

CLOSING THE LOOP

Post-Occupancy Evaluation: The Next Steps

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Architecture, Science and Feedback

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Hope Springs Eternal

Dare I believe that after over half a century of waiting, something I've been hoping for all that long time is at last about to happen? This meeting makes me believe that indeed I might, and I want to celebrate by tracing my adventure with this idea from its early beginnings as a component of adolescent confusion to my present conviction that its day has come and is now witnessed by your presence today I make no apology for indulging in autobiography. There's not much point in living as long as I have if you haven't got some experience worth sharing, and I think I have. Of course you're entitled to disagree. In which case I apologise for wasting your time.

Art and Science

At my age you get to thinking about the influences that have shaped your life and I have often wondered why I was so desperately keen to be an architect. It wasn't as though it fell into my lap. In fact it was anything but an easy journey but something made me persevere in spite of all the obstacles and I have come to the conclusion that the seed was sown, or at any rate fertilized, in the place that I called home. I was brought up in Derbyshire on the margin between the foothills of the Peak District on the west and the iron and coal measures to the east. So it was no accident that there was an iron works virtually at the bottom of our garden and cycle trips over the moors to great houses like Chatsworth and Haddon Hall were habitual Sunday excursions. Bolsover Castle brooding over its valley of coal mines and smoky coke ovens was a particularly poignant vision.

When the iron works tapped its furnaces at night the sky was lit up with an orange glow and I would race there to see this dramatic event with the molten iron flowing in golden rivulets filling up the channels in the sand to make pig iron when it cooled and solidified. Great engines as tall as a house ran thunderously on furnace gas to make the blast that created the reaction that produced the iron. I was entranced by the economy of this operation which I now see as an instinctive feeling for what we now call sustainability. Sometimes this competed with a Turner-esque sunset

which sent me racing with equal urgency up to the moors to see the best of it. So, although I couldn't at the time articulate what I felt in terms of what I wanted to do with my life, the pleasure I took in machinery, beautiful buildings and landscape was what I wanted to experience, first at school and then in later life. Above all I chafed at the rigid distinction academic convention insisted on between the Arts and the Sciences which seemed to me to be simply two sides of the same coin.

World War Intervenes

It was this that led me naively to declare, as I was about to leave school for university at the beginning of the Second World War, that I wanted to study architecture. My teachers looked at me in horror and amazement. "Don't you realise there's a war on?" they exclaimed. "Who wants architects in a war? It is science that will win this one and you're too good at physics to be wasted - go to Cambridge and do your stuff". I had neither the guts nor the know-how to challenge this view and I allowed myself to be conscripted into science without demur. I enjoyed the elegant rigour of the scientific method and looked forward to living among the beautiful buildings of Cambridge.

I had also become obsessed in earlier years by the obscenities of the First World War and was inclined to pacifism.

I was not a model student. I spent more time in the Music Department and going to magical lectures by the architect Albert Richardson than I did in the labs. Perhaps subconsciously I was hoping to fail and be sent off to fight - news of the Holocaust was filtering through the network of my Jewish friends and my pacifism had evaporated - but I was trapped in the Government drive for scientific manpower. Eventually I got a poor degree and opted to go to sea for the navy, feeling by then thoroughly guilty about my safe life in Cambridge.

Operational Research

My work involved the application of electronics to global navigation and anti-submarine warfare. I was operating at a low level in the scientific war effort but learnt enough about Operational Research to appreciate its virtues. The essential idea was that the best way to apply science to war was to get the warriors into the laboratory and the scientists into action. That way the users of the weapon systems would adjust their aspirations to what the state of the art could provide, and the scientists would produce equipment that was robust in battle and easily maintained with limited resources of material and skill.

The whole system rested on feeding back the behaviour of equipment in use to the designers of the next improved version. I well remember a certain high frequency radio direction finding aerial mounted at the top of a hundred feet high mast which required for efficient operation the adjustment of a trimming condenser. Doing this job meant climbing up with a voltmeter and a screwdriver. With the ship rolling in a stiff breeze you were frozen and frightened over water most of the time and I remember when I finally got down the mast my knees refused to support me and I crumpled up on to the deck. The system was redesigned to make this operation unnecessary. It was a forceful lesson in the value of feedback.

