THE USABLE BUILDINGS TRUST

With government connection to building performance in use, departmental responsibilities fragmenting, and the design professions not filling the gap that was opening up, in 2002 the authors helped to set up the Usable Buildings Trust (UBT), a not-for-profit charity to help connect people and disseminate information. Over the past ten years, we have had some modest successes but considerable setbacks. Three examples are outlined below.

CLIENTS. Since most designers and builders did not feel it necessary to engage closely with building performance, we obtained funding for a project on feedback for construction clients, who we hoped would take the lead, in their own interests. We then got a shock, when we discovered that major clients with building programmes tended to have procurement departments, whose concerns were project management, delivery and defects: inputs and outputs, not outcomes. Those most interested in-use performance tended to be one-off clients procuring buildings for their own use. We did also find individuals in major clients who were committed to good outcomes, but their reflective nature tended not to fit the organisational culture and so they would often move on to other jobs.

ENERGY CERTIFICATES. UBT helped to develop strategy and detail for the energy certificates required under the European Union's Energy Performance of Buildings Directive (OJEU, 2003). We argued that certificates for display in public buildings should be based on actual metered energy use and

updated annually; and assisted with strategy for these Display Energy Certificates (DECs). We hoped DECs would make energy performance in use visible and actionable; extend in due course from public to commercial buildings and from larger into smaller buildings; and encourage people to measure other aspects of in-use performance, e.g. occupant satisfaction and productivity. DECs were introduced in England & Wales in 2008 and have had some effect, but unfortunately the government has not given proper support to their further development, whilst also introducing other systems of reporting that are conflicting rather than complementary.

SOFT LANDINGS. The Probe team identified deficiencies in how building work was procured. Too often there was inadequate briefing/programming and little or no continuity from client and design intent to completion and handover, and on into operation. UBT therefore helped to research and develop the Soft Landings process (Way and Bordass, 2005), which has been taken further with the support of an industry group convened by BSRIA, the Building Services Research & Information Association, including a published Framework (Way et al, 2009), case studies and other documents. The approach can potentially be grafted onto any procurement system, for any building project, in any country, improving the focus outcomes and in particular augmenting five stages: 1). Briefing/programming; 2). Expectations management during design and construction; 3). Preparation for handover; 4). Initial aftercare and 5). Longer-term aftercare and POE. It is designed to bring out the leaders, allowing the client and team members to set priorities and assign tasks. The government has decided to adopt the principles for public sector procurement projects, but has decided to codify it more than we would have preferred. A danger is that Government Soft Landings will turn into yet another ossified standard, with process being regarded as a substitute for leadership, but only time will tell.

WHO OWNS BUILDING PERFORMANCE? AVOIDING ANOTHER FALSE DAWN

Buildings last a long time, well beyond the time horizons of their creators. Good performance in use is in the public interest, but is the result of the actions of many players. Sadly, and in spite of all the evidence, it has been difficult for policymakers to appreciate that building performance is about a lot more than construction, and to get joined-up government thinking and action. We see performance in use as too important to be entrusted to designers and builders; and certainly not just to architects, who are no longer “leaders of the team”, as they were in the UK fifty years ago.

In his commentary on Probe, Cooper (2001) raised a fundamental question: which party involved in the procurement and operation of buildings owns POE? The response of the authors (Bordass et al, 2002) was that follow-through and feedback would become routine practice if it became something clients wanted and would pay for, owing the benefits and savings it would bring. However, this was before we discovered that major clients were much less interested in building performance in use than we had anticipated. Ten years later, the British government’s mandation of Soft Landings suggests that the tide is turning.

How best can this increasing interest in performance in use be supported? UBT considers that it will need cultural changes and new institutions.

A NEW PROFESSIONALISM

In terms of cultural changes, UBT has been advocating *a new professionalism*, where all building professionals engage much more closely with the consequences of their actions. This is already implicit in the codes of many professional institutions, as they require members to understand and practice sustainable development. The Institute of Civil Engineers even expects them to “do the right thing”. At present, these aspirations tend to be honoured in the breach.

