Post Occupancy Evaluation – A Simple Method For The Early Stages Of Occupancy
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1. Summary

This paper presents a post occupancy evaluation (POE) method, specifically targeted at the first twelve months of occupancy of an office building. As a backdrop to this, the paper discusses the benefits of routine post occupancy evaluation and the barriers to its implementation. The generic issues relating to a range of POE techniques are also described.

2. Why undertake a post occupancy evaluation?

Table 1 summarises some potential benefits obtainable from post occupancy evaluation (POE) studies depending upon when they are undertaken in the occupancy cycle, ie on occupation of a building, on a subsequent ongoing basis, or just prior to a move (when the name post occupancy becomes a misnomer). The benefits arising from any such study may accrue from, for example:

- staff time savings or improvements in efficiency through the provision of appropriate facilities (eg local meeting spaces aid team work);
- staff reduction in discomfort thereby reducing instances where staff feel physically affected in their work (eg glare on computer screens, noise in the open plan, improved chairs);
- increased staff motivation (eg the provision of local coffee facilities, cold drinking water machines in response to staff requests);
- an ability to prioritise facilities budgets more effectively (eg knowing that lighting is the biggest concern to staff);
- an ability to spot potential system inefficiencies (eg inappropriate time clock setting, windows open and the heating on).

3. Where are we now with post occupancy evaluation?

The familiar DTI Partners In Innovation (PII) funded PROBE series[1] of post occupancy evaluation studies (POEs) is one widely known example of a broad spectrum of UK POE activity, going back many years. Reviews of POE activity have previously been carried out by Cooper [2] and Jaunzens [3]. This activity has covered a wide range of issues, including technical performance, energy and environmental performance, cost-effectiveness, and client and occupant satisfaction.

Although POE methodologies have long been available, there is very little feedback data in the public domain, apart from the PROBE studies, and hence the value of many of the methods used has not been able to be publicly demonstrated. An ongoing PII project led by the Confederation of Construction Clients, 'A Feedback System for Construction Clients and the Industry' is currently documenting available POE methods. Further details can be obtained from the project manager, Bill Bordass, at bilbordass@aol.com.

The last few years have seen concerted efforts to promote routine POE. For example:
- The Confederation of Construction Clients (CCC) has a mission to 'secure major measurable and consistent improvement in performance across the industry'. Its Clients' Charter [4] obliges signatories to obtain feedback on building performance.
- The Construction Best Practice Programme (www.cbpp.org.uk) administers a series of performance measurement tools including key performance indicators for customer satisfaction with the construction product and the construction process.
- BREEAM 2002 [5] gives a credit for having a means of measuring staff satisfaction, and a further credit for using it to set performance improvement targets.

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- RIBA Practice Services suggest [6] that in terms of the interaction between clients and users, the greatest improvement would come through 'the provision of systemised feedback and in instituting POE'.

CIBSE itself has given its support to POE through encouragement for the PROBE studies and in supporting the PII funded work presented here – the development of a post occupancy evaluation method specifically aimed at the first twelve months of occupancy.

4. What POE techniques are available?

Depending upon the purpose of the POE study, any aspect of the construction process or the construction product can be assessed. Methods employ a range of techniques, eg questionnaires, interviews, focus groups, measurement, observation. The relevance of a technique depends upon, for example:
- the level of detail required in any resulting report;
- the level of information available to support an evaluation;
- the amount of funding available balanced against the expected payback;
- the skill levels of the people who will be undertaking the tasks;
- the degree to which a problem has already been identified.
This is discussed further in Table 2.

The most accurate evaluation can usually be gained from employing techniques in effective combinations, eg a widely circulated questionnaire as a basic 'health check' of a building and a focus group to examine any major problem identified in more detail. The key is:
- to be appropriately holistic (looking at the interplay between the physical environment, facilities provision, and organisational attitudes);
- to dig deep (look for both cause and effect);
- to verify the results obtained subjectively (either through objective measurements or through balancing subjective opinions from a broad range of players);
- to involve all parties (assessing perception and reality, for example in the case of productivity impacts, do staff and managers' opinions coincide);
- to be robust (that is transparent in methodology so that results can be interpreted with the appropriate degree of assurance, limitations can be understood, and repeatable if benchmarking or trend checking is to be undertaken).

