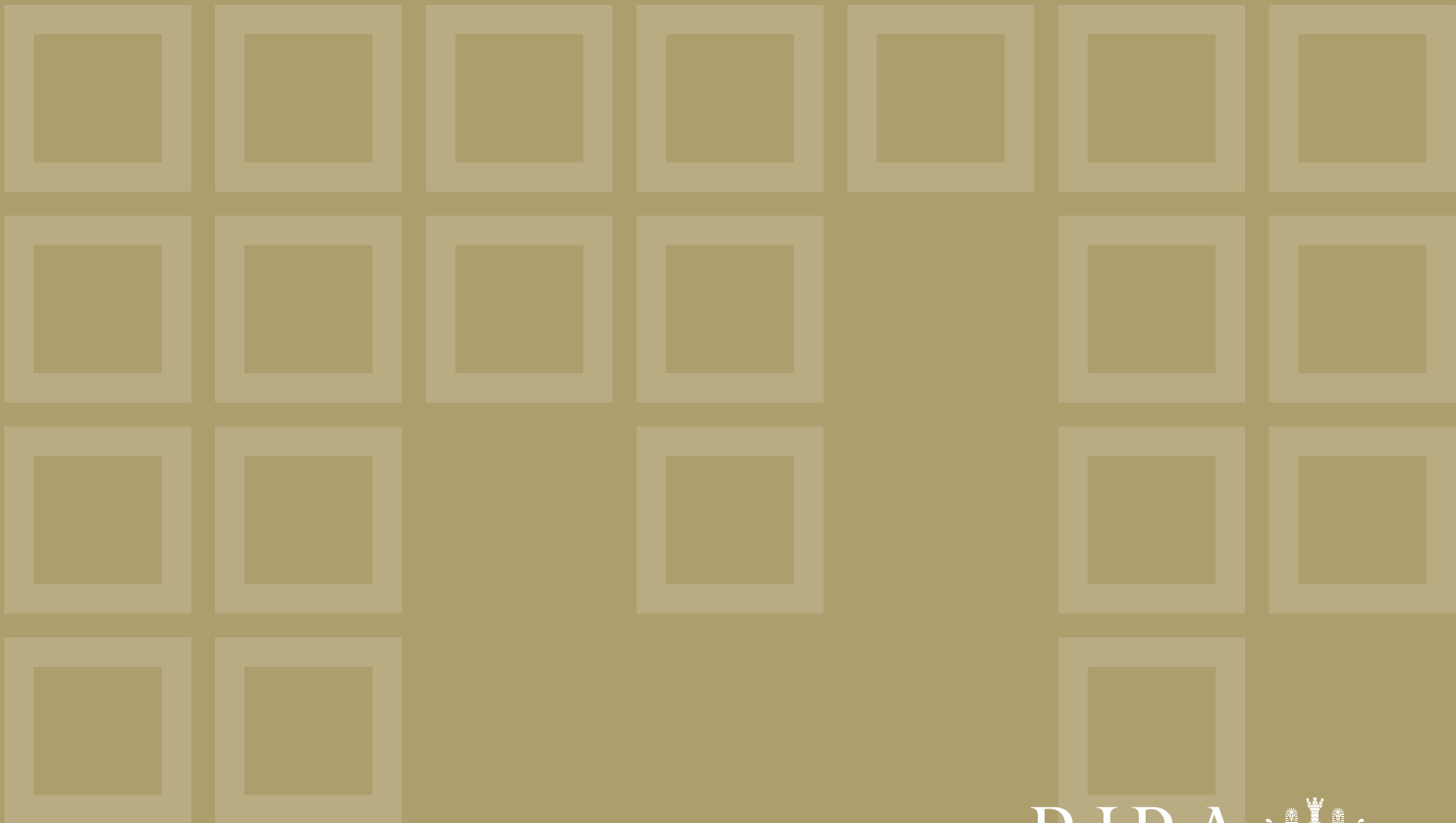


Building Knowledge:
Pathways to Post Occupancy Evaluation



Building Knowledge: Pathways to Post Occupancy Evaluation

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Foreword

RIBA Benchmarking shows that 10% of RIBA Chartered Practices offer Post Occupancy Evaluation (POE), but this service has contributed a negligible amount to the turnover of RIBA Chartered Practices. This means that the profession is missing a trick in demonstrating its value. Whatever you want to call it Post Occupancy Evaluation, Building Performance Evaluation or just learning from projects, feedback is vital for any successful future of our profession.

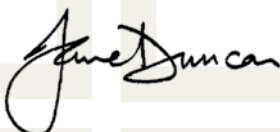
POE is about putting people and their needs first. We can't make an environment that is good for people without knowing what they want, and making sure that they receive it from our designs.

POE is about reducing waste. Enormous amounts of money, time, effort, energy and resources go into creating inappropriate buildings that have to be adapted or even demolished only a few years after completion. Only by finding out how our buildings are behaving can we know how to build better in the future and avoid a proliferation of the industry's mistakes.

POE is not just about assessing energy usage. It can show how well a business performs in its new offices, the number of coffees sold in a cafe, the homeliness of sheltered accommodation, the urge to dance in a club, the sense of collective identity felt by a community, the learning attainment of schoolchildren, and even the stress levels experienced by women giving birth. Architects work can and does impact on all these things and we really need to know how.

Users' testimonials, focus groups and interviews are all valid sources of information. Not only does asking others to reflect on their environments give us important information about how to improve, it also involves them in the design process, improves their understanding of how their spaces work and might even make them into better clients in the future.

Finally, POE does not have to be complicated or expensive. The guidance in this document shows how all practices, whatever their size or circumstances, can be gathering information on the success and even the weaknesses of their schemes and using this information to develop their unique relevant practice offer. It also reveals a hunger from clients and others for more information on how their buildings work and even a growing readiness to pay for such services. We really need to pay this heed, and learn from the practices featured in this report.



Jane Duncan
RIBA President 2015-17

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Executive summary

The case studies in this report indicate that the time is right to make Post Occupancy Evaluation (POE) a standard part of architectural practice. POE is widely recognised as being central to addressing the gap between designed intentions and the actual outcomes in use, and pivotal in understanding the wider socio-economic, environmental and cultural impacts of investment in good design. POE is not just about energy and user satisfaction but can also include more intangible issues such as productivity, identity, atmosphere and community.

There is also a clear appetite for POE from clients willing to pay for the service, particularly those with a long-term stake in a building and who have an interest in ensuring their estate is as resource efficient as possible. Organisations from the commercial, public and voluntary sectors are keen to understand how their projects are working and how they can be improved. This is driven by a long-term commitment to enhance a buildings' environmental performance, reduce running costs, and increase occupant health, wellbeing and productivity while achieving a positive impact on the wider context.

With the 'greening' of business and growing impetus of Corporate Social Responsibility, organisations require robust and holistic evaluation methodologies that evidence the meeting of long term sustainability targets. POE can also demonstrate through the setting of SMART (specific, measurable, agreed, realistic and time bound) objectives the impact of buildings on organisational and staff productivity, community identity and brand. Tracking these results over time can demonstrate the impact of business strategy, estate development and facilities management. POE data can be impressive to clients when architects are pitching for work, while being useful to them in justifying the decision to hire a particular architecture practice to their funders. This is why it plays an increasingly integral role in the work of the most forward looking and innovative architectural practices.

POE can take on various shapes and sizes, from light touch to more intensive, and each POE should be tailored to individual project contexts to measure what is defined as important to the client and project team, ensuring that a building has been operational

sufficiently long to make an effective assessment. Whilst some practices carry out POE in house, others opt for an external consultant or academic collaborator to draw in research expertise and ensure objectivity. Ideally the whole project team will participate in the POE process to promote shared learning and responsibility. Once completed a strategy is needed to ensure that POE knowledge will be used and fed-back into further projects, and communicated more widely to evidence best practice, performance and value.

POE provides a nexus for shared learning about what works, what doesn't and why – yet the acknowledgment of poor performance is not something that many architects feel comfortable with. The case studies presented here clearly indicate that the impact of this risk can be reduced or eliminated, particularly when building projects are undertaken in the spirit of shared accountability and continuous improvement. The case studies also show the clear commercial benefits to architects for whom POE can enhance practice credibility, reputation and position in the market-place as well as opening up new funding streams, making the process not only viable, but potentially profitable.

