

# A guide to feedback and post-occupancy evaluation

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*Buildings can add substantial value for their clients, their occupiers, the economy and the environment. In spite of this, opportunities are regularly missed and value needlessly subtracted because people do not learn enough from the buildings they make. When undertaking a new project, to make the most of the potential and to avoid common pitfalls, you and your team need to obtain feedback from previous projects and their performance in use and feed this forward into the product and into the procurement process. Then you need to add feedback from the project itself, both while it happening and after it is completed and in use – what is known as post-occupancy evaluation. This guide will help you to get started on making feedback a routine part of building procurement and operation. This will improve the quality and performance of what you are doing and allow subsequent projects to benefit from your achievements and experiences. It will also make the project more enjoyable because it will help you to build on past successes, avoid common pitfalls, solve problems, and interact more creatively with the members of your team.*

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## Introduction

1. WHAT IS FEEDBACK?  
Feedback is about feeding knowledge of outputs back into inputs in order to improve outcomes, see Annex A. It connects activities including performance assessment and benchmarking, design quality assessment and whole-life value into achieving excellence in the procurement process and improving the completed facility and its performance. Feedback also helps one to spot emerging issues before they turn into big surprises.
2. WHAT DOES FEEDBACK EMBODY?  
Most of what we do – our processes, our procedures, our products, our technologies, our laws, standards and codes of practice – is built on the world's experience of feedback. At its simplest, feedback is quality assurance: are we getting what we want; and if not, what corrections do we need to make? The emphasis in this guide is on what adds the most immediate value to the process, the product, its performance, and to the activities of the design and building team.
3. FEEDBACK INTO BRIEFING, DESIGN AND CONSTRUCTION  
This guide concentrates on incorporating feedback into the stages of the project in which the design and building team are involved. This includes not just the design and construction period, but the critical activities beforehand and afterwards: preparing and testing the brief; and following through from physical completion of the asset to its beneficial operation in the hands of the occupier and operator.

### FEEDBACK, SCIENCE AND BUILDINGS

Feedback is also the foundation of science. This has more relevance to buildings than one might think.

- *Science examines facts. For construction, the facts include the context, the brief, the site, and feedback from similar situations.*
- *Science develops ideas (hypotheses) to help explain the facts. For construction, the design is the idea.*
- *Science devises and undertakes experiments to test its ideas. For construction, the building itself is the test.*
- *Science observes the results of the experiments to test the ideas, and then refines the ideas and procedures. This rarely happens with construction projects: the design and construction team normally walk away.*
- *Scientific theories progress by exploring errors and anomalies. Refutation of ideas by unexpected findings is at the heart of the scientific process. Construction hopes to get everything right first time, whilst not sufficiently appreciating the essential role of feedback in the improvement process.*

*Because the design and construction team (and indeed often their clients) have not traditionally evaluated the results of what they have done, the construction industry tends to have been slow to learn from the performance of its completed products – particularly how they behave in the hands of their users. If you are lucky they will attend to defects and snags, but they are less likely to spot nagging problems, or even to realise when they have achieved a simple success.*

*Consequently, chronic problems can persist, and emerging difficulties may only be noticed once there has been a major failure. Conversely, time and money can easily be wasted by trying to improve things for which good solutions already exist, while those that really need the attention continue to be neglected.*

*A widespread problem - which particularly affects the public sector - is buildings which are too difficult and expensive to maintain and to manage. Feedback systems can help to identify opportunities for stripping-out complication where it does not add value.*

#### 4. FOCUSING ON PERFORMANCE

Recent initiatives on rethinking construction have tended to concentrate on the construction process itself: integrated teams and supply chains, logistics, better use of information technology and factory production, and so on. The next step is to try to get an end product which has better quality and all-round performance, not least in the eyes of its users. This report aims to help you to get started. It involves making feedback a routine part of the procurement process for clients, designers, builders and project managers alike.

#### 5. WHAT SHOULD I BE DOING?

You, the client, are the expert on what you want out of your building. The supply side of the industry – designers, constructors, suppliers, and project and facilities managers can help you to get there. Together you can achieve – and where possible surpass – the product and performance you are looking for, through a process which is effective, efficient and as far as possible enjoyable. The process involves clear communication and monitoring of your goals.

#### 6. WHAT SHOULD I BE EXPECTING?

If you have selected well, the members of your integrated design and building team will be good at what they do – but don't expect them to know everything. In particular:

- They won't know about your needs and priorities unless you tell them. This should take the form of a dialogue: although it may start and even finish with a set of instructions, these need to be improved by feedback. As rapport develops and solutions begin to emerge, perceptions of requirements and possibilities begin to change too, feeding back insights of the opportunities and constraints into the understanding of what is possible and desirable. For example, design ideas might lead to discussion of new working practices, more re-use of existing facilities, or more sustainable approaches than were initially anticipated in the brief.

- The team may be integrated but it is unlikely to be seamless. Tasks get divided up between the experts and handed down from one to another – often without much overlap. While innovation within the industry is attempting to break barriers down, divisions still do exist and are to some extent necessary. Clear division of labour ensures that you obtain professional services which are integrated, but without blurring the responsibilities for carrying out the many specialised technical tasks to the required standards. The team needs feedback mechanisms (e.g. from the Portfolio of Feedback Techniques in Annex B) to improve its understanding of what is required and how the developing solutions relate to your needs.
- Ordinary people might reasonably expect the construction industry – designers, builders and project managers - to be the experts on the performance of the buildings they create. But by and large, team members are not. Their job is to design and build things. Once the facility is complete and handed over they go away, on to the next project. Traditionally, they have not stayed around to help the occupiers and managers into the new facility, to find out what is and is not working, and learn from the experience. If it occurs at all, most of the feedback has been indirect (e.g. via the research community). Within an integrated project, you need to ensure that there is more overlap, so improving customer service and helping to close the feedback loop.
- Your integrated team may include facilities managers, but often they will be involved very little at the planning, design and construction stages. Even where they are, facilities management is a young profession, still coming to terms with what it really needs to do and developing the tools of its trade. Few facilities managers are yet expert at briefing or at interacting with designers and builders. Any interaction will need to be organised carefully.
- The best facilities should strive for excellence in terms of investment value, user value and environmental performance. At the heart of the all-rounders that do achieve all three one nearly always find a committed client, who in turn has selected a good design, building and management team; put in much effort in briefing, integration and target-setting; is realistic about the assumptions of team players; and has operated effective but unbureaucratic systems of monitoring and feedback to help keep the means (the building) aligned with the client's ends.