For example in the case of a possible problem concerning poor indoor air quality, it may be necessary to understand whether it is caused by:
- an increase in occupant density and subsequent lack of system re-commissioning to upgrade air flows due to the facilities manager being unaware of the need;
- a change in space layout such as the movement of a desk that is temporarily blocking an air flow path because the occupants have not understood the ventilation system operation;
- the introduction of a partition to counteract an increase in noise levels arising from teamwork in an open plan space necessitated by a lack of meeting rooms.

Cost implications
The cost implications of a post occupancy evaluation study are dependent upon the technique being applied, the levels of in-house versus external staff involved, the need for specialist equipment, and the size of the building being assessed. The resulting cost savings arising are dependent upon the scale of the (potential) problem (averted) discovered, the ability to resolve any problem identified, and the nature of the work being undertaken within an organisation and hence staff value (ie the need to manage risk).

Although difficult to quantify in general terms, a decision can be made on an organisation by organisation, or building by building basis about how much a client is willing to invest in POE. For example in a 2000m^2 office of 200 staff at an average annual cost to the company of

£30,000 each, annual staff costs per m^2 are £3,000. The cost of the possible POE techniques can be calculated on a cost/m^2 basis and the result expressed as a % of staff costs. This can then be considered in the light of credible likely impacts of staff performance on the building, not forgetting the need to commit funds to remedy any problems discovered.

5. Barriers to routine POE
If POE is so useful and effective, why isn't it a standard part of every project? A study by BRE for CRISP [3] revealed a range of barriers, for example:
- Clients who believe they spend enough time and money procuring a building and are therefore unwilling to pay more when it is meant to be finished. Clients who believe that the design team and its future clients will reap most of the benefits of a POE anyway, while a bad result might even reduce the value of their own building.
- The project team who believe that they cannot afford to carry out a POE themselves and need permission from the client and the occupier in any case. If they do unearth a problem, they could attract responsibility for sorting it out and they might even be sued. They believe that their PI insurance premium could rise to cover the increased risk; and their insurance could even be invalidated.
- Occupiers who believe that moving in is disruptive enough and they now want to get on with their work. They are not convinced of POE's cost-effectiveness. It may also get them into trouble with their staff, particularly if they have already been complaining about something.

6. A successful POE study
To carry out a successful POE study, enthusiasm from all the participants is necessary. This entails:
- all those taking part believing in the potential benefits;
- all those taking part seeing the usefulness of their own contribution;
- the contributions required being made manageable in terms of the time and cost implications;
- giving feedback to be given on the POE exercise itself.
If in any doubt advice should also always be sought from one's PI insurer.

Although there are advantages associated with an independent evaluation being carried out, the first twelve months of occupancy would normally see the design team still associated with the building. Hence an in-house evaluation might be more practical. Regardless of who is carrying out the exercise, it must be undertaken in a spirit of mutual respect for the opinions of all parties, openness, co-operation and collaboration rather than litigation. Ideally therefore the wish to undertake POE should be implicit from the start of the project process. In this way:
- the project team can be clear about the basis on which they will be judged;
- POE can be seen in a positive light throughout rather than a hastily bolted on extra;
- any cost implications can be tackled openly and constructively.

7. POE – a method for the early stages of occupancy
With all this as a backdrop, in 2000, a team led by BRE and including CIBSE received DTI PII funding to investigate the opportunities for POE in the first year of occupancy (ie pre-PROBE), and specifically to:
- Explore liability issues with designers, professional bodies and insurance companies.
- Seek ways to remove the culture of fear, blame, and conflict.
- Develop a POE method for use by designers offering a post-handover service, or by experienced clients, building on available techniques where possible.
- Focus on issues that regularly cause difficulties, where the design team can work with clients and occupiers to propose an action plan to improve building performance.
- Encourage designers to offer these services to their clients, and clients to request them.