The experiences of the case study practices offer key lessons for other architects who want to integrate POE into their work.

Client Benefits

There is a market for POE amongst commercial clients who have a long-term stake in their buildings, are keen to understand how they are performing, and how designs can be improved in future commissions. Design practices can offer POE as a core service for which these clients will pay. The development of learning through POE can be fed into future projects to refine processes, designs and hand-over procedures which are of mutual benefit to clients and designers.

Business Benefits

POE provides a means through which businesses can develop and evidence their company ethos and brand. POE research should be developed strategically to develop practice specialisms. The sharing of this expertise can help to establish and consolidate a practice as a leader in the field, providing a platform

to influence clients and commissioners about the benefits of investment in good quality evidence-based design.

Risk Reduction

POE provides solid information as a basis for decision making and risk reduction that can be developed by clients in the long term and adjusted to take into account critical issues such as climate change.

Collaboration

POE is best undertaken as a collaborative process, involving different members of the project team to promote shared learning and trouble shooting from a range of disciplinary perspectives. POE research can lead to the resolution of issues through better building management and user education.

Advancing knowledge

To be a professional is to have custody of a body of knowledge. Developing POE is an essential step in demonstrating and developing the effectiveness of what architects do. Knowledge developed through POE feeds into knowledge management strategies within both practice and the wider built environment community facilitating greater organisational learning and innovation. Collaboration with the academic community provides access to the expertise and resources to undertake robust POE research, lending rigour and credibility to findings and analysis.

Continuous Improvement

Carrying out POEs on a sequence of projects – ideally with the same team – creates a virtuous cycle of learning and improvement. Undertaking POE research across a number of projects allows for comparisons to be drawn between buildings of a similar type and helps practices to highlight and develop their strengths, while identifying and addressing their weaknesses.

Carrying out a POE before and after a refurbishment or retrofit enables the measurement of improvements, and highlights areas that might need further attention. POE is also helpful to clients in defining priorities for a

new project based on the systematic evaluation of an existing facility.

Evaluating experience

Simple yet effective POE methods such as building walk throughs and round table focus groups can clearly elucidate what has worked and what hasn't from the user perspective. Qualitative approaches help draw out stories of the impact of a project or building on the different groups involved. Creative approaches such as mapping and photography workshops are also effective ways to engage users in POE.

Building performance and behaviour

Energy and environmental monitoring can help determine whether the building is performing as intended. POE can also reveal how occupant behaviour impacts on building performance and where the management of a building can be improved by educating users in its most efficient operation. Occupant perception surveys can also draw out the links between internal environmental quality, user satisfaction and productivity.

Sustainability

POE is central to understanding, benchmarking and improving the contribution architecture can make to the wellbeing of people and the environment over the long term. This includes measures of resource efficiency and biodiversity; as well as the impact of the environment on, for example, student learning, staff productivity, patient health and wellbeing.



Introduction

Evaluation is a vital step in producing buildings that fit the needs of people and the environment, minimising waste and promoting wellbeing, and providing a means to develop an understanding of the social, commercial, cultural and environmental impacts of architectural processes on clients, occupants and the wider community.

This report stresses the importance of architects revisiting and learning from their buildings in use through Post Occupancy Evaluation (POE) and shows that it can be a simple and straightforward process. It fits into a wider RIBA agenda of supporting the development of the research culture within architecture to encourage continuous learning and improvement in building design and performance, but crucially, also, to enable architects to evidence the value of their work. The project has been initiated by the RIBA Research and Innovation Group and funded through the AHRC project 'Evidencing and Communicating the Value of Architects'.¹ Although the main audience for this report is architects, it is important to recognise that POE is best undertaken as a creative collaboration between all members of a project team, including clients and other built environment professionals.

Regular evaluation is standard in the most innovative businesses and, we argue, should be standard in architecture. POE can support the design of better, more appropriate buildings that add value in tangible ways such as reduced environmental impact, reduced running costs and less tangible ways such as wellbeing, identity, community and atmosphere. This knowledge can directly contribute to a better understanding of the value of the architecture profession to the built environment – yet very few architects undertake POE on a regular basis to help show the value of their work.²

Barriers to POE include: cost; concerns about risk; effect on insurance; lack of leadership; procurement; education and know-how. There is also a cultural barrier within the profession whereby POE is seen to be the responsibility of more technically oriented architects or consultants, meaning that its emphasis has been on energy with a concomitant neglect of issues of social and cultural value. Despite these

disincentives architects and other built environment professionals, industry bodies and increasingly clients are pushing forward the agenda³ as they can see the benefits POE offers to their organisational goals.

This report is based on a call for evidence launched by the RIBA Research and Innovation Group and a series of discussions with architects whose practices undertake POE regularly on their projects, academics for whom POE is a significant part of their expertise and clients who have had POE undertaken on their buildings. It is split into three main sections. Section One, *Prioritising POE*, shows why POE is important. It provides a summary of the current state of POE in the UK and argues that much more needs to be done to embed POE into the way that architects and the broader building industry work. Section Two, *Approaches to POE*, explains how POE can be integrated into individual projects, signposts existing POE tools and resources, and sets out the best ways to ensure learning is fed back in to wider practice. Section Three, *POE in Practice*, brings these approaches to life through a set of practical case study examples demonstrating how POE has been successfully used by individual practices, clients and researchers to understand and communicate the value of investment in high quality architecture.



Section one:

Prioritising POE

Post-occupancy evaluation (POE) is the process of understanding how well a building meets the needs of clients and building occupants. POE provides evidence of a wide range of environmental, social and economic benefits core to sustainability. It can also address complex cultural issues such as identity, atmosphere and belonging. The need to understand these wider impacts has become all the more pressing in the context of an appetite from commercial companies, (see for example the Marks and Spencer and URBED case studies below) to evidence the positive impacts of their businesses and wider estate. Impact is an integral part of the assessment process for funding bodies such as the Heritage Lottery Fund, with money channelled to projects that can prove lasting contributions to people and communities.⁴

The Post-occupancy Review of Buildings and their Engineering studies⁵ (PROBE) and more recent Innovate UK building performance evaluations⁶, show that there is a persistent 'performance gap' between design intentions and how buildings work in-use in terms of building fabric, services and technologies as well as user satisfaction and well-being. Just how to create appropriate, sustainable and inspiring environments for people is the core body of knowledge of the profession, but this knowledge must be expressed in rigorous, comparable research terms if it is to be utilised and valued by others.

Architects are regularly asked to make statements on how they add value but are often poorly prepared to do so. An example is the 2012 Social Value Act which requires projects procured with public money to demonstrate their wider social, economic and environmental benefits.⁷ Given recent government emphasis on preventing rather than treating illness it is only a matter of time before such projects are also required to consider their effect on health and wellbeing.⁸

The incorporation of the principles of Government Soft Landings and British Standard 8536-1:2015⁹ within BIM Level 2, mandated on all centrally funded projects from April 2016, gives a clear signal of the UK government and wider industry recognition of the value of integrating POE in project contracts. For public projects, POE can help clients meet their requirement

to demonstrate value for money. The development of new and existing standards such as the WELL Building Standard¹⁰ and Passivhaus¹¹ depend upon POE for certification, while BREEAM, LEED and SKArating offer credit for doing POE and drive a heavy proportion of projects' sustainability agendas.

There has been a concerted effort made by practices, institutes and researchers to remove barriers to POE and challenge misconceptions. The RIBA has re-introduced POE into the *Plan of Work* under Stage 7: In use¹², and is producing a suite of guidance on POE and its big sister Building Performance Evaluation (BPE) to help practices integrate feedback into their work.¹³ The RIBA Insurance Agency¹⁴ has confirmed that architects with an RIBA Insurance Agency professional indemnity insurance policy are covered to undertake Post Occupancy Evaluation/ Building Performance Evaluation services, but recommend that practices that are going to offer these services inform the RIBA Insurance Agency of their intention to do so. The RIBA has also highlighted the way that the Research & Development tax credit system can be used by architects to reward investment in research by allowing staff costs to be claimed back as relief on corporation tax.¹⁵ Whilst the case studies below demonstrate that a growing number of clients are utilising the power of POE for their own strategic benefits there is considerable work to be done in demonstrating these benefits to clients.