### **FEEDBACK AND POE (Post-Occupancy Evaluation)**

STUDIES COMMISSIONED BY CRISP - the Construction Research and Innovation Strategy Panel

In 2000, CRISP commissioned three studies that are relevant to the effective use of feedback. They identified a feedback vacuum, with few linkages between those who occupy and run buildings and those who actually commission, design and make them. Key conclusions included:

The relationship between buildings and occupiers is constantly changing, with frequent clashes between operational requirements and physical facilities.

Designers seldom get feedback and only notice problems when asked to investigate a failure.

Occupants' knowledge is not being used adequately to inform designers. Facilities managers are seldom involved in briefing and there is no natural home for their experience.

Very few POEs are undertaken. People don't want to pay; and aren't sure what to do, who should do it, or what value it will add. Designers fear the risks of liability and of voiding their insurance.

In the few POEs that were done, the information usually stayed with the client and consultant group. We need a "keeper of information" of good and bad examples of products and processes.

Building services are some of the most troublesome and least understood aspects.

*The authors envisaged major potential benefits for:*

- *Clients (getting better outcomes and also demonstrating their commitment and achievements).*
- *Designers (fine-tuning what they had done and learning how to do better next time).*
- *Facilities Managers (helping them to understand the potential of the building and to run it better, and getting their knowledge made use of more widely).*

All this would result in better and more cost-effective buildings all round. CRISP recommended that clients should regard POE as worth paying for, and to start defining what they actually require. This Guide and the Feedback Portfolio (Annex B) have now made a start with this.

### 7. HAVEN'T NEW PROCUREMENT SYSTEMS LIKE PFI REPLACED ALL THIS?

No. PFI is primarily a contractual and financial device. Just because it brings together the parties involved in finance, design, construction and operation under one umbrella, it does not automatically sweep away problems that have been endemic in the industry, and in landlord/ manager/ tenant relationships. Specifically, a new procurement system cannot immediately solve the historic fact that feedback has not been routine (as revealed by the CRISP studies summarised in the box above) and that the industry as a whole does not have the appropriate procedures and knowledge management systems in place. PFIs need their internal feedback systems too<sup>1</sup>.

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<sup>1</sup> Sadly but understandably, where PFI teams do operate feedback systems internally, they appear reluctant to publish the techniques. This is partly because they see any techniques they operate and knowledge gained as trade secrets helping them to maintain their competitive position. In addition, the publication of any bad news (or even good news which later proved to have been optimistic) might carry reputational risk.

### Principles

#### 8. APPLICATIONS OF FEEDBACK

Feedback information can be gained and applied in three main ways:

*Hindsight.* This is the first (and sometimes the only) thing many people first think of: looking back once a project is complete, at how well it has done, the extent to which it met (or exceeded) its objectives, and the lessons that can be learnt.

*Foresight.* Getting ready before a project or an activity starts. Here you can review past knowledge and experience, examine what you, your team and others have done, and prepare for the tasks to come. Often this will benefit from the results of previous hindsight activities and techniques. New investigations and discussions can also be undertaken.

*Insight.* Getting feedback (on what people have been doing, what they have done, and how it does or is likely to perform) while the project is running. At one level it is routine quality control. At a higher level it can be applied to improve performance and to overcome problems by helping to apply the team's creativity and past experience to the tasks in hand. Early activities include joint visits to similar, newish buildings and discussing the experience. Clients can often see this an unnecessary expenditure, but the exercise is invaluable in developing shared understanding and common reference points.

Effective feedback is not just about extracting codified knowledge relevant to the project (what is written down), but the tacit knowledge in the heads of the participants (both when they start and as they come and go) - for example by means of interviews and facilitated discussions. It is also about discussing risk and relevance in relation to the context.

#### 9. FEEDBACK AS HINDSIGHT

Using feedback to review the outcomes of a completed project helps clients, project managers, and design and building teams to learn from what they have done, and plan to do better next time. The results and lessons can then be disseminated to their organisations, their peers, and to the industry and its clients as a whole. Some techniques are outlined in AE 08 – Project Evaluation and Benchmarking. Others will be introduced later in this guide. Common hindsight activities include:

PPRs – Post-Project Reviews. These review the conduct of the project: how it was set up, how well it went, how people and organisations interacted, how problems were dealt with, and how well it kept to programme and budget. They need to occur fairly soon after handover (typically within the first year), when team members may still be available and memories fresh.

POEs – Post-Occupancy Evaluations<sup>2</sup>. These examine the product and its performance. POEs can cover a wide range of issues, either individually or in combination. Historically, however, their roots are in studies of architectural design, technical performance, indoor climate, occupant satisfaction and environmental impact<sup>3</sup>. They can be undertaken at any time, but most commonly occur within two years of handover.

PIRs - Post-Implementation Reviews. These look back after the facility has been in use for some years, and review the extent to which it has met its aspirations and delivered the anticipated business benefits to the organisation. To assist in the assessment, a PIR will often bring in findings from POEs and other sources.

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<sup>2</sup> The term POE comes very much from the design and construction perspective, i.e. the evaluation of a facility after it has been occupied. For the user/client of course, the building's life begins when they occupy it and continues through their whole period of occupation. It is not surprising, therefore, that surveys have revealed that some occupiers and facilities managers did not understand the term POE, thinking it was something that was done not during their occupation, but after they had left!

<sup>3</sup> POE activity in the research community has only interlocked with mainstream practice for brief periods at best – as with the Building Performance Research Unit at Strathclyde University circa 1970. Owing to the priorities of funders and academe, research tends to be mostly single-issue, while many aspects of building performance are much wider – e.g. how organisations, businesses, users and management interact with spaces, systems and technologies, and the effect this has on the tasks they do.

KPIs – Key Performance Indicators. To date most of these – including even the customer satisfaction questionnaires - have concentrated on the procurement process, not the completed product, and on how you are doing generally, not the specific things you need to improve. As discussed in AE 08, Construction Industry KPIs tend to be more useful in helping organisations to gauge their performance in relation to others, than for day-to-day management.

Other performance evaluation and benchmarking procedures, such as the Design Quality Indicators which are reviewed in AE 09.