The remainder of this paper concentrates on the method development. It has proved unrealistic to propose a full-blown POE procedure at this stage, given the big difference between what might reasonably be done and how little normally happens today – a situation further exacerbated by the remaining uncertainties about liability. Instead, the team has decided to develop a voluntary Code of Practice. This is based at a strategic level and is intended to focus attention on considering key aspects of building performance that merit attention at the early stages of occupancy, as well as the need to instigate more detailed processes to be put in place over the lifetime of the building.

The main tool is a checklist to be used as part of a client / project team dialogue, intended to:
- Ease less experienced or one-off clients into POE by providing a quick, simple and inexpensive means of holding a post handover dialogue with their project teams.
- Allow more experienced or repeat clients to adopt or adapt it as part of their standard project management procedure.
- Help the supply side to develop POE as a standard part of the services they offer.
- Work towards problem reduction and resolution by confirming that key actions have been undertaken in areas known to be critical, or that plans have been made to achieve them.

This is supplemented by an explanatory document for less experienced clients and designers.

Table 3 lists the issues covered within the method in its September 2002 version. For reasons of space these are simply tabulated, however a formatted POE method can be viewed at www.cibse.org.uk/research. On the website it appears in the form of an audited list with space for compliance methods to be noted, any relaxations agreed, and notes of further actions to be taken. These are presented with a number of suggested means of compliance. It should be stressed that these are simply suggestions and that a satisfactory consideration of these issues can be undertaken in a number of other ways. Contractual obligations will also differ from project to project.

The eight critical areas identified are:
1. Commissioning and fine-tuning of building services.
2. Commissioning and fine-tuning of controls.
3. Initial technical information, support and training.
4. Information and training for non-technical staff.
5. Keeping information up to date.
6. Keeping training up to date.
7. Client feedback and learning.
8. Client/design team communication.

The method is intended to be used at either an agreed single point or points within the first twelve months of occupancy. If the check is being carried out as a one-off it may be necessary to wait until the end of the first twelve months of occupancy to ensure a sensible result. However it would appear to be more beneficial to carry out the checks at intermediate key points within the first twelve months to ensure that problems are dealt with as soon as possible. The method should be used by a representative(s) from the project team and client/occupying organisation as appropriate. The issues covered may fall under the responsibility of a project manager, facilities manager, human resources manager, architect, services engineer etc. Whoever is present as part of the process will need to be able to comment on their behalf if they are absent.

The basis for its use will be agreed, for example, it might be voluntary as part of an informal project round up, or contractual as part of a formal project review. It will also need to be used in an agreed form, for example in its entirety, priority sections only, or with the use of additional questions on issues of particular concern to the client.

6. Feedback so far

Aside from consultation exercises with engineers and architects, three case studies have been carried out to test the method to enable it to be refined and made freely available in the winter of 2002. The feedback from these case studies will appear on the Construction Best Practice Programme website. It has however been generally agreed that the method is:

- a very useful aide-memoire bringing together many diverse issues that may fall between two stools;
- reminds people of what ought to be done but which often isn't; and
- can be used beneficially even in a short session.

7. Acknowledgements

8. References

1 'PROBE 23, the Centre For Mathematical Sciences', the PROBE team, Building Services Journal, July 2002.
2 'Post occupancy evaluation - where are you?', I Cooper, Building Research and Information, Volume 29, Number 2, March-April 2001.
3 'Encouraging Post Occupancy Evaluation', CRISP Commission 00/12, D Jaunzens, M Hadi, H Graves, available from www.crisp-uk.org.uk.
4 'Construction Clients' Charter', Confederation of Construction Clients, www.clientsuccess.org.uk.
5 'BREEAM 2002 for existing offices', BRE
6 RIBA Practice Services response to Egan (www.architecture.com)