Attention is being paid by Architecture Schools to ensure that students arrive in practice well versed in POE. SCHOSA, the Standing Conference of Schools of Architecture, made a resolution at their 2015 conference to embrace POE and BPE in education.¹⁶ A number of architecture schools have begun to work in closer collaboration with practices to carry out POE on live projects with students.¹⁷ There is also a growing body of research into the social and environmental performance of buildings across health¹⁸, education¹⁹, housing²⁰ and office buildings²¹ that rely on and have developed new POE methodologies.

Practices have taken the lead in developing robust and innovative approaches to POE in order to learn, improve and evidence the performance of their projects. Far from impacting negatively on an



architect's reputation POE can enhance practice credibility and brand.²² As the case studies in this report show, some practices have been pro-active in developing collaborations with academic researchers in order to gain the resources and expertise to carry out POE on their projects. These include small scale partnerships with individual research projects or PhD students, to larger research council funded consortia. An ever increasing number of practices have designated research leaders, with larger offices appointing research specialists to carry out POE work and dissemination. Architects have been involved in developing innovative project delivery frameworks such as Soft Landings²³ that put continuous improvement and innovation at the heart of projects, ensuring POE is embedded, valued and remunerated from the start. There is increasing evidence that a project team incorporating a feedback loop from previous projects helps deliver better building performance. A small number of practices have begun to utilise this knowledge in order to move to a position where they are able to guarantee the performance of their buildings and would therefore benefit from the wider introduction of performance based procurement, an example being the energy performance contracting model RE:FIT, run by the Greater London Authority.²⁴

Despite these positive developments much needs to be done to recognise the construction industry's collective responsibility to gather feedback and to remove some of the barriers – perceived and actual – to POE becoming mainstream. These include the question of cost and who pays for POE, the fear of exposing problems with a design, impacts on reputation, and the need for the development of POE education and know-how within practice. The remainder of this report seeks to address these barriers by illuminating how practices and clients have worked to overcome them and by providing architects with the knowledge to embed POE into their work.

“ In the vast majority of cases, teams don't think laterally and are stuck in the design concept too deeply to appreciate how it's actually going to be used. Moreover the client often doesn't see this, which only goes to compound things post-handover. I would also say it's very important for the design team to question the client on what operationally needs to be thought about’.

John Davies, Derwent



Section two:

Approaches to POE

Post Occupancy Evaluation and Building Performance Evaluation²⁵ is closely tied to the development of the project brief as part of RIBA *Plan of Work* Stages 0, 1 and 2 and should be seen as intrinsic to good briefing and good design.²⁶ It can take a wide variety of forms – light touch in the form of a building walkabout and user interviews or more detailed.

For a project to be a success it is extremely important to define what that success would look like in the form of a set of quality objectives, ideally in a SMART format (specific, measurable, achievable, realistic and time bound) that can feed into overall client and practice strategy and performance assessment. There are three different kinds of reviews integral to POE:

- The effectiveness of the procurement process itself
- The performance of the built fabric and construction details
- The operational effectiveness of the building – in this case the ‘users’ need to be defined

Once objectives have been set POE can be planned and resourced.

The contractual relationships between members of the project team may need to be reviewed in order to establish whose responsibility it is to achieve the targets and who has the right degree of objectivity to assess progress against those targets and when they will do it. The use of consultants may be considered to provide an outside expert viewpoint. Collaborative responsibility may mean that performance based specifications and integrated project insurance may be in order as these share risk across the project team. The use of ‘base and stretch targets’ to reward performance achievement is the approach taken by some of the most innovative and business savvy clients working today. Architects may influence more clients to manage learning across project teams and over successive projects in order to reduce risk and drive up quality.

The development of POE can be integral to a practice’s business strategy, on how it develops, shares and derives benefit from its knowledge. POEs from previous projects may need to be reviewed in order to shape project and quality objectives in the early stages

to ensure that lessons are learnt and applied. This is particularly useful when working with a repeat client, but can also be achieved by drawing lessons from the design teams wider portfolio, alongside published POE data and case studies, for example the Digital Catapult Building Data Exchange.²⁷

A Life Cycle Assessment (LCA)²⁸ examines, at the design stage, a building’s anticipated fabric and energy performance over its projected life span. For the built environment an LCA can be summarised as a systematic set of procedures for compiling and examining the inputs and outputs of materials and energy and the associated environmental impacts directly attributable to the functioning of a building throughout its life cycle.

For building designers this means developing, over all RIBA Stages, an understanding of the impacts of their design decisions over the expected life of a building. This should include consideration of the following issues:

- Sustainable materials
- Recycled content
- Retention of existing on site fabric and structure
- Future fabric deterioration and maintenance
- System replacement cycles and the impact on occupiers
- Durability of components and systems in relation to overall life expectancy
- Future flexibility and capacity for adaption, extension and alteration
- Minimising waste during construction and over the replacement life cycle
- Efficient demolition and disposal
- Optimising the potential for reuse and repurposing of components and systems (Circular economic thinking)
- Impacts of future climate change

POE helps us design better buildings by making plain consequences of design decisions over

time, encouraging design thinking past Practical Completion. It is recommended that POE should also include a review of fabric performance.

POE can be carried out at any point after the completion of a project, ideally at least after a year of use, when the users have settled in. Consideration needs to be given to the split between Category A and Category B fit out which are, more often than not, undertaken by two different parties both of which affect the outcomes of a POE study differently. To get the most out of the process experts suggest that POE research is repeated through the life of a building. POEs of a client's existing building are particularly useful, illuminating what works and what doesn't in terms of design and technical performance to feed into the design, and providing a benchmark for comparison in the evaluation of a new building project. The data provided by POE can better enable the industry to demonstrate the operational performance, and social performance based on the total expenditure on the building²⁹, hopefully encouraging a more long term view of the importance of carefully considered sustainable construction.

A range of approaches and methods can be used to carry out POE. The relevance of a technique depends upon the particular outcome that has been defined as important to deliver and measure at the briefing stage. This could be an outcome for a client or an outcome for the practice – used to prove efficacy of specialist skills. It sets the expectation for the client and users and can have a big impact on whether they feel it has been valuable or made a difference. The approach and scope of the POE will also depend upon the resources that are available in terms of time and money as well as the expertise of those who are undertaking the research. It is important to note here that although smaller practices may feel that POE is not for them the information gained from a light touch POE, exploring one simple issue or question, can be of great value to their clients. Comprehensive listings of POE resources are available online, hosted by the Usable Building Trust³⁰ and Innovate UK³¹ and in the RIBA POE/BPE primer that should be read in conjunction with this report.³² The RIBA is also publishing an interactive briefing and evaluation tool to help

“ A lot of effort goes in to researching the client's needs and desire at the planning stage, but for us post-occupancy evaluation would provide the opportunity to reflect on the whole process, celebrate successes and learn from any aspects that were less than successful. A rounded research project would not be complete without an assessment of the results of the 'experiment' of constructing a new building. Common sense would suggest that for a substantial project of this nature, an evaluation of what was achieved or not achieved and the reasons why would be expected by our membership and should form part of our annual report. ”

Professor Tim Helliwell,
Client for the Royal College of Pathologists

architects to better embed performance outcomes into the briefing, design and handover processes.

To get most value out of the POE process it is crucial to define how the information will be used and in what format so it can be assimilated into actionable knowledge by the practice, project team and wider profession. The final outputs may vary depending on the scope and funding route of the POE, but all seek to draw the thread between the design intentions set out at the briefing stage and how far they have been met in use and to gather lessons for future projects. An urgent question for the profession is how to collate POE research in a format that all can benefit from.