This came home to us at the end of the war in Europe when we brought some of the latest U-boats over to our base in Northern Ireland so that we could examine their equipment. It was much more sophisticated than ours but most of it was out of use because of the hostile environment inside a working submarine and the lack on board of the specialist skills needed to maintain it. It has been said that the robust nature of our fighting technology was one of the important factors that gave us the edge to secure victory.

The Building Research Station

Ever since Cambridge I had discovered that I couldn't stand most of my fellow scientists. This was the first time I learnt that if you don't like the people you're working with you're in the wrong job. I concluded that I had been right about architecture after all. So as soon as the Navy could release me I wangled a transfer to another branch of the Scientific Civil Service - the Building Research Station (BRS) - and was drafted into the Architectural Physics Division. I reckoned that this must be a step nearer to architecture and found myself in a place of high morale and enthusiastic sense of purpose. The staff were divided equally between scientists and architects dedicated to applying the lessons they had learnt doing war-time operational research to the challenge of rebuilding a better Britain. The core idea was to make a bridge between the users and designers of buildings through the work of multi-disciplinary research and development groups. Building and testing full-scale prototypes was an essential part of the experimental regime.

The whole country was badly damaged and virtually bankrupt, starved of buildings, with a physical infrastructure which had been worn out, if not destroyed, during the war and a people impatient and hungry for the better life promised by victory. There was no time to be lost and it was an essential part of the ethos of the Station that the only research which was worth doing was that

which could be immediately applied to the building industry, using readily available construction techniques of known cost and reliability. Surveys of dwellings and their inhabitants showed, for example, that 55db was a socially acceptable value for airborne sound reduction across party walls between houses. It was established that an eleven inch cavity wall could achieve this and thus became the standard against which other forms of construction could be compared.

The correlation of subjective response with measurable criteria established by feedback, and construction methods of tested buildability was the key. This kind of pragmatic consensus was applied to standards of artificial and natural lighting, heating and ventilation, plumbing, electrics and so on. The whole was embodied in a series of modestly priced blue books, the 'Post-War Building Studies', an encyclopaedia of feedback which was at the side of every drawing board in the country after the War.

These were exciting times; the company was congenial and I was reluctant to leave, but my friends at the Station persuaded me that while it was evident that I would never be more than a third rate scientist there were some indications that I might make a better fist at being an architect. So with their advice and encouragement I brushed up my drawing at Art School and managed to persuade a civil servant in the department of Scientific and Technical Manpower, (who shall be for ever blessed), that, since all I had was a Science Degree, it was clear that my education as an architect had been interrupted by the War. I could therefore legitimately claim a Further education and Training Grant from the Government to complete my studies. He was not as green as he was cabbage looking however, and denied me a full grant but went so far as to promise that if I got a scholarship he would match it. So I did, and he did, and I arrived at the Architectural Association (AA) over half a century ago in 1947.

Architecture At Last

The rest was bliss. After all the uncertainty and false directions I found myself with people that I liked, respected and could learn from, and I was doing what I found immensely enjoyable. Architectural education was in a state of revolution. Just as the scientists who came home after the War brought with them the charisma of operational research and transformed the Building Research Station from a sleepy country place where samples of materials were put out in the weather for years to test their durability, into a hotbed of discussion between architects and scientists; so the staff and students in the schools of architecture, many of whom had been involved in the War, were impatient for change and desperate to repair their fractured lives.

Before the War architectural education had been structured around the study of historic style and classical rules of composition, with abstract design exercises based on hypothetical clients and conjectural sites - “design a monastery on a rocky promontory” was the popular caricature of a typical brief. Just as science during the war had surprised the Generals by its essential relevance, it was now seen as a vital component of architecture. The key lesson of operational research that good design depended on a multi-disciplinary team and a close working relationship between users and designers was reflected at the AA in the introduction of engineers to teach building science and anthropologists, sociologists and statisticians to discuss the needs of the building users. We asked for real clients that we could talk to for our design exercises and real sites that we could walk about on, and we got them.