Table 1: The benefits of post occupancy evaluation			
Stakeholder	**On occupation or within first 12 months**	**On a subsequent ongoing basis**	**Prior to a move**
Benefits to clients	• ensures that the building provided matches the design brief • facilitates joint problem solving whilst the project team are still on board • ensures that the building operates optimally from the outset • ensures that culture change programmes are being effective	• allows building performance to be maintained • allows building performance to be benchmarked • highlights areas where improvements could be made to reduce costs, improve environmental conditions, or modify the provision of facilities to meet changing business needs • avoids complacency	• informs requirements for new premises • prioritises funding allocation • secures pre-move buy-in to planned changes, including culture changes to be facilitated by the new premises
Benefits to end users	• ensures that the working environment is satisfactory and supportive • ensures that end users understand and are able to exploit the means to control their working environment • ensures that facilities provision is adequate	• ensures continuing satisfaction with the internal environment and facilities provision • demonstrates the commitment of an organisation to providing staff with a suitable workspace	• allows staff to inform the brief for subsequent premises • allows staff to voice their concerns
Benefits to facilities managers	• ensures that they understand the building operation • ensures that they are aware of likely problem areas for subsequent monitoring	• allows the FM team to interact positively and proactively with the end users making the reporting and resolving of problems easier • allows the FM team to prioritise their funding allocation • allows the FM team to demonstrate the value of their own performance • allows opportunities for potential savings in, or reuse of, space to be spotted, creation of informal meeting room provision or quiet space • provides early warning of any problems	• allows the FM team to inform the brief for subsequent premises, avoiding past deficiencies
Benefits to the project team	• immediate feedback and the opportunity to jointly resolve problems in a mutually supportive atmosphere • a learning experience for all staff within the organisation • fine tuning can be carried out in an informed manner	• the maintenance of ongoing customer relationships	• the development of a better informed brief and subsequently smoother design process

Table 2: Some POE Techniques			
Technique	**Advantages**	**Disbenefits: cost or resource implications**	**Notes**
Questionnaires	• Obtains detailed qualitative data from end users • Allows performance benchmarking • Enables a problem to be geographically pinpointed • Obtains a broad based opinion • Can be re-administered in a controlled manner to ascertain trends or response to any remedial actions	• Requires skilled design to ensure questions are clear, unbiased and diagnostic • Requires staff time to complete • Requires staff time to chase responses • Requires resources to analyse the responses received, some expertise in statistical processes required, graphical presentation	• Determine whether a standard or tailored questionnaire is required • Ensure that questionnaire can be completed within 20 minutes • Determine acceptable degree of statistical rigour as will impact on response rates needed and actions required to chase up responses • Ensure that staff are clear about the actions to be taken in response to questionnaire results • Can use electronic questionnaire storage and completion mechanisms
Focus Groups	• Takes minimal management time to prepare provided that the purpose of the group is clear • Involves less staff (although for more time) • Can tackle particular issues in a great deal of detail as issues can be explored by the group • Can be flexible to allow unexpected avenues to be explored	• Requires expertise in facilitation to ensure a balanced discussion • Obtains variable degree of qualitative data from a small number of staff • Runs the risk of being biased by the opinions of a few staff • Removes the possibility of anonymity	• A suggested focus group size is 6-8 staff • Suggested maximum length of 1 hour • Consider selection process. Voluntary attendance may bias the responses, selected attendance may have time implications for the chosen individuals
Interviews **eg of the facilities staff, business managers**	• Allows an issue to be considered from a range of aspects if interviewees are carefully chosen • Can be restricted in the time required to take part to key personnel who can be approached as part of their normal roles	• Obtains detailed qualitative data but on selected issues • Removes the possibility of anonymity • Runs the risk of bias in responses • Unlikely to include any end user input	• Interviewees need to be selected carefully to provide a balanced perspective
Physical monitoring **eg light levels, noise levels, air and radiant temperatures, CO_2 levels, air flow rates**	• Provides quantitative objective data • Enables a problem to be geographically pinpointed • Enables a problem to be time pinpointed (eg season, time of day)	• Requires expert taking of measurements and interpretation of results • Suitable equipment may have to be hired or external consultants used • May require long term measurements and equipment being left in situ	• Needs a level of acceptable environment to be defined for comparative purposes • Needs a clear strategy to determine measurements points, frequencies and duration of monitoring • BMS data will be invaluable provided that the BMS sensor accuracy has been checked • Can be combined with energy monitoring to assess overall building energy efficiency
Observations **eg space use audits, energy walkabouts**	• Requires few staff resources • Can be carried out without any end user involvement or inconvenience • Can provide quantitative data if designed appropriately • Can provide an unbiased viewpoint and may reveal a problem that has not previously been noticed, ie one which has no owner	• Comparison can be difficult unless observer is given a methodology to apply	• Can be carried out on one area in detail over a specified period, eg a canteen over lunchtime; or of a whole building