In a light touch POE a practice may find it useful to develop a simple POE template document that is used on every project and is accessible to the whole office, perhaps as part of the practice's quality management system. In a more in-depth POE the report may be longer and more comprehensive to provide specific feedback to the project team and client. This could include the discussion of key positive and negative findings supported by the presentation of data by maps, graphs and tables, photographs and sketches, alongside the analysis and presentation of quotes from interviews or focus groups with the client and end users. The report could include any proposed design or management changes to address issues that are discovered. A more comprehensive POE may build on this foundation, with an aim to make comparative evaluations of other facilities based on published benchmarking data and case studies, with an eye to improve not just one building, but to influence design guidelines for future projects of the same type.³³

Once a report has been produced it is important to ensure that the information is disseminated to the right people. In a light touch review this may include a reflective review with the project team and a site visit to share the learning. A more formalised approach would build upon this with, for example, dedicated CPD sessions, the development of a set of resources on the office intranet and a POE workshop including the design team and client. An embedded approach may seek to share the findings further by submitting data onto shared BPE and POE databases, making presentations at conferences and events and through

contributions to publications. This not only enables learning across the built environment professions, but also works to enhance a practice's reputation as a specialist and market leader in a particular field. Sharing POE and the monitoring of resource use with end users through focus groups, workshops, websites, social media, reports, guidance and other channels can help them to engage more critically and thoughtfully with the built environment.

Section three: POE in practice

This section provides a set of case studies illustrating how POE has been successfully integrated into practice. These include examples drawn from small, medium sized and large practices that embrace a range of approaches, methodologies and POE value type (social, environmental, economic, cultural). It also includes client-led projects that illustrate the value of POEs to organisations who are increasingly willing to fund it. The case studies also feature projects that have been developed in close partnership with academic researchers and which push boundaries in the development of new and robust POE approaches that can be applied in the field.



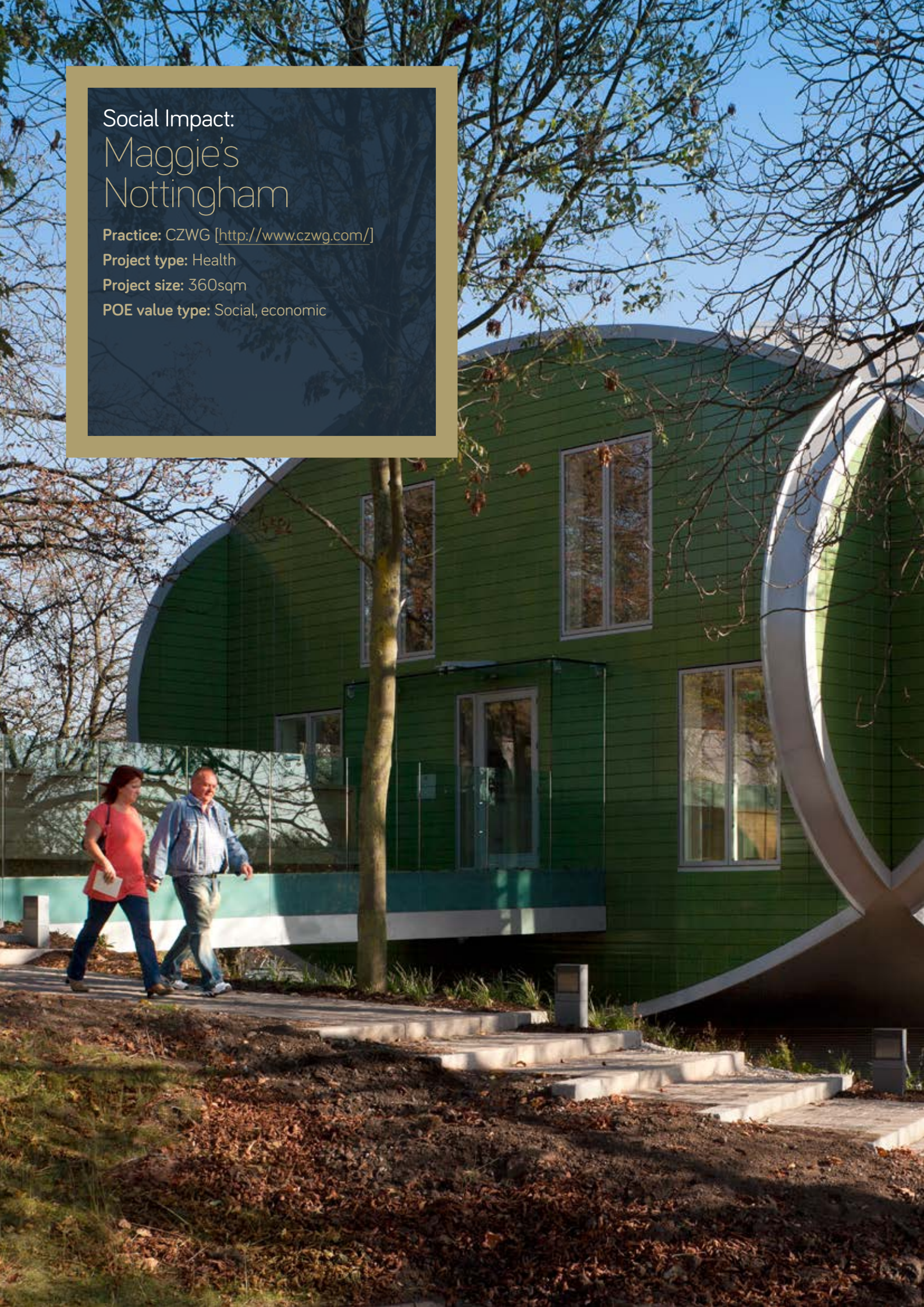
Social Impact:
Maggie's
Nottingham

Practice: CZWG [<http://www.czwg.com/>]

Project type: Health

Project size: 360sqm

POE value type: Social, economic





Social Return on Investment (SROI) was applied to Maggie's Nottingham to investigate its potential as an innovative approach to POE, enabling the social impacts of the building as experienced by its users to be captured and expressed as a monetary value.

Key learning

- Innovation in POE methodologies drawn from other fields and developed in an academic context have great potential to evidence the value of investment in high quality architecture.
- POE findings should be expressed in different ways depending on the audience, including quantitative data, qualitative narratives and in monetary terms.
- Rigorous POE research led by academic researchers, ensures robustness in the research process and lends credibility to the final results.

Designed by CZWG in 2011, Maggie's Nottingham provides free practical, emotional and social support to people with cancer and their families. The centre is designed to be at once a striking and uplifting space, whilst also creating a welcoming, comfortable and homely feel. The building is a bright green, domestic scale structure with interlocking and curved external facades that sits amongst trees on a sloping site within an NHS hospital campus. It has a bridge entrance, a sociable kitchen space with a large kitchen table, several small sitting room spaces, a library, a set of small private spaces upstairs, an activity room and a small staff office. There is plentiful natural light with large operable windows offering views to the trees outside. The kitchen opens onto a spacious balcony. The interior design has a non-institutional style with plaster walls and ceilings, an oak floor and familiar domestic furnishing.

With funding from the Economic and Social Research Council (ESRC), Kelly Watson from the University of Manchester worked with Arup to trial Social Return on Investment (SROI) as a POE methodology at Maggie's Nottingham as a way to investigate and capture the social value of the project. SROI is a framework for measuring a much broader concept of value than is captured in traditional financial accounting, including social and environmental costs and benefits. The approach tells the 'story of change' that has been created by a particular activity or intervention and describes outcomes for those involved in both words, data and, crucially, in monetary values.³⁴ It has been used in other contexts, most notably the housing association sector³⁵, but has never before been applied to architecture.

SROI involves the quantification of social outcomes identified through qualitative stakeholder engagement. Financial proxies are applied to the results which are presented as a monetised ratio of £ costs per £ of social outcomes. This means that the social returns per every £1 spent on a project can be disseminated and the payback period can also be calculated.



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The SROI methodology has six stages:

1. Establishing scope and identifying stakeholders
2. Mapping outcomes
3. Evidencing outcomes and giving them a value
4. Establishing impact
5. Calculating the SROI
6. Reporting, using and embedding

The analysis was carried out over a six month period, five years after first occupation, through a series of interviews with the project team and centre manager, focus groups with different user groups (visitors, centre staff, session leaders and volunteers), a series of user surveys and applying monetisation techniques to the quantitative results.³⁶

The SROI analysis produced a range of different data including qualitative narratives, quantitative user feedback and financialised returns data. This proved very useful for communicating effectively with different audiences.

The total impact of the design of Maggie's Nottingham for the building users was found to be £134,800 per year, projected to £3,572,800 over the 60 year lifetime of the building using HM Treasury discounting rates.