AE 08 advises that performance assessment is best carried out as an ongoing review process (i.e. as insight), not least because people move on. Other reasons for making feedback more immediately applicable to the activities of the project team and the client sponsor are discussed below.

### **CASE STUDY – THE VALUE OF BENCHMARKING OCCUPANT SATISFACTION**

Complaints from occupants of Phase 1 of the Centre for Mathematical Sciences at Cambridge perturbed the University. However, when a Probe POE was undertaken, its standard occupant questionnaire survey revealed excellent levels of user satisfaction in relation to most of the benchmarks (derived from surveys of comparable buildings).

It appeared that many of the complaints were not related to the design of the building but were direct or indirect consequences of its phased construction – in particular a partial handover with blurred responsibilities for facilities management, building services and controls not fully handed over or fine-tuned, and the noise, dust and inconvenience of working next door to the construction sites for the interconnected Phases 2 & 3. Without this benchmarking of occupants' perceptions, the anecdotal evidence might have underservedly tarnished the building's reputation.

## 10. THE IMPORTANCE OF ROUTINE FEEDBACK

Hindsight activities after a project is completed give clear benefits at the organisational level – provided, of course, that the organisation has its own effective internal feedback (“knowledge management”) system which can make good use of it. For individual members of the client, design and building team on a specific project, the argument is less clear cut: the project is over, they are doing other things, the budget is spent: why rake over old ground? Hence it is important to make follow-through and feedback an accepted part of the process, and a routine programmed (and budgeted, and insured) part of project delivery.

### **CASE STUDY - HINDSIGHT INTO FORESIGHT**

*Oxford University's Estates Department commissioned a POE of the Phase 1 of its multi-faculty building in Manor Road. The POE included occupant questionnaires, interviews, and a technical and energy survey. Amongst other things, the survey revealed problems with:*

- *Window design for operability and glare.*
- *Privacy and outside awareness in offices adjoining the main staircase.*

*By the time of the POE, the design of Phase 2 was well advanced and planning consent had already been obtained. In spite of this, the architects were able to respond creatively to the findings and revise the window details, staircase location and design, office location, and a number of smaller items. Workspace changes including windows, shading, furniture and lighting were mocked-up in a test room in the shell of the new building in order to obtain comments from occupants before details were finalised.*

### **CASE STUDY – OCCUPANT BENEFITS AS A CONSEQUENCE OF POE ACTIVITIES**

To test new accommodation strategy guidelines, the Department of Health refurbished one floor of its offices at Wellington House as a pilot project, undertaking surveys before and afterwards. The questionnaire survey showed that the occupants generally liked the alterations, but privacy was a problem. However, the space use survey showed that the quiet rooms provided for private study and small meetings were little used. An open discussion revealed three main reasons for the problem:

Privacy: the rooms had no blinds, which made them unsuitable for confidential interviews.

Technology: it was difficult to relocate to a quiet room in the middle of a telephone call which became confidential. Cordless telephones would make this much easier.

Habit: many people had not appreciated how they could be using the quiet rooms.

Following the discussion, the use of the quiet rooms increased significantly.

### 11. HINDSIGHT INTO FORESIGHT AND INSIGHT<sup>4</sup>

Feedback is not just about being wise after the event, as many think. Feedback experience can be applied to improve the process and the product at any stage, feeding forward immediately into what happens next. Even Hindsight activities can bring immediate benefits, for example in using POE findings to fine-tune the operation of a building and make small changes, as outlined in the case studies below.

- Many of the Hindsight operations outlined in Paragraph 6 are intended to feed through into foresight anyway. Make sure you and your team have identified any available results of past experience in your organisations, and learned the lessons from them.
- While some Hindsight techniques (e.g. Post-Project Reviews) can only be carried out when the experience is fresh in the team's minds, POEs can be done by anyone at any time. In formulating the brief for new work, you can therefore use POE techniques to examine the performance of comparable examples, in particular the existing facilities which you plan to upgrade or replace (as in the Wellington House case study above) or comparable facilities (as in the Oxford University case study above).

### **CASE STUDY – ENVIRONMENTAL BENEFITS RESULTING FROM POE ACTIVITIES**

An owner-occupier of a low-energy office appointed its engineers Buro Happold to review its energy performance and to advise on fine-tuning its building services during the first three years of occupancy. When the first year's gas consumption was above the design target, the situation was investigated and the level of airtightness of the external walls was suspected. This was confirmed by a pressure-test of the building, including smoke tests which identified leaks. After the leaks were sealed, gas consumption dropped and occupant satisfaction improved.

Operational energy use in buildings is a major contributor to climate change. In spite of its vital importance, energy performance has been of little interest to building occupiers, to whom energy costs are often relatively unimportant. This may change when the European Directive on the Energy Performance of Buildings is phased in between 2006 and 2009. One requirement is for public buildings over 1000 m<sup>2</sup> to display an energy performance certificate. This could well lead to much more emphasis on setting and achieving energy targets; and in assigning responsibilities for their achievement.

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<sup>4</sup> The classification of techniques and applications as Foresight, Hindsight and Insight was proposed by DBA David Bartholomew Associates in their PII on *Learning from Experience*, which is discussed in more detail later.

### Process

#### 12. SPECIFYING BY PERFORMANCE

Over recent years, large clients have often outsourced their technical services departments (which in the past used to maintain feedback systems, particularly on technical performance) and have fewer in-house experts on design and construction. Clients in central and local government have also been encouraged to specify by the performance required. However, in the past, few designers and builders have routinely monitored the performance of the buildings they produce, so the industry is not experienced in delivering to specified performance levels. Until there is better feedback, it will be very hard for clients to specify reliably by performance alone, and vital for them to get the feedback loops working, in order that everybody involved can learn.

#### 13. MAKING FEEDBACK OF IMMEDIATE RELEVANCE

As discussed above and in Annex A, the more remote the link between undertaking a feedback activity and applying the findings, the more dependent the process will be on as-yet imperfect knowledge management systems to transmit the feedback information from its origin to the point at which it is needed. While such systems are essential to improving performance, they depend very much on the skills of organisations, professions, and sometimes whole industries. In this guide we therefore concentrate on what can be done in the here and now by the client and the project team to improve performance on project that are underway. Encouragingly, buildings that are monitored tend to perform better as well, owing to the more effective closure of the feedback loop.