We also campaigned for the publication of independent architectural criticism based on experience of the building in use. An article I wrote in 1950 in the magazine of an architectural students association is a typically hot-headed contribution - *“Architecture is in transition. If we are to control the process of change we must understand it and guide it in the right direction; and if we are to understand it fully we cannot afford to reject the confident precision of scientific enquiry. Architecture must become an exciting experiment in new ways of living. And the architect who believes that his work is done as soon as the building is finished must be made to look as ridiculous as the scientist who believes that his experiment is complete as soon as he has assembled the apparatus.”* Reading it now I can’t help wondering whether its arrogant tone of social engineering might lie behind some of the mistakes that we made in the 60s and 70s, and some of the failures which I shall go on to describe.

As soon as I qualified and became involved in architectural practice I became aware of the innate conservatism of the construction industry, and the intractable conflict between the aesthetic preoccupations of the architect and the practical necessities of listening to the client and learning from the users. I had to put my innocent idealism on the back burner as I struggled to learn how to turn dreams and visions into a physical reality inhabited, sanctioned and paid for by real people and produced by the motley collection of warring tribes that was, and still is, the building industry.

Practical Disillusion 1 - The Office Survey

Certain incidents stand out from the next half century of work when I tried in vain to light the torch that I still carried in my mind to help establish a learning industry. One was as a member of a

multi-disciplinary team that conducted a survey of architects' offices promoted by the Royal Institute of British Architects (RIBA) in 1960 in an effort to find out how architects really worked and in the light of this how they might be helped to improve the quality and efficiency of their service to clients. On the issue of job management we examined the way design records were kept and looked ; “ ... *at the extent to which design decisions were recorded for future reference and the performance of design solutions in use studied and assimilated for the benefit of future jobs. Although many architects maintained an interest in their buildings after they had been handed over, it was generally a casual one ... There was a noticeable lack of systematic activity in this field ... We think that the study of buildings in use, from the technical and cost points of view as well as in terms of design, could be carried much further by the majority of offices to the great benefit of the profession and the community. The ability to learn lessons systematically from experience is the key to technological progress and social influence.*” We said in our concluding recommendations that; “*The study of buildings in use ... should be carried much further by all types of office.*” This was later included by the RIBA in its Plan of Work for design team operation published in 1963 as Stage M - Feedback in firm instructions to architects to review the performance their buildings.

Practical Disillusion 2 - The New Universities

Bill Bordass in his contribution to “*Closing the Loop*” (Beyond Probe: Making feedback routine) reports the sad story which followed, but I was misled by the RIBA's support to embrace the idea in the Development Plan for the new University of York which was published in 1962. This set out proposals for the growth of the University during the first ten years of its life. Conscious of the dangers of prediction I wrote; “*It is ... important that the future of a University should not be restricted by enforced compliance with a rigid plan. Our aim has been to try and establish the minimum framework for growth which will ensure orderly development at the required speed and at the same time allow the greatest possible freedom for variation in the form, content and relationship of the building units ... If this approach is valid, it means that the plan must be subject to continuous review and re-appraisal ... We therefore suggest that the present Report should be seen as the first of a biennial series of at least four Reports, the subsequent ones being produced as a result of a continuous review of the Plan in operation. It follows that some way must be found of ensuring that this occurs, and that in the course of it full use is made of the experience gained by the University as a whole - both students and teachers - in these early and crucial years.*”

Of course this didn't happen. A young institution hoping for trouble free growth based on a glowing reputation is not anxious to risk having to publish what might be bad news. I have to remind myself however that when this was written we didn't know that we were to be appointed executive architects for the bulk of the University's early growth and this degree of continuity ensured close and frequent contact between designers and users which made informal feedback inevitable. But I still regretted the lack of a systematic procedure that I had hoped for which indeed meant that what the York team were learning was largely lost to the rest of the office and their clients. As it was, the first survey of student opinion didn't happen for twenty years. It was conducted by graduate students of the Department of Social Work as part of their practical curriculum. It cost nothing and taught us much that we ought to have known earlier.