The outcomes of the design reported by the building users with the most significant value were wellbeing and performance related. Important design features reported included:

- the non-clinical, homely environment evidenced by preference for interacting at a kitchen table rather than a desk;
- the variety of both social and private spaces e.g. open plan kitchen area and small private sitting rooms providing range of environments for different user preferences;
- the window design and related access to natural light and views to nature, promoted a connection to outside whilst maintaining privacy;
- the quality and choice of furniture and fittings, colourful and quirky, gender neutral, domestic scale lighting rather than overhead strip lighting, surface materials that are warm to the touch.

Applying SROI to the built environment as a form of user-centred POE is worthwhile but time consuming. Consideration should be given to data access issues, the balance between qualitative and quantitative methods used, their suitability to the environments where they will be carried out and the build type when

inputting cost data. It was concluded that SROI has considerable potential as an early stage investment evaluation tool for planning and commissioning, rather than as a tool for detailed design decisions. The findings suggest that investment in professional fees, rather than the contract sum or furniture, fittings and equipment (FF&E) costs, produces the most positive long-term impacts on building users.



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Organisational Efficiency: Morelands, London

Practice: Allford Hall Monaghan Morris
[<http://www.ahmm.co.uk/>]

Project type: Commercial

Project size: 2,006 sqm

POE value type: Environmental, social,
economic





A major refurbishment of two floors of a large office complex, including workspace for Allford Hall Monaghan Morris' (AHMM) own office, provided the opportunity to develop an understanding of environmental performance, occupant satisfaction and productivity through POE research.

Key learning

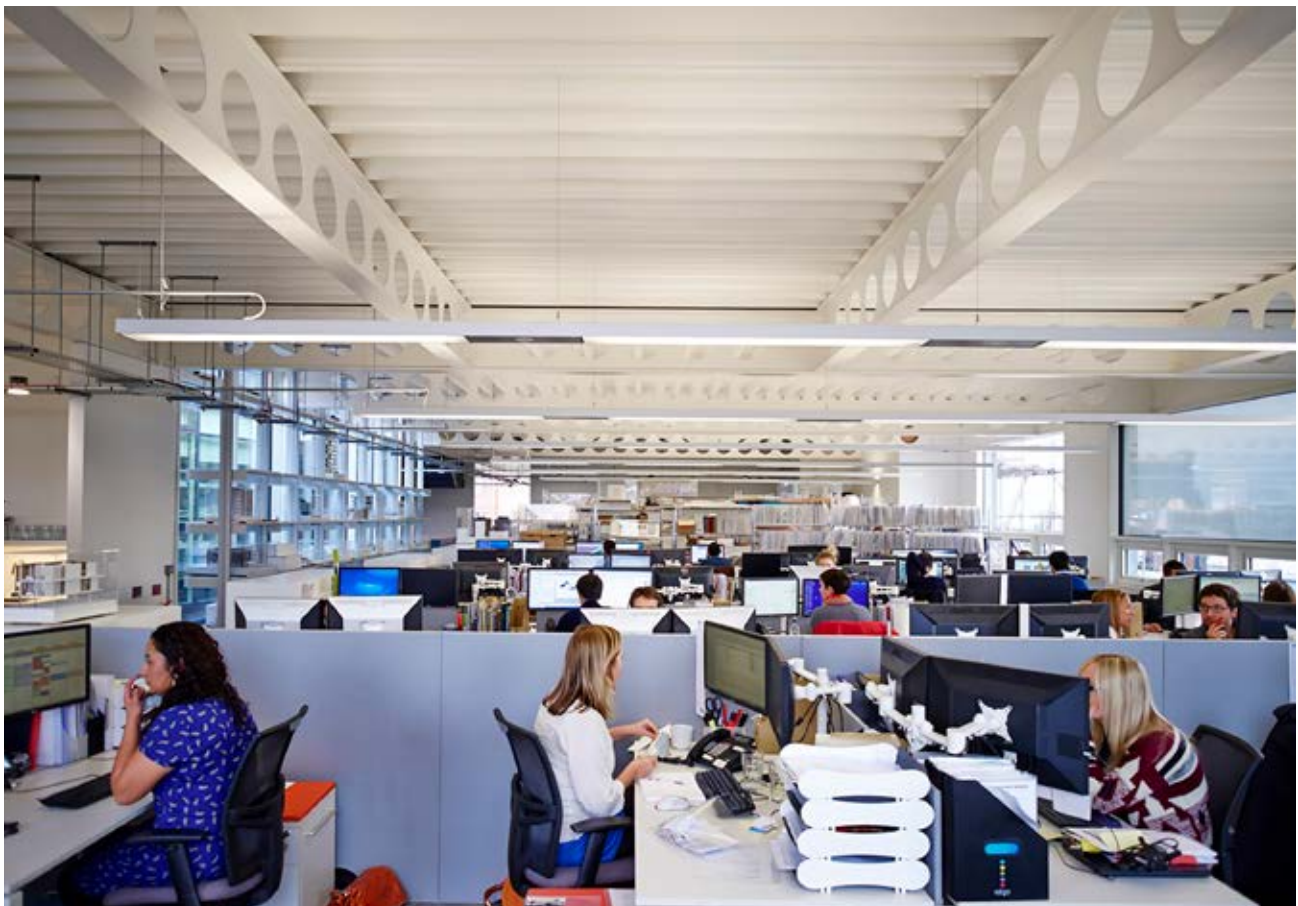
- Carrying out a POE pre- and post-refurbishment allows comparisons to be drawn, providing clear evidence of improvements in design and performance.
- Understanding worker satisfaction and productivity is highly relevant in office buildings, where running costs may be dwarfed by investment in personnel.
- Combining environmental monitoring with surveys of occupant perception help to develop an understanding of the impact of behaviour on building performance.

Morelands is a complex of twentieth century warehouse buildings in Clerkenwell, London that was repurposed as office space in the late 1980s to house the area's growing creative industries. AHMM recently completed a refurbishment of the entire complex, including their own offices, to provide energy efficient and uplifting open-plan workspace, through the maximisation of natural light and ventilation, improved thermal performance and the use of renewable technologies.

AHMM's building performance team worked independently and in partnership with Masters' students from University College London³⁷ to undertake POE work on their Morelands office. The POE involved a comparison of AHMM's previous offices, located in the same building pre-refurbishment, with the performance of their new studio space. The study was designed to provide

a 360° view of the functionality of the building taking into account occupant satisfaction, indoor environmental quality, energy consumption, cost and productivity metrics. Investment and operational costs were also reviewed alongside other human metrics such as absentee and staff turnover rates.

A number of methodologies were employed to test a range of architectural and operational aspects of the building. These included a survey of occupant satisfaction in the old and refurbished offices using the Building User Survey (BUS) methodology³⁸; the monitoring of internal environmental conditions using a combination of off-the shelf monitors and data loggers and latterly AHMM's own bespoke monitoring equipment as well as a CIBSE TM22³⁹ energy audit to understand energy consumption broken down by fuel type, end uses, zonal consumption and renewable sources.



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The POE revealed that operating costs reduced significantly as a result of the refurbishment, seeing a 69 per cent reduction in total energy use per desk space compared to the previous office. Whilst this is a significant reduction, the POE also revealed that the relative costs of the utilities represented a very small proportion of overall business costs. Investment in staff recruitment and salaries were far higher, leading to a focus on what impacts the building might have on occupants. Crucially occupant surveys revealed elevated rates of satisfaction with space and conditions in the re-furbished office space, leading to higher perceived productivity as a result. It is interesting that satisfaction and perceived comfort remained high despite the fact that environmental monitoring revealed elevated heat and CO₂ levels in the office at certain times of day. This indicates that there may be a 'forgiveness factor' for occupants of sustainable office buildings.⁴⁰

In order to improve internal environmental comfort the building performance team have worked to engage staff in understanding and operating their building more effectively. Monitoring revealed that during the warmer months staff only opened windows when the temperatures were already high in the office. With an awareness of the impact of this behaviour instilled through training sessions, staff have now taken on responsibility for opening windows earlier in the day and overnight to cool the fabric of the building, to prevent high temperatures and CO₂ levels. This small, low cost adjustment illustrates how comfort levels can be maintained through passive strategies, rather than the adoption of complex or energy-intensive technologies. It also reveals the importance of engaging with occupants, which has continued through the integration of live environmental monitoring and energy data onto AHMM's office intranet.