#### 14. LINKING FEEDBACK TO PROJECT DELIVERY

Processes are therefore needed which incorporate feedback systems into the routine delivery of projects, including Hindsight activities such as POE. If designers, builders and project managers can be persuaded to see feedback as part of their routine project commitments<sup>5</sup>, then it is much more likely that they will take these responsibilities seriously. Table 1 above (or preferably opposite) shows how feedback activities over the life cycle of a project are related to the various procurement stages and to the Gateway process.

#### 15. WHERE DO I START?

You can start operating feedback systems at any stage. From the beginning of a project:

- *The business case.* Feedback techniques such as questionnaire surveys will help you to find out about what users do and think, and to determine the potential for improvement – preferably using techniques that can be applied in the completed facility to confirm the benefits.
- *Strategic briefing.* Visits to comparable facilities and discussion with their clients, occupiers and managers will help to improve your understanding and to identify opportunities and pitfalls.
- *Team selection.* You must make clear the feedback and related activities you wish the design and building team to undertake; and take their attitude to, experience of, and plans for feedback into account when selecting the team. Consider adopting a “soft landings” procedure (see the box below) which incorporates feedback and aftercare in the procurement process.

#### **CASE STUDY – SOFT LANDINGS AT THE UNIVERSITY OF CAMBRIDGE**

*A team including the University’s consultants and suppliers has developed the “Soft Landings” process which aims to ease the transition from completion into initial operation. The University is now requiring design teams to include soft landings procedures in their fee bids, and is also undertaking post-occupancy reviews of all its projects.*

For more details, see the Feedback Portfolio, discussed in Appendix B.

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<sup>5</sup> As it happens, in 1963 RIBA, the Royal Institute of British Architects, put Stage M – Feedback in the first edition of its Plan of Work for Design Team Operation. However, in 1972, while remaining in the master version of the Plan of Work, Stage M was taken out of Architects Appointment and the explanatory documents by RIBA Publications, reportedly because there had not been enough take-up by clients and RIBA did not want to create the impression that their members would do it for nothing. In 2003, however, the RIBA Practice Committee decided to re-introduce feedback into publications, but no longer merely as a discrete Stage M, but as something that occurs throughout the course of a project – as we are recommending here.



## A Guide to Feedback

- *Detailed briefing.* It helps to visit comparable projects with your team, and to discuss them carefully. This not only gives useful information on the facility visited, but will improve communications between team members and with the client, unlock past experience, and provide useful references to refer back to in discussion<sup>6</sup>.
- *Outline and detailed design.* Make sure that the options developed are informed by feedback experience where available, particularly in relation to their practicality and usability. Seek feedback from facilities managers. Where possible encourage the team to formulate the design expectations in ways that can be related both to the requirements in your brief and to outcomes that can be monitored in the completed building.
- *Construction.* Learning from Experience workshops (see Annex B) can be useful in planning the work to be done and to unlock tacit knowledge and creative ideas in overcoming problems.
- *Completion.* This is the point to confirm the follow-through, aftercare, monitoring and feedback activities that will take place after handover. Traditionally this is where the design and building team walked away, often leaving both themselves and the occupier in ignorance. With integrated procurement a smooth, managed transition needs to be planned.
- *Initial occupancy.* This is where the designers feed their experience and insights to the users and operators, and learn from them. Good communication is vital. Meanwhile feedback systems will alert people to problems and allow function and performance to be reviewed against design expectations. Once any teething problems have been overcome, it will be time for the Post-Project review.
- *Fully in use.* Once the facility has settled-down and is fully in use, POE activities can be undertaken, looking at achieved levels of performance, occupant satisfaction and so on and identifying any scope for improvement through fine-tuning. After a period of stable operation, a Post-Implementation Review can be undertaken.

TABLE 1: GATEWAY PROCESS AND KEY FEEDBACK QUESTIONS

Procurement stage	Gateway Review	Key questions
Establish organisational need	GATEWAY 0: Strategic assessment	How well are our existing facilities really working? What do the users think about them? Could they or our processes be improved? What are the true user needs?
Develop business case	GATEWAY 1: Business justification	Have we looked at analogues? What benchmarks should we be using to assess our progress? Are our expectations too ambitious, or too modest?
Develop procurement strategy	GATEWAY 2: Procurement strategy	How do we make sure that we and our suppliers get the most advantage from feedback: first from their and our past experience, and then in the course of the work?
Strategic briefing		Have we made use of feedback information and experience in preparing the brief? Do we want to look in more detail at comparable facilities and their performance?
Competitive procurement	GATEWAY 3: Investment decision	How experienced are the candidates in operating feedback and aftercare services and in learning from these? How will we evaluate this in making our selection?
Award and implement contract		Are all the team members signed up to follow-through and feedback? Are they implementing and monitoring the appropriate procedures?
Detailed briefing		Have we stated our requirements clearly, where practicable in a form that can be monitored throughout the process? Should we visit comparable facilities together?
Outline design	DECISION POINT 1: Outline design	What has worked well in similar situations? What are the downside risks of the solutions proposed? What do the facilities managers think?
Detailed design	DECISION POINT 2: Detailed design	Does it match our strategic and detailed requirements? Are the proposals likely to be usable and manageable? Should mock-ups be built? What do the FMs think?
Construction		Are we reviewing what is being built and installed against the design proposals? Are we learning from experience as we go on?
Commissioning and completion		Have we prepared a plan for commissioning, handover and aftercare activities, including POEs and PPRs? Are the facilities management team sufficiently involved?
Take delivery of facility	GATEWAY 4: Readiness for service	Are the occupiers clear about the monitoring and aftercare services the design and building team will provide? Have they provided a workstation for them?
Initial occupancy		Have the occupants been told about the building, and who to contact about problems? Are the agreed aftercare, monitoring and POE activities being carried out?
Fully in use	GATEWAY 5: Benefits evaluation	Have you arranged for a PIR? Does this need POE input? Are there other lessons to be learned? Have you disseminated the feedback information?

<sup>6</sup> D Kernohan et al, *User Participation in Design and Management* (London: Butterworth, 1992) discusses ways of getting the most out of building visits and discussions with users.