Table 3: Post occupancy evaluation method, version Sep 2002 - the key checks

Check	Method of compliance, please indicate as appropriate
1.0 Physical performance of the	
1.1 Adequacy of commissioning records verified	• Record sheets for all items in commissioning schedule signed by competent person and placed in the O and M manual
1.2 Satisfactory remedial actions in place for those items requiring post handover commissioning	• Contract documents held by project manager include a methodology for resolving items on agreed snag list, which details actions, responsibilities and time frames for action
1.3 Completion of post handover commissioning	▪ Records of fine tuning activities undertaken are signed off by the Facilities Manager and kept in the O and M Manual
Operation of the controls and	
2.1 Adequacy of commissioning records verified	• Record sheets for all items in commissioning schedule signed by competent person and placed in the O and M manual
2.2 Satisfactory remedial actions in place for those items requiring post handover commissioning	• Contract documents held by project manager include a methodology for resolving items on agreed snag list, which details actions, responsibilities and time frames for action
2.3 Completion of post handover commissioning	▪ Records of fine tuning activities undertaken are signed off by the Facilities Manager and kept in the O and M Manual
3.0 Initial technical information,	
3.1 Adequacy of O and M Manuals verified at handover	▪ Contents comply with the requirements of the CDM Regulations. To be signed off by the Planning Supervisor and placed in the O and M Manual ▪ The contents comply with the requirements laid down in the HOBO (see note 1) document. To be signed off by the Project Manager and placed in the O and M Manual
3.2 Schedule of technical training approved	▪ Confirmation that technical staff training will be undertaken as per the original contract documentation. This should provide details of: the programme; numbers to be trained; means of testing and certification; and any other items required. Detailed requirements confirmed as appropriate by the design and building management teams and signed off by the Facilities Manager
3.3 Formal training programmes undertaken for both internal and outsourced facilities / maintenance staff as appropriate	▪ Appropriate training has been undertake as agreed (including study of the O and M Manual and emergency procedures). Signed training records for all relevant technical staff are supplied, held and managed by the Facilities Manager (or Human Resources Director as appropriate)
3.4 Suitability of O and M Manual reviewed by occupier	▪ Initial comments by the Facilities Manager on the suitability of the O and M Manual at the time of handover have been received ▪ Further comments have been received from the Facilities Manager and technical staff after training is complete and experience has been gained ▪ Revisions made to O and M Manual as appropriate and signed off by the Facilities Manager
3.5 Confirm that appropriate operational and maintenance procedures are in place	▪ Early discussions have taken place between the client and the design team to confirm requirements, which have now been acted upon ▪ Discussions are currently ongoing to put in place appropriate procedures

4.0 Initial information and	
4.1 Staff handbook preparation	• Draft staff handbook has been included in the O and M Manual • Facilities Manager has proposed revisions to the staff handbook to suit the actual use of the building • Facilities Manager has approved the final version of the handbook prior to publication
4.2 Schedule of staff training	• A detailed programme of training has been prepared, which includes any elements agreed within the original contract documents, and has been agreed with the Facilities Manager
4.3 Staff training undertaken	• Signed training records (or a list of all those having attended) for all relevant staff are held and managed by the Facilities Manager (or Human Resources Director as appropriate)
4.4 Staff handbook distributed	• Notes of issue to, or receipt by, staff to be included in the training records above. Copy of the handbook issued to be held by the Facilities Manager within the O and M Manual
5.0 Keeping information up to	
5.1 Suitable arrangements made to store plant drawings and building documentation for ease of viewing and updating, together with a secure archive	• Facilities Manager confirms that arrangements are in place, details of which are held with the O and M Manual
5.2 Ease of access to emergency information verified	• Facilities Manager confirms that emergency information is clearly highlighted within the O and M Manual, and emergency procedures are properly included in staff training
5.3 Formal responsibility for updating of building information	• Facilities Manager confirms that adequate arrangements are in place, with details held in the O and M Manual. All changes made, and the reasons why, are recorded in the O and M Manual
5.4 Appropriate BMS trend logging established	• Facilities Manager confirms that a system is in place and that this has been discussed with the relevant Project Team members
5.5 Suitable M & T programme established for water and energy	• Facilities Manager confirms that this is in place, accompanied by adequate sub metering, and guidance from the Project Team on expected first and subsequent year's performance
5.6 Appropriateness of maintenance budget and staff verified	• Facilities Manager confirms that any pre-existing budget and resource forecast has been considered in the light of building performance
5.7 Mechanisms established for appropriate routine observational checks by facilities management	• Facilities Manager confirms that any pre-existing budget and resource forecast has been considered in the light of building performance
6.0 Keeping training up to date	
6.1 Formal arrangements made to train new technical and building	• Facilities Manager confirms that adequate arrangements are in place and that Human Resources (if appropriate) have been made aware of this need. Arrangements are documented in the O and M Manual
6.2 Feedback sought on the adequacy of the training given and remedial measures taken	• Facilities Manager confirms that a system of post-training interviews is in place; that any feedback received is recorded and held with the O and M Manual; and that remedial action is taken