Collective Learning for Change: New Art Exchange, Nottingham

Practice: Hawkins\Brown
[<http://www.hawkinsbrown.com/>]

Project type: Cultural

Project size: 1,360 sqm

POE value type: Social, cultural





Through POE research at New Art Exchange, Hawkins\ Brown show the value of designing a community arts centre that can be adapted for changing uses, and how the management of the space can be tweaked to maximise the performance of the building for its users.

Key learning

- POE is best undertaken as a collaborative process, involving different members of the project team, to promote shared learning and trouble shooting from a range of disciplinary perspectives.
- Simple yet effective POE methods, such as a building walk through and round table focus groups can clearly show what has worked and what hasn't from the user perspective.
- POE research can lead to the resolution of issues through better building management, and user education.

Completed in 2008 and designed by Hawkins\Brown, New Art Exchange provides a dedicated centre to support and promote African/Caribbean and South Asian art within the Nottingham area and beyond. The new building provides exhibition galleries, a café, performance and rehearsal spaces, artist-in-residence studio, meeting rooms and arts education space for the centre's extensive engagement programme with young people.

With a black brick facade and an arrangement of frameless windows offering glimpses of the different activities taking place within, the New Art Exchange proudly stands out from the red brick buildings of its surrounds. It also responds to the local context through the integration of aluminium plates printed with images of the community designed by the artist Hew Locke and through the celebration of local trades who, with young people from the local building training college, helped build the centre.

Hawkins\Brown instigated POE research in order to understand how the building was performing from the perspective of building users. The research was carried out as a collaborative exercise with input from the client and consultants to ensure shared learning. A four stage POE process was undertaken. This included a review of energy use; assessment of occupant satisfaction using the Arup Building User Survey (BUS) method; a building walkthrough to reassess build quality, wear and tear and a focus group to enable an open discussion about how far the project fulfilled its objectives.

Overall building users reported that they liked the building including its “beautiful and minimal... black and white colour scheme” and the “contemporary, bright and open” interior that was felt by many to be a “motivating space to work in”. The long-term flexibility of the building was highly valued providing “the community with access to a creative space



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which can be changed and adapted as necessary”. The performance suite can, for example, be extended into the learning space next door which itself doubles up as a catering or green room when required. The community also commended the durable materials chosen for the scheme, including the concrete floor which according to users has lasted well and is easy to clean.

The more problematic aspects included the “slightly clinical” feel of public areas such as the cafe, which it was thought could benefit from an injection of welcoming colour and comfortable soft furnishings. Users also felt that the cafe could have been a more flexible space with the addition of theatrical lighting and a PA system. In the gallery spaces the positioning of windows and plugs was seen to obstruct the hanging of artwork. In the centre’s offices staff reported that on hot days the internal temperature could become uncomfortable. The building services

team also reported some difficulties with the under floor heating and ventilation system.

Following the POE a number of actions were taken to resolve some of the issues identified by building users. This included the need for more user friendly instruction manuals and a longer handover period to resolve building services and management issues. The gallery staff had not been informed that heavy duty plasterboard had been installed specifically to accommodate heavy exhibits - now the full capacity of the gallery can be used. Issues with overheating in summer were also resolved through the education of staff on the best use of windows to ensure sufficient ventilation, in particular the opening of trickle vents after hours to allow for night time cooling.



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Improving User Experience: Lordship Eco-Hub, London

Practice: Anne Thorne Architects
[<http://annethornearchitects.co.uk/>]

Project type: Community

Project size: 298 sqm

POE value type: Social, environmental





As a practice that specialises in a participatory approach to design, Anne Thorne Architects used post-occupancy evaluation to understand the impact of user involvement in the development of a sustainable, self-build community facility.

Key learning

- POE research should be focused on the practice specialism.
- POE can be used as a way to capture the impact of being involved in an architectural process, rather than just focusing on the end product of the building.
- Qualitative approaches help draw out stories of the impact of a project or building on the different groups involved.

Located in Lordship Recreation Ground in Haringey, London, Lordship Eco-Hub was designed to provide community space for a diverse range of community groups, as well as public amenities such as a cafe area and toilets adjacent to the playground and lake. Anne Thorne Architects (ATA) worked with the local authority and user groups to promote genuine community engagement and environmental sustainability through the process of design development and construction. To create a comfortable, efficient and easily maintained community amenity the team sought to create a building that maximised natural light and ventilation, with high levels of insulation to reduce energy requirements. The use of simple construction methods, including a timber frame and straw bale walls, meant that volunteers from the local community were able to participate in the assembly of the Eco-Hub.

Through POE research ATA were keen to understand how far the Eco-Hub met the client and end-user expectations, both through measurements of the

technical performance from an environmental perspective, as well as qualitative interviews to understand how users experience the building and the impact of their involvement in the process of shaping it.

The results from monitoring the technical performance of the building showed that the project was providing a comfortable shaded space in summer and a sunny draught-free space in the winter months.⁴⁴ However it is the knowledge gained from qualitative interviewing that has been particularly valuable to ATA, highlighting how substantive involvement in design can change the way people feel about a space and a building they occupy.

At Lordship Eco-hub interviews revealed the positive impact on the users who were actively involved in the design of the project. Participants in the self-build process were given the opportunity to learn and raise aspirations through developing the environmental design.



© Anne Thorne Architects

““ I didn’t expect to get such a great level of knowledge and input from the moment I arrived. There is kind of a duty of care which we are all feeling, it really feels very rich and is what I had hoped I might get out of working on this. ””

Self-build participant

The collaborative approach led to the development of stronger relationships and a sense of ownership within the community.

““ All the designs have been developed with a transparent and strong relationship between the community and council. It has been tough, but it’s been rewarding... Everyone who has been involved will have had a say, a little piece of their decision making has been built into the design. I think it has tangible benefits in terms of people taking responsibility, people wanting to look after and maintain it. ””

Local Authority client

““ You can see that there is quite a harmonious way of working and that feeds back to the way the construction process actually goes, how successful it is, and how cooperative people are. ””

Self-build participant

According to the project architect Fran Bradshaw, there is a real appetite to find out the impact of buildings on users in this more holistic way both within the practice but also, increasingly, from clients.

““ The development of a better understanding of how a building process impacts upon people’s lives and experiences is crucial ‘if we really want to understand the buildings we make’. ””

Fran Bradshaw, Anne Thorne Architects



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A Learning Laboratory: Foundry Studios, London

Practice: Cullinan Studio
[<http://cullinanstudio.com/>]

Project type: Commercial

Project size: 785 sqm

POE value type: Environmental, social





For Cullinan Studio, the development of their own office at the Foundry was an opportunity to put the practice in the unique position to gain first-hand experience of the organisational and environmental performance of one of their newly completed office buildings.

Key learning

- Proactively pursuing the opportunities to carry out research means making the most of all possibilities, such as a POE on a practice's own office refurbishment.
- Collaborating with research students is an effective, economic and mutually beneficial way to undertake POE research.
- Undertaking POE research across a number of projects, allows for comparisons to be drawn between buildings of a similar type.

Completed in 2012, the Foundry is a refurbishment of a dilapidated Victorian Warehouse located on a narrow towpath along the Regent's Canal in Islington, London. The project was developed by Cullinan Studio, who acted as both designer and client, to provide a new bespoke workplace for the practice, supported by rentable office space and the development and sale of 12 apartments on the same site.

The core aim of the project was to create a beautiful and efficient workplace, enhancing the work and creativity of the office, reflecting the practice ethos of place-making, and social and environmental sustainability.

Cullinan Studio collaborated with the University of Reading, BuroHappold and researcher Trevor Keeling who undertook the research as part of his Engineering Doctorate (EngD). Keeling enabled Cullinan Studio to compare their results with data from other projects featured in his thesis.⁴¹ At the Foundry the practice



was keen to understand the interaction between environmental conditions and the wellbeing of occupants, as well as gaining a holistic view of the strengths and weaknesses of the design as built. In order to measure these aspects a number of different methodologies were employed. Over a one



week period in the summer of 2014, the researcher measured light levels, temperature, humidity, CO₂ levels and sound in the office using several data loggers. External temperature and weather data was also collected. This was combined with an electronic survey that was sent to occupants at the end of the week. The survey asked questions about satisfaction, perceived performance and perceptions of the building's character.