### Techniques

#### 16. WHAT CAN YOU GET FEEDBACK ON, AND HOW?

Almost anything. For POE there are four main groups of techniques, which can be used individually, or combined in packages. In order of increasing detail these include:

- *Observation.* A lot can be learnt from just walking through a building, either alone or in a review group, recording impressions and observations, perhaps in relation to a standard checklist. This can include not just visual observations but quick spot measurements (e.g. of light levels, temperatures, air movement and noise) using hand-held instruments. However, although many things can be immediately apparent to a visitor, it is much better to include discussions with occupants and management, and make use of performance data if available.
- *Questionnaires and interviews.* There is little more useful than people telling you what they think<sup>7</sup>. Responses to standard questions can be compared with benchmarks, write-in comments on the questionnaire forms can give valuable insights, while interviews can fill in the background.
- *Facilitated discussions.* When people get together, they can spark each other off. People fear this can lead to arguments and ill-feeling, but if the discussions are properly facilitated even the most delicate situations can be made to generate light rather than heat. They can be undertaken at any stage in a project: sharing experience and insights at the start, reviewing problems in the middle, and in post-project reviews at the end.
- *Physical monitoring, measurement and analysis of performance statistics.* People often think that feedback has to involve a lot of measurement and expense; and often detailed measurement is expensive. However, comprehensive measurement is seldom necessary in practice. You only need to measure what is important to you.

#### 17. :THE IDEAL TECHNIQUE?

Ideally techniques should be simple to use; widely applicable; robust but comprehensive; cheap, quick and easy to operate; and give useful results speedily. Where possible, benchmarks based on performance data should be openly available: in the past this has proved difficult because steady funding for data management of benchmarks (which involves collating the results of past studies) can seldom be found. This helps to account for the lack of continuity in many POE activities. But costs are falling steadily as techniques become more streamlined and analysis more standardised. The internet helps as well, especially in distributing the results more effectively.

#### 18. WHICH TECHNIQUES SHOULD I CHOOSE?

Various studies have identified that no single, standard technique or set of techniques suits all circumstances. Instead, it is best to choose what suits you from a portfolio of alternatives – such as the one recently developed with the help of DTI and now operated a charity, see Annex B. It is helpful to start with one “hard” technical assessment (energy performance is often chosen), one “soft” one (e.g. an occupant survey), plus a post-project review by those involved.

#### 19. HOW MUCH WILL IT COST?

Almost as little or as much as you like. Individual survey techniques are now inexpensive, often involving the equivalent of a week's work or less. However, in improving the whole procurement process the implications are more far-reaching. If clients don't pay for the feedback required to improve the quality of their buildings, then they and other stakeholders will pay anyway in other ways - in terms of lost opportunity, unavoidable remedial measures, and reduced occupant satisfaction and productivity. Senior management often do not appreciate this: they want to take their buildings for granted, are irked that buildings can turn into expensive, risky distractions from their core business; and wish the industry would put its house in order. They think they should be entitled to effective operation of feedback systems and application of their findings as part of the industry's standard service and built into its normal pricing, even if currently this doesn't usually happen. But feedback is not yet the industry standard and somebody has to pay for the learning curve. Some clients may be prepared to do this explicitly. Others may prefer to write it into their requirements for design and construction services and evaluate the responses obtained.

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<sup>7</sup> “People are often the best measuring instruments, they are just harder to calibrate” – Professor G Raw, Psychologist, BRE.

### ANNEX A: What is feedback?

#### A1. A DEFINITION

The dictionary definition of feedback is “the modification, adjustment of or control of a process by its result or effect, especially the difference between the desired and the actual result”. Some feedback is instantaneous, e.g. the “negative feedback” loops in electronics and control systems, which improve stability by detecting the discrepancy between intended and actual outputs (e.g. an acoustic signal or a room temperature) and making the necessary corrections - a form of quality control. For buildings, feedback can be defined as “learning from what you are doing or from what you and others have done to understand where you are and to inform and improve what you are about to do”.

#### A2. LAYERS OF FEEDBACK

Figure A1 illustrates different levels at which feedback can be carried out in relation to building projects – from new construction through refurbishments to minor works. The solid yellow arrow along the top indicates (but only in a general sense) the passage of time, both for a project and for the life cycle of a building. It starts with client-related preparatory activities on the left, moves through implementation by the design and building team in the middle, and on through completion and handover into normal use on the right. It then implicitly circles back on itself as the building needs work (e.g. re-stack, alteration, refurbishment or even demolition), and another project starts. In this guide, our prime interest is in the central activities involving the design and building team.