6.3 Formal arrangements made to train new staff occupying the building	▪ Facilities Manager confirms that adequate arrangements are in place and that Human Resources (if appropriate) have been made aware of this need. Arrangements are documented in the O and M Manual
6.4 Feedback sought on the adequacy of the training and documentation given to end users	▪ Facilities Manager confirms that all (or a representative sample) of staff have been consulted with regards to the adequacy of the training received ▪ The staff handbook contains a feedback form on which staff can comment on the quality of the training and documentation received
7.0 Client feedback and training	
7.1 Formal interviews carried out with key staff, eg IT and HR Directors and Managing Director to obtain both positive and negative building performance feedback	▪ Facilities Manager confirms that a system is in place and that records of discussions held and actions taken are held with the building log-book and O and M Manual and feedback given to those taking part
7.2 Formal end user post occupancy satisfaction survey undertaken to obtain both positive and negative building performance feedback	▪ Facilities Manager confirms that a system is in place and that records of discussions held and actions taken are held with the building log-book and O and M Manual and feedback given to those taking part
7.3 Formal interviews carried out with facilities staff / maintenance team to obtain both positive and negative building performance	▪ Facilities Manager confirmed that a system is in place and that records of discussions held and actions taken are held with the building log-book and O and M manuals and feedback given to those taking part
7.4 Lessons learnt from the building in relation to the suitability of original brief over the first 12 months occupancy formally recorded	▪ In the case of a repeat client a formal consideration of the implications for the original building brief has been made and the record taken passed to the appropriate client representative
7.5 Widely promoted end user contact point or help facility	▪ Facilities Manager confirms that this is in place and that records of all complaints logged, with the remedial actions taken, are recorded and kept with the O and M Manual
7.6 Feedback provided to staff on building operation	▪ Facilities Manager confirms that system is in place
7.7 Formation of building user group to provide continuous feedback	▪ User group has been formed with clearly defined remit and reporting mechanism
8.0 Client / design team	
8.1 Client aware of contact details for relevant project team members should problems occur	▪ Contact details for all involved parties are located within the building log-book

8.2 Client aware of responsibilities for action of relevant project team members should problems occur	• Contract documents clearly state the roles and responsibilities of each project team member during the defects liability period
8.3 Special arrangements for persistent problems have been put in place	▪ Explicit processes have been documented which indicate the circumstances under which it is appropriate to involve the project team in collaborative problem solving, and the manner in which this should be achieved.
8.4 Design team involvement in client feedback activities	• Explicit agreements have been made as to whether and the extent to which the design team should be involved in the Activities listed in Section 5.0.
8.5 Formal wash-up sessions planned between the client and the project team	▪ An end of first year of occupation meeting will take place between the Facilities Manager and the Project Team to consider the issues arising from this process. ▪ A more frequent documented system of review has been put in place to correspond with the original contract requirements or at a frequency agreed between the Facilities Manager and the design team

Note 1: HOBO documentation will be available from an ongoing PII project developing handover protocols, contact Mike Jaggs at BRE, jaggsm@bre.co.uk.