UBT helped to arrange a debate in London in September 2011 on the role of the building professional in the 21st century, by the Edge, a multi-disciplinary group that considers emerging issues in the built environment, see www.edgedebate.com. Speakers identified a number of gaps: between professions; between practice and academe; and between design assumptions and how buildings work in use, owing to a failure to develop a shared knowledge base. Solutions were seen to lie in ethics, integration, practice based on evidence, and an action-learning culture. Some thought the UK had all the necessary knowledge and skills, but lacked the resolve to bring them together.

Building Research & Information then issued a call for papers on New Professionalism, leading to a Special Issue on the subject (BR&I, 2013), which was discussed at another Edge debate shortly after publication. The authors of four of the papers presented their views, which were debated by a panel of senior representatives of UK professional institutions in architecture, engineering, surveying and construction, in response to questions from the audience.

It was agreed that the challenges of sustainability were exposing inadequacies of regulations and markets, and creating a vacuum that building professionals and their institutions could help to fill. However, the meeting was not sure whether they would have the will to do so, the necessary capabilities, and whether society would trust them in this role. Critical needs were identified for:

- A shared vision and identity for practice and education, with more emphasis on ethical aspects and perhaps something similar to the Hippocratic Oath.
- Better procurement processes, with a proper focus on outcomes.
- Building performance in use to become a properly-recognised and represented knowledge domain.

After the first debate, the Edge suggested developing some shared principles that any built environment professional could adopt - today. The ten points that emerged are shown in Table 1. They fall into three groups: 1). ethics and behaviour; 2). engagement with outcomes, reflecting and sharing knowledge; and 3). the wider context of policy, practice, education and research.

**TABLE 1: ELEMENTS OF A NEW PROFESSIONALISM –
TEN POINTS DEVELOPED WITH THE EDGE**

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.
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.
8. 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: *Building Research & Information* (2013), Table 1, page 6.)

AN INSTITUTE OF BUILDING PERFORMANCE

How can society best support the development of a built environment where much more emphasis is given to in-use performance outcomes, not just for new buildings but in improving the existing stock? How do we avoid yet more false dawns? The change in attitudes and practices of the *new professionalism* need institutional and educational support. Our view is that the existing institutions will not be able to move fast enough. We need new structures that can both support and challenge them.

Fairclough (2002) identified the need for government to sponsor research that went wider than the construction industry. We would put performance in use into this category. However, in the current political climate, it seems unlikely that this will happen, certainly not to the degree necessary. One problem is that the prevailing world view since the late 1970s has been to leave things to the market. As a result, government no longer wants to build technical capacity itself, but looks to industry for solutions. But what industry owns building performance; and should any industry own it anyway? Not the construction industry: it regards buildings largely as construction projects. Not the property industry, which sees them as money machines. In the 1980s, we had great hopes for the emerging facilities

management industry, but it has not covered itself in glory. The UK government also put its faith in PFI, the Private Finance Initiative, where a contractor finances, designs, builds and operates public assets. We expressed concern about this (Bordass et al, 2002), but in the event it turned out much worse, producing buildings that were too often expensive, inappropriate and of poor quality.

UBT has concluded that we need a new institution to develop and represent the knowledge domain of building performance in use. IBP, the Institute for Building Performance, would have the following attributes:

- Independent, public interest.
- Interdisciplinary from the start. No historic silos.
- Authoritative, evidence based. Able to bring together work from many different sources.
- Connecting research, practice and policymaking.
- Able both to support and challenge the construction and property industries.

We are seeking philanthropic support to get this started.

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Adrian Leaman specialises in understanding buildings from the users' point of view. He is best known for his work with Building Use Studies, and has been involved with pioneering projects including Space Syntax, the Probe series of post-occupancy studies, and studies of sick building syndrome, and workplace productivity.

Adrian and Bill are co-founders of the Usable Buildings Trust, a charity devoted to disseminating independent and objective findings about building performance and to influence the industry, its clients, building managers and government. They are co-authors of the Soft Landings Framework, which helps design and building projects to take more account of performance in use. They are also advocating a "new professionalism" that takes proper account of outcomes, and edited a recent issue of Building Research & Information journal on the subject. Many of their articles and presentations can be found at www.usablebuildings.co.uk.