#### A3. THE INDIVIDUAL LAYERS

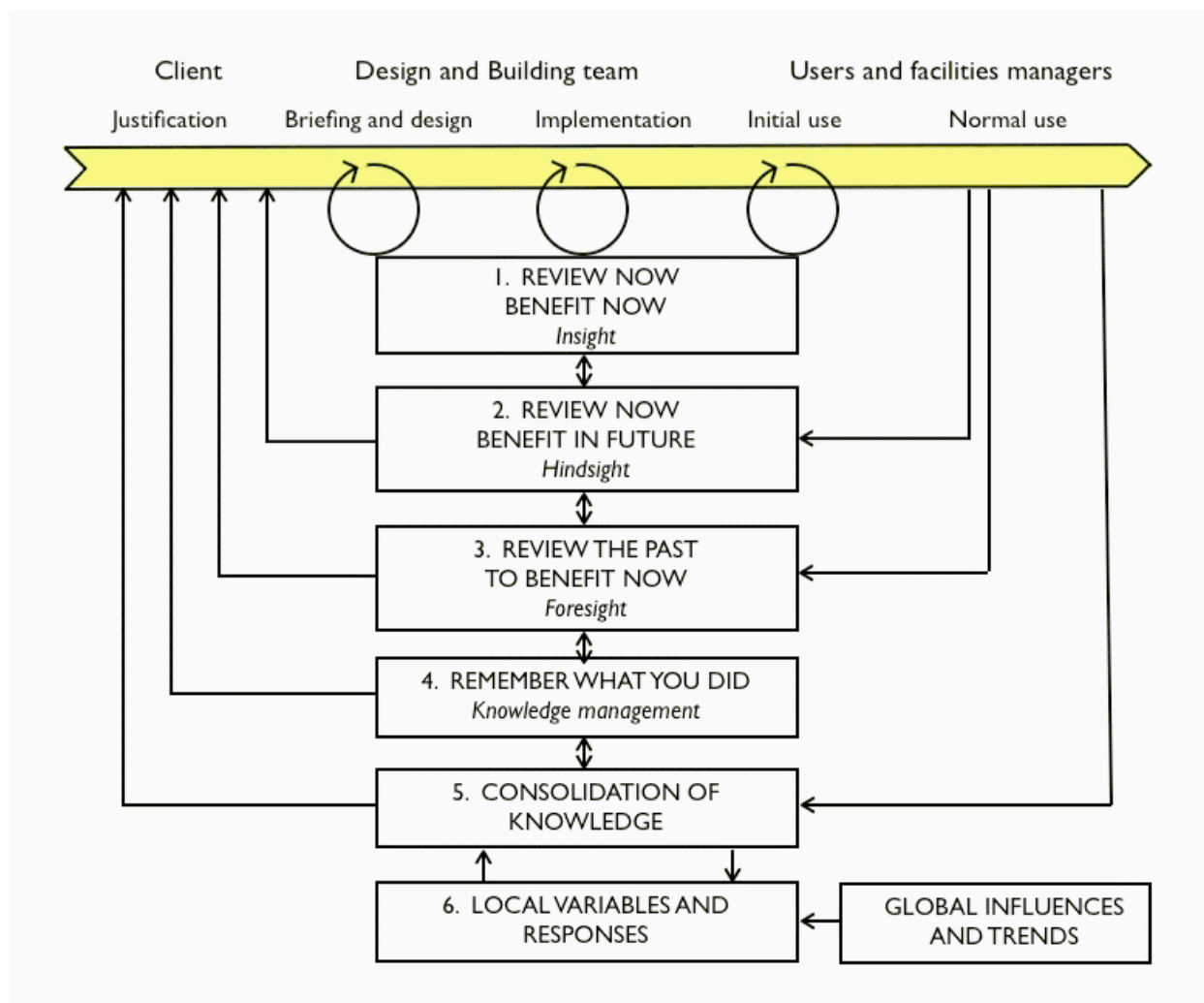
The layers of feedback in figure A1 are numbered in relation to their distance from the time line of the project and their increasing remoteness from the action on the project concerned:

- Those nearest the top are closest to the context of the projects and are the activities with which this guide is most concerned: Level 1, Insight; Level 2: Hindsight; and Level 3: Foresight.
- All these should feed into and be fed by Level 4 – Knowledge Management in the organisations and industries concerned, but that is not the subject of this guide<sup>8</sup>.
- Level 5 is the research and standard-setting loop, through which most formalised feedback has tended to take place, and which provides generalised knowledge which needs to be interpreted and applied to the project concerned as part of normal activities. Level 5 can be fed both from its own investigations and with data and insights from the project team’s feedback activities.
- Level 6 is more diffuse but more strategically influential feedback as a consequence of changes to the wider environment and the associated social, political, legal, technical and economic responses.

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<sup>8</sup> “Spreading the Word”, a research project sponsored by DTI in 2003-05, has investigated knowledge management in design offices and undertaken a series of case studies. The results are available via Constructing Excellence.

**FIGURE A1: LAYERS OF FEEDBACK**  
2004



**LAYER 1 - INSIGHT**

Feedback and feedthrough activities undertaken by the design and building team and their client while a project is in progress.

**LAYER 2 - HINDSIGHT**

Feedback from recent team experiences and outcomes into possible future activities, as yet unknown.

**LAYER 3 – FORESIGHT**

Feedback or recent and past experience by the client, the team and others into proposed future activities, e.g. in project definition, briefing and feasibility stages for both a project as a whole and for detailed aspects (e.g. the application of particular techniques and technologies).

**LAYER 4 – KNOWLEDGE MANAGEMENT**

Accumulation of specific and general past experience by all organisations involved, ready for future use

**LAYER 5 – CONSOLIDATION OF KNOWLEDGE**

Research into a range of experiences, activities and outcomes. Incorporation into knowledge, standards and practices for general application. Subject to influences from Layer 6, see below.

**LAYER 6 – OUTSIDE INFLUENCES**

Requirements throughout the nest of feedback loops will change with outside influences and perceptions, e.g. with greater awareness of the need for universal access, or to reduce carbon dioxide emissions – leading to changes in policies, attitudes and economics.

### ANNEX B: The Feedback Portfolio

#### B1. THE FEEDBACK PII

In 2001 the Confederation of Construction Clients (CCC), initiated a project with DTI under the “Partners in Innovation” scheme (PII), to identify what clients might need to help them to obtain feedback on the performance-in-use of their completed projects - particularly in the first few years of occupancy. After the CCC got into difficulties in 2002, the project was completed with the support of the steering group and a user group of leading designers with their clients.

#### B2. THE DISCOVERIES

The team’s research and the input from the steering group:

- Widened the remit of the project from POE to feedback throughout the life cycle of a building and of a project - be it new construction, alteration, or even demolition.
- Preferred a “pick and mix” approach to techniques to a single standard system. The Federal Facilities Council in the USA had also reached a similar conclusion, see Annex C.
- Identified serious client concerns that POE results would stay on the shelf and not get used, owing to the weakness of organisational “Knowledge Management” systems within design and construction firms, many client organisations, and the construction industry as a whole<sup>9</sup>.
- To avoid having to rely on potentially forgetful organisational systems, the emphasis of the project moved to making feedback and follow-through a routine part of project delivery for the design and construction team: the approach also adopted in the present guide.

#### B3. THE FEEDBACK PORTFOLIO WEBSITE

An important output of the PII project was the “Feedback Portfolio” website of techniques, results and contacts from which people can choose to suit their needs. The portfolio is open-ended, and will be developed over time.

#### B4. THE USABLE BUILDINGS TRUST

When the PII project ended in 2004, its products were made over to a new charity, the Usable Buildings Trust (UBT), which is dedicated to making feedback routine. The Portfolio, at [www.usablebuildings.co.uk/fp/index.html](http://www.usablebuildings.co.uk/fp/index.html), contains a selection of techniques to choose from, plus supporting information and contacts. All the material is accessible through a simple-but-powerful user interface, with every item clickable, and which is capable of being extended almost indefinitely.