The airtightness of the building, combined with the use of renewable and low-carbon technologies including an air source heat pump and photovoltaic panels, led to a 50 per cent reduction in energy-use compared to the architect's previous office located in an adjacent building. The office also scored highly in terms of occupant satisfaction with internal environmental conditions. The high levels of natural light present throughout the day and the corresponding limited use of artificial lighting, were



“ The research reinforced the studio's understanding that passive design, coupled with a high level of personal control, greatly contributes to more joyful human experiences in the workplace. ”

Kristina Roszynski, Cullinan Studio

considered by staff to positively influence their work performance. Staff also valued the ability to control the temperature of the office by opening windows in the morning to maintain a narrow range of temperatures, rather than relying on the complexity of the building management control system.⁴² The 'fabric first' approach to low-energy retrofit through the re-use and insulation of the existing structure, meant that compared to other buildings included in the study the Foundry performed very well environmentally.

The POE also revealed the importance of a building's character as well as its role in communicating and supporting the ethos of the wider organisation. In the survey staff were asked to choose from a pre-defined list of words that they associated with the design of their workplace. At the Foundry 'support and consideration,' 'practicality' and 'generosity' came top of the list.⁴³

The studio is keen to build upon this work with further studies looking at the impact of office environments on wellbeing and productivity. They recognise the importance of developing this body of knowledge in order to make the business case for well considered, efficient and uplifting buildings for the people who use them.

Designing with care: Hospice designs

Practice: JDDK Architects
[<http://www.jddk.co.uk/>]

Project type: Health

Project size: N/A multiple projects

POE value type: Social





With over two decades of experience in delivering hospices, JDDK Architects seek to identify, evaluate, and share good practice through POE research.

Key learning

- Collaborating with academics provides access to the expertise and resources to undertake robust POE research, lending rigour and credibility to findings and analysis while providing a useful independent viewpoint.
- Carrying out POEs on multiple projects helps develop best practice in a particular building typology.
- The sharing of this expertise can help to establish and consolidate a practice as a leader in the field, providing a platform to inform clients and commissioners about the benefits of investment in good quality evidence-based design.

Responding to a gap in knowledge in the design of hospices JDDK Architects and their long-term collaborators, Northumbria University, set up a research project to learn from the practices' extensive portfolio of hospice buildings. Following the untimely death of JDDK's director Ian Clarke the practice and the university brought together a series of papers written by Clarke during his pioneering career in the field of hospital design.⁴⁵ The promotion of a socially beneficial ethos in the architecture and interior design departments at Northumbria University has been complemented by a desire from students to engage positively with authentic and philanthropic projects. The JDDK Hospice initiative therefore addresses a wide variety of educational, professional and societal issues towards the promotion of design excellence as an active factor in the improvement of the end-of-life experience.

Twelve case studies of completed JDDK hospice projects have been selected as a sample for post-

occupancy evaluations. An initial study of the Marie Curie Hospice in Newcastle upon Tyne has provided a central focus for piloting a variety of methods of evaluation. The research initiatives objectives included:

- developing an evidenced-based approach to hospice design processes⁴⁶;
- an evaluation of what works in hospice design and where improvements can be made;
- communicating the complex and interrelated aspects of hospice design for the benefit of stakeholders and health-care professionals;
- establishing clear measures for the value of good design in the context of palliative care.

Though the research is at an early stage key themes have emerged from the project. These include:

- the optimum travel distances for nurses on call in these hospices;



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- the importance of consultation with staff at all levels in ensuring ownership and quality of the completed project;
- the need for a briefing document that clearly defines and compares the relative costs and values of architectural elements, enabling clients to make informed choices regarding the use of their budgets (examples include the choice of natural and artificial lighting to service corridors, or the production of non-linear layouts that encourage visual and social interaction between occupants);
- the importance of judicious use of daylighting to benefit patient well-being⁴⁷;
- the need for flexibility in the form of single, double and triple occupancy rooms with respect to patient well-being;
- the important philosophical and ethical implications of designing for death, with respect to normative practices in medical architecture.



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The value of sustainable design:
Cheshire Oaks
Marks and Spencer,
Ellesmere Port

Practice: Aukett Swanke
[<http://www.aukettswanke.com/>]

Project type: Commercial

Project size: 18,100 sqm

POE value type: Economic, environmental,
social





Through a rigorous POE process on their Cheshire Oaks store, M&S have shown how sustainable design makes commercial sense, reducing running costs, strengthening reputation, and creating spaces that are more comfortable and enjoyable for shoppers and workers alike.

Key learning

- There is a market for POE among commercial clients who have a long-term stake in their buildings, are keen to understand how they are performing, and how designs can be improved in future commissions.
- POE provides a means through which businesses can evidence their sustainability credentials, thereby strengthening company ethos and brand.
- Clients are interested in understanding both the quantitative aspects of building performance, and the qualitative impacts of a building on how people feel.

When M&S set the brief for their flagship Cheshire Oaks store near Ellesmere Port, they sought to develop an exemplar in sustainable design that embodied the environmental and social commitments set out in their corporate social responsibility initiative – Plan A. Conceived as a ‘sustainable learning store’ the project was intended to provide a test-bed for the development of best-practice sustainable standards for use across the M&S estate.

Faced with this ambition the architect Aukett Swanke delivered a holistic scheme that integrated both social and environmental sustainability features. These included a ‘fabric-first’ approach, based on using building materials, orientation and careful detailing to maximise energy efficiency, the use of low energy ventilation systems and a biomass boiler, water saving measures including a rainwater harvesting system, sustainable urban drainage and increased biodiversity through a living wall and large areas of landscaping.⁴⁸

With the client committed to understanding staff and community satisfaction the team also took local groups on guided tours of the site.

In 2013, a year into the building’s occupation, consultants from Faithful and Gould, alongside researchers from University College London undertook a POE study of Cheshire Oaks M&S to see how well the building was performing in terms of resource consumption, as well as occupant comfort and satisfaction from the perspectives of a range of different building users. The technical monitoring of the building was funded by Innovate UK, with additional funding from M&S for the analysis of user experience.

The POE study involved a number of approaches to capture ‘hard’ and ‘soft’ aspects of the design. Meters were integrated into the building design, to monitor electricity, gas consumption and associated CO₂ emissions. This was combined with the distribution



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of Building User Surveys (BUS)⁴⁹ to staff and six focus groups involving 35 participants from the local community, customers, shop floor staff and operational and maintenance staff. The POE research was repeated at another M&S store for comparison.

In operational terms the building performed better than predicted, using 42 per cent less energy and producing 40 per cent less carbon than the comparator store.⁵⁰ The building scored in the top 1 per cent for 'design' and 'image to visitors', the top 7 per cent for improved productivity and the top 11 per cent for comfort when compared to other buildings assessed using the BUS method.⁵¹

The focus groups highlighted many positives including the living wall and meadow planting, the light and airiness of the space and the building's dramatic architectural form – in particular the glulam timber roof. The overall quality of the environment was felt to contribute to a better and more enjoyable shopping experience for customers, encouraging people to stay for several hours on each visit.

The quality of the building was also seen to enhance the morale of employees. During focus groups staff often said they were 'proud' to work at Cheshire Oaks, whilst those at the comparator M&S store were merely 'satisfied' – with one staff member saying 'it must be one of the nicest places in the country to work – not just Marks and Spencer's but generally.'

The building has been heralded as an exemplar in sustainable design in the retail sector, and learning from it is being shared throughout the industry as well as being used within M&S to develop design and operational standards for their wider estate.



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Learning Spaces:

Wilkinson Primary School, Wolverhampton

Practice: Architype

[<http://www.architype.co.uk/>]

Project type: Education

Project size: 2,495 sqm

POE value type: Environmental, social, cultural





Wilkinson Primary embeds the learning drawn from a sustained programme of POE research undertaken on Architype's Wolverhampton schools, evidencing the continuous improvement in the performance of their buildings in environmental and social terms.