#### B5. THE PROTOTYPE PORTFOLIO OF TECHNIQUES

The prototype Portfolio of Techniques available at the time of writing includes ten techniques that were tested in 2003-04 by a User Group of leading designers and their clients. At the request of the User Group, the techniques included were restricted to ones which had been developed in the UK, were appropriate for use in a wide range of non-domestic building types<sup>10</sup>, and which where possible had good track records, with benchmarks available where relevant. Members of the User Group wanted to keep the number of techniques relatively small, because they felt that too much choice would have been confusing, and non-specialised, because otherwise it would have been difficult to compare notes. As it happened, the techniques proved to be applicable in a wide range of circumstances.

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<sup>9</sup> Other projects are currently endeavouring to improve the situation, including the PII “Spreading the Word” which is looking at information dissemination within design offices, with partners from leading firms of a range of types and sizes.

<sup>10</sup> Many can be used in connection with other construction projects too. Specialist techniques (e.g. structural performance testing) or sector-specific ones (e.g. for healthcare and housing) are not included at present but can be added if there is sufficient demand.

### B6. THE FEEDBACK PORTFOLIO OF RESULTS

UBT plans to add a Portfolio of Results, to supplement the Portfolio of Techniques. A prototype has been developed and UBT is now seeking funding to put this into production. The Results Portfolio will start by indexing the material already on the website (e.g. the Probe studies), and adding new ones, including case studies of feedback applications undertaken with the feedback User Group, which has continued to meet after the PII ended and has recently begun to set up separate sub-groups, which will concentrate on different sectors.

### B7. CURRENT CONTENTS OF THE PORTFOLIO OF TECHNIQUES

Currently the techniques are in five categories: further categories will be added as the portfolio expands. Further details are available on the website.

- *Audit category.* This includes quantitative technical assessments, at present the CIBSE TM22 energy survey method, which was used in Probe – a series of 20 POEs of recent buildings published in *Building Services, the CIBSE Journal* between 1995 and 2002.
- *Discussion category.* This includes techniques which get people together to discuss what they are about to do (foresight), what they are doing (insight) or what they have done (hindsight). These currently include Learning from Experience workshops and/or interviews, and the post-project (hindsight) review workshops devised by HEDQF – the Higher Education Design Quality Forum<sup>11</sup>, initially for university buildings but now being used more widely.
- *Questionnaire category.* This includes the BUS occupant survey as used in Probe and elsewhere, the CIC Design Quality indicators and the Overall Liking Score, a rapid survey of occupant satisfaction.
- *Process category.* This includes techniques – Soft Landings and the BRE Checklist - which can be used to adapt procurement processes to incorporate feedback in an organised manner.
- *Packages category.* This currently includes Probe (see box below) and AMA Workware, which is most frequently used before and after making organisational and space planning changes.

### B8. APPLICABILITY OF TECHNIQUES THROUGH THE LIFE CYCLE

Figure B1 is the user interface from the prototype website, and shows where the techniques are most appropriately used throughout the life cycle<sup>12</sup>. The legend along the top of the table shows the life cycle stages<sup>13</sup>. Each letter can be clicked for details on its meaning in the particular context.

**FIGURE B1: SCREEN SHOT OF USER INTERFACE SHOWING STAGES IN THE LIFE CYCLE**

NOTE: Please ask for an up-to-date version if publishing.

About the Portfolio **Feedback Portfolio: Techniques**

Showing: Where used in life cycle [Development, Publication and Practical Details] →

	Prepare		Design		Implement		Finish		Use	
	Verify need	Strategic brief	Option appraisal	Develop design	Prepare to implement	Implement	Complete	Initial operation	Routine operation	Change
Showing: All [Audits] [Discussions] [Packages] [Process] [Questionnaires] ↓										
AMA Workware Toolkit	H	H	M	H				H	M	H
BUS Occupant Survey	M	M						H	H	H
CIBSE TM22 energy survey		M	M	M		M	M	M	H	H
CIC DQIs	M	M	H	H				M	H	H
HEDQF POE Forum									H	
Learning from Experience	M	H	M	M	H	M	L	H	L	H
Overall Liking Score	M	M						H	H	H
POE 1st year Occupancy		L			Prepare	Prepare	H	H		
Probe								M	H	H
Soft Landings		Prepare			Prepare	Prepare	H	H	H	

<sup>11</sup> HEFCE, the Higher Education Funding Council for England, now requires POEs to be done on the projects it funds. The HEDQF method is one way – but not the only way - of satisfying this requirement.

<sup>12</sup> H=High, M=Medium, L=Low, Prepare = Planning required here if the technique is to work effectively later.

<sup>13</sup> The stages on the Feedback Portfolio website are not identical to those in Achieving Excellence, because they have been coordinated with a wide range of procurement plans from the UK and around the world.

## A Guide to Feedback

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The ten techniques available to the User Group are shown in the left-hand column, in alphabetical order but colour coded by the Categories discussed above<sup>14</sup>. Clicking on the name of a technique opens two more windows: one with details of the technique, what it does, how and where it has been used, and how to get help; and the other with links to publications, websites and contacts.

### B9. WHERE THE TECHNIQUES FIT

The mapping of techniques gives some useful insights. For example, the Probe package was a method of POE and so is only directly relevant once the building is completed and best once it has settled into routine operation.

However, constituents of Probe have wider application, for example:

- The BUS survey is commonly used to find out what occupants think about a building before alterations, relocation or new construction is planned. This allows improvements to be targeted on the areas of concern and actual performance to be checked afterwards.
- The CIBSE TM22 method, though developed to assist energy surveys of buildings in operation, can also be used when developing design targets, and also in checking the likely performance of the design, in confirming what is installed and commissioned on site, and to review its performance in use. This “cradle-to-grave” benchmarking can provide greater transparency between expectations and outcomes.
- Soft Landings focuses on aftercare and feedback in the first few months and years of occupancy, but for the process to work well, preparation is required long beforehand, this the whole process focusing on building commitment and capability to deliver better outcomes.

#### **CASE STUDY – PROBE (Post-occupancy Review Of Buildings and their Engineering)**

*From 1995-2002, Probe, co-sponsored by Government and the Building Services Journal, undertook POEs – typically 3 years after completion – of twenty innovative buildings, which had been featured in the Journal when they were new. Such publishing should happen routinely, but in fact it occurs rarely in any country. The Probe studies showed that even good buildings could often be improved with the insights provided by such feedback. Probe’s key techniques were:*

- *a questionnaire to extract key information from the occupiers in advance of the main survey;*
- *an energy survey, which also threw light on many technical and management issues;*
- *an occupant survey; and in the later Probes*
- *an air pressure test of the airtightness of the walls, floors and roof.*

*Many people have commented “is that all it does?”; or “of course it is only about building services”. In fact Probe covers a wide variety of topics; it is unusual to do this much; very few POEs include benchmarked surveys of both “hard” technical and “soft” people issues; and building services tend to be the most problematic items as the CRISP reports showed.*

*“Probe’s coverage is more than enough. Anyone who says they want more or it isn’t right for them has probably not appreciated what it offers (including the face-to-face discussions), and should be sat down in front of a Probe Resource Pack (a 150-200 page report and appendices which underpin the 6-page article published) and talked through it. After 3 years, I still have mine by my desk and make regular use of it in planning improvements. It also benefited the design of another building.”*  
**MANAGER – OFFICE BUILDING SURVEYED IN PROBE**

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<sup>14</sup> Techniques in a single category can be shown by clicking the appropriate Category name [in square brackets immediately above the technique names].

## B10. ATTRIBUTES OF TECHNIQUES IN THE PROTOTYPE

Figure B2 is a screenshot of the user interface used to compare the attributes of each technique. The techniques list down the left is the same as in figure 1, but the top strip now shows the attributes in three main groups:

- Development status. How well established it is, whether development had ceased or is continuing, and whether the technique is accredited by recognised bodies.
- Publication status. How available in the public domain is the technique, the results produced, and the associated benchmarks.
- Practical details, in particular availability of software, how easy it is to do without specialist support (other than via the internet), and how expensive it is likely to be.

Each cell can be clicked for more precise information on the exact meaning of the term in context.

### FIGURE B2: USER INTERFACE SHOWING ATTRIBUTES OF EACH TECHNIQUE

*NOTE: Please ask for an up-to-date version if publishing.*

About the Portfolio **Feedback Portfolio: Techniques**

Showing: Development, Publication and Practical Details [Where used in life cycle] →

	Development status			Publication status			Practical details		
	Well established?	Development continuing?	Technique accredited?	Technique published?	Results published?	Benchmarks available?	Software available?	Easy to do yourself?	Level of effort and cost
Showing: All [Audits] [Discussions] [Packages] [Process] [Questionnaires] ↓									
AMA Workware Toolkit	H	M			L			L	M
BUS Occupant Survey	H	H	M	M	M	H	M	M	Varies
CIBSE TM22 energy survey	M	H	No	H	M	H	H	M	Varies
CIC DQIs	L	H	M	L	L	L	M	M	tba
HEDQF POE Forum	M	L	M	M	L	n/a	n/a	M	££
Learning from Experience	L	No	No	H	L	n/a	n/a	M	M
Overall Liking Score	M	M	L	M	M	L	L	M	L
POE 1st year Occupancy	No	No	No	H	No	n/a	n/a	H	L
Probe	H	H	No	M	H	H	H	L	M
Soft Landings	No	H	Not yet	Not yet	Not yet	Partial	n/a	Essential	H

## B11. POSSIBLE FURTHER DEVELOPMENTS

New techniques are likely to be added to fill gaps, for example on cost, sustainability, and specific aspects of technical performance. The classification will also be developed. More user interface screens and classifications may also appear, for example perhaps a portfolio of core techniques preferred by the User Group, and supplements showing emerging, specialised, sector-specific and international techniques. Discussions are also planned on improving compatibility between some techniques (e.g. common protocols for data scales, definitions, categories, means of presentation and data analysis frameworks); and eventually some techniques may even merge.



### ANNEX C: The Federal Facilities Council Report on POE

#### C1. POE USE BY GOVERNMENT AGENCIES

North America has long experience of Post-Occupancy Evaluation (POE). However, few Federal agencies do POE routinely. In 1987 a Federal committee recommended making POE more rigorous and systematic, and setting up a central database and dissemination system - but little actually happened.

#### C2. THE FFC REPORT

In 2000, the Federal Facilities Council (FFC), looked at the matter again. Its report<sup>15</sup> concluded that POE was no longer an option, but essential if agencies which had downsized and outsourced their building-related skills were to avoid becoming victims of an industry which did not understand the real needs of its clients, or how its products really worked in use. The barriers it identified were very similar to those revealed by CRISP and in the Feedback PII: limited senior commitment, poor knowledge management, lack of funds, fear of failure and adverse publicity.

#### C3. THE BENEFITS

The FFC saw POE as bringing many benefits in terms of supporting policy, testing new concepts, justifying decisions, making designers more accountable, improving quality and actively involving occupants. It found that the agencies and companies that used POE more routinely tended to link it to a business driver, particularly where facilities were important to their image (as with embassies), their customers (e.g. the Post Office) and to attract and retain staff (e.g. the army). Most POEs were undertaken within two years of handover of a new or refurbished facility.

#### C4. A STANDARD POE METHOD?

The FFC had expected to propose a standardised POE method. However, it concluded that this was neither necessary nor desirable: a balanced approach to suit the needs made more sense.

#### **THE FFC's SUGGESTIONS FOR ACHIEVING A SUCCESSFUL POE PROGRAMME**

- *State clearly what you want to achieve as an organisation and the part POE plays.*
- *Have long term management commitment to signal its importance.*
- *Collect the information, take the time to make sense of it, and have the will to share it.*
- *Match the resources for data collection and analysis to the available time and budget.*
- *Use a mixture of qualitative and quantitative, direct and indirect techniques.*
- *Create broad opportunities and incentives for participation and reflection.*
- *Require involvement in POE in contracts and pre-qualification for suppliers.*
- *Identify critical stages where feedback can be built in.*
- *Do POEs of innovative projects to decide whether to continue the innovations.*
- *Examine projects where there are complaints or controversy, to avoid repetition.*
- *Start by creating protected, small-scale opportunities for innovation and evaluation.*
- *Identify the likely users and how they will want the results communicated.*
- *Provide simple databases with information to suit different audiences.*

These points have been extracted from the FFC's report by the authors.

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<sup>15</sup> Federal Facilities Council, Technical Report 145, *Learning from our buildings: a state-of-the practice summary of post-occupancy evaluation*, National Academy Press (2001), Washington, DC, USA.