Key learning

- Learning from POE research can be fed into subsequent projects to refine building designs and construction processes.
- POEs undertaken on successive projects can clearly evidence improvements in building design and performance.
- POE can help develop practice reputation as leaders in a particular field or specialism.

Following an arson attack on Wilkinson Primary School in 2010 Architype were commissioned by Wolverhampton City Council to deliver a new building. At the briefing stage the client set out clear objectives for the design:

- that it should meet the highest PassivHaus standards;
- provide a secure school environment where staff and students feel safe;
- provide flexible and stimulating spaces to support learning;
- provide community facilities to be used outside school hours to foster local ownership and pride in the school.

Building on a sustained programme of POE work undertaken over a ten year period and working in

partnership with Coventry and Wolverhampton Universities, Architype sought to understand how well Wilkinson performed in environmental and social terms compared to five other schools they had designed in the area. A full time researcher undertook extensive environmental monitoring of classrooms covering CO₂ levels, humidity and temperature during all seasons and the monitoring of the operation of blinds and windows through the use of time-lapse cameras. Perceptual questionnaires were also used, exploring such issues as empowerment and comfort with both children and teachers.

In terms of environmental performance the POE showed that Wilkinson performed very well, seeing an almost 70 per cent reduction in energy used to heat spaces and hot water compared to the first school delivered by Architype in Wolverhampton, as well as high levels of user satisfaction and comfort in the



school at all times of year. This can be attributed to refinements in the design and construction process including:

- measures to increase the building's airtightness and addressing thermal bridging;
- reductions in low-level south-facing windows to minimise solar gain in summer combined with high level glazing to ensure daylight is maximised in winter;
- a combination of mechanical and natural ventilation systems to ensure fresh air levels are high whilst enabling heat recovery in cooler months;
- the integration of induction hobs in kitchens to reduce heat and energy use.

These improvements significantly reduced running costs and, according to the school caretaker, made the building far easier to run from an operational perspective.

Alongside these important environmental developments the school also valued the cultural associations of the design. Located in the Black Country, the building is on the site of a forge that had been owned by industrialist John Wilkinson – the name-sake of the school. According to the head teacher it was 'really important that when the school was built it reflected the character and history of the site'. Through the use of corten steel and clay tiles the building is seen to echo the areas industrial past, while also providing the sense of rootedness, robustness and safety the school community felt they needed having experienced the trauma of the arson attack.

This POE work has not only led to improvements in the design, construction and management of Wolverhampton schools culminating in the design of Wilkinson, but has also enabled Architype to evidence an upward trajectory in the performance of their buildings overall.⁵² As a result Architype have not only been able to develop their reputation as leaders in delivering highly sustainable public buildings, but are also moving closer to the point when they will be able to guarantee the performance of their projects, giving the firm a clear competitive advantage.



© Dennis Gilbert, VIEW



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Universal Evaluation: Sustainable investment policy

Practice: URBED [<http://urbed.coop/>]

Project type: Commercial

Project size: N/A multiple projects

POE value type: Social, economic,
environmental





Through the development of a sustainable investment policy, which includes a robust programme of POE assessments, URBED have helped developers to ensure their investments in place have a long-term positive impact on people and the environment.

Key learning

- POE can help sustainable development companies and investors to understand how building projects impact on a broad range of sustainability measures.
- The development of learning through POE can be fed into future projects to refine processes, designs and hand-over procedures which are of mutual benefit to clients, designers and building occupants.
- Design practices can offer POE as a core service for which clients will pay.

Over the last decade URBED have been working with a developer to create tools and processes to assess schemes against a sustainable investment policy. These cover the entire project life-cycle, from site acquisition to completion and management under four over-arching themes: Health, Happiness and Wellbeing, Regeneration, Environmental Sustainability and Urban Design. They go beyond concerns of environmental performance and energy use to consider a range of issues including local economic impacts and employment, urban design quality, green infrastructure and occupant well-being. The resulting process has been applied to several buildings including high-density mixed-use schemes to low-rise residential and office developments. All are in urban locations and have neighbourhood and urban regeneration as key aims.

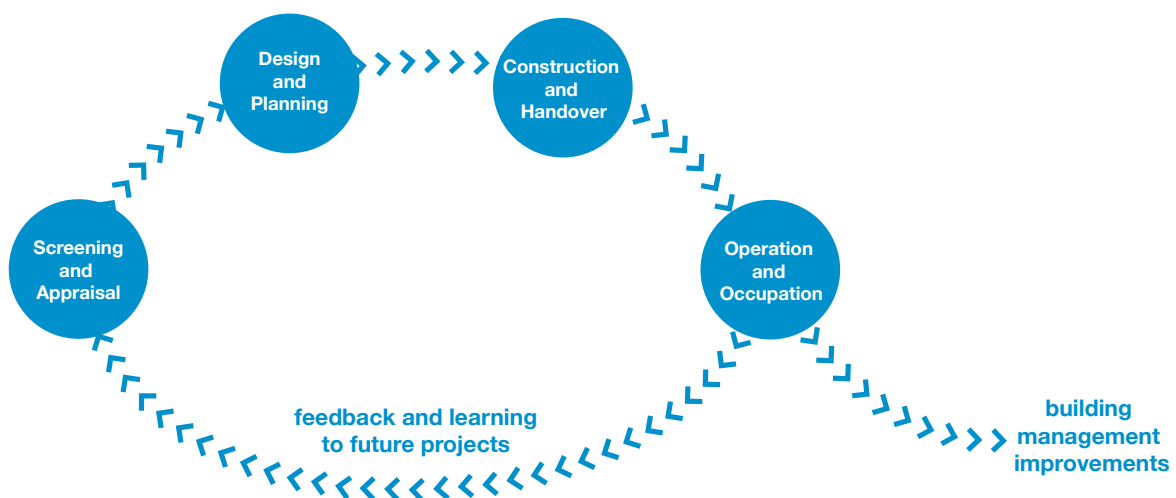
Understanding how developments work in-use is a crucial component of this work. URBED have employed a range of POE methods in order to evaluate schemes against the developer’s sustainable investment policy. These include scheme walkthroughs, energy and water use data, energy generation and



recycling data, building user surveys and interviews, monitoring of environmental conditions including temperature, humidity and CO₂ levels and round tables with the project team to reflect on project outcomes.

URBED then analyse this data highlighting key strengths and weaknesses in each scheme and benchmarking against national standards and design

ASSESSMENT STAGES



targets. These include, for example, energy and water use, transport use, the success of waste storage and collection strategies, as well as analysis of the success of a scheme against established urban design principles. This data is combined with the comments made during surveys and interviews revealing how a development is working from a user perspective and in this way contributing to their quality of life.

There are numerous examples of this POE work improving the operation and management of buildings. An example is the previously undiagnosed mechanical and control problems in an office building that was suffering from overheating, which were then fixed. The same study revealed the impact of the use of halogen lighting and its contribution to overheating, leading to the installation of more efficient LED lamps.

Common lessons have been learnt that have influenced the design of future projects. A much greater emphasis is now placed on a 'fabric first' approach to achieve energy targets and carbon emissions reductions. The studies demonstrated that complex technological approaches can lead to problems that often demand excessive management resource – an example is management time spent sorting out metering and billing issues caused by high system losses experienced in district heating schemes.

Findings have also led to changes in the development process. The views of the asset management teams who are responsible for individual developments are, for example, now sought in early design stage workshops so that feedback from completed projects is shared. At the other end of the process handover has been dramatically improved, with more time and effort spent providing materials and inductions for tenants and residents. Perhaps most importantly POE has reinforced the feedback loop in learning from built projects in the work of both the developer and URBED, meaning that the user experience is considered right from the very start of the design process.



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Building Knowledge: Pathways to Post Occupancy Evaluation

This document offers practical guidance for practitioners and clients on the evaluation of buildings, a crucial step in delivering value, reducing waste and making buildings that are appropriate for people and for our environment in the long term.

Based on the work of cutting edge practitioners working in the field of health, education, retail, organisational design and sustainability this report shows how Post Occupancy Evaluation:

- Delivers important business benefits to both practice and clients;
- Saves money;
- Reduces waste and environmental impact;
- Improves wellbeing;
- Develops knowledge;
- Can prove the value of good design;

and makes the case for mainstreaming POE across the UK Construction Industry.

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