During the 60s seven new universities were being built in England and this programme presented a unique opportunity to build a data bank which would embody a rich variety of experience in the relationship between planning assumptions and the social and academic consequences. Assuming that academic institutions would be particularly eager to contribute to the general store of knowledge I did my best to encourage such an enterprise without success. In spite of the fact that between us we were spending a great deal of taxpayers' money even the University Grants Committee, the guardians of the public purse, showed no interest in finding out if they were getting good value.

Another Try

I found these experiences dispiriting, and my mood wasn't lightened by the fact that although I eventually became Chairman and then President of a large multi-disciplinary design firm I couldn't persuade my colleagues to embrace feedback as a natural part of their way of life. In fact I couldn't get them to acknowledge that science owes its success to the fact that it grows and changes by testing a hypothesis through observed experimentation, the results of which are fed back into the body of knowledge to generate a new cycle of hypothesis, experiment and feedback. It has always seemed obvious to me that buildings are similarly experiments designed to test the hypothesis of the brief and that the results should be fed back to improve performance so that, as in science, the whole body of knowledge is enhanced.

I still don't understand for sure why this analogy should have been rejected so decisively. Was it my fault, or was it just lack of time and money? There is of course a natural reluctance to admit mistakes in a competitive society, but perhaps the difficulty lies in a fear that our creativity as

designers might be inhibited by too big a dose of reason.

Nevertheless when I retired from architectural practice in 1998 I was encouraged by friends and colleagues who knew about my career-long frustration, to use my retirement to do something about it. So I wrote a synopsis for a research project designed to promote feedback and showed it to an old friend, the managing partner of a research consultancy. He thought it had enough promise to provide the basis of a submission for a grant from the “Partners in Technology” (PIT) Research Programme of the Department of Environment, Transport and the Regions (DETR). He worked the necessary linguistic miracle to manipulate our thoughts to fit the Department’s format and at the same time nobly volunteered as Project Director with his firm as lead partner (=sponsor). It was called “Closing the Feedback Loop” and we fed it into the bureaucratic machine.

Which promptly turned it down. The judgement was summed up as “... *not convinced that this offers value for money; needs to be more selective*”. DETR then threw a spanner in the works by declaring an unacceptable conflict of interest arising from the fact that my friend’s consultancy was involved in administering the PIT programme. They were therefore unable to continue as sponsor and he had to stand down as Project Manager. The obvious name to look to for salvation was Bill Bordass whose work with Adrian Leaman and others on the “Post-occupancy Review of Buildings and their Engineering” (Probe) was currently being published in the *Building Services Journal*. Although he had always been at the back of my mind as an ex-colleague and long standing friend I thought he would be too busy, and in any case I wasn’t too keen to submit my amateurish ideas to his acutely critical gaze. However my friend was not so shy and persuaded Bill to join in.

Probe to the Rescue

This was a huge relief and Bill and I set about reworking the submission to reflect his wide experience in the field and to relate the Project to what we knew of the Department’s priorities. Bill deals with the strategy and outcome of the project and sets it in the wider context in his paper to “Closing the Loop”. My purpose here is to describe what it felt like to be a member of the team. Our objective now was to build on the Probe experience to produce Guidelines for the application of feedback to the products of the construction process which would be simple, quick, cheap and enough fun to use to attract the attention of enough of the industry’s leaders to get the ball rolling. At the same time as establishing the validity of techniques for assessing the performance of buildings in quantifiable terms Probe was beginning to explore ways of discovering the likes and dislikes of the people who were using them. The interaction of the results in these two fields was

starting to reveal significant associations between the physical attributes of construction and the opinions of the users about the effects of the building on their own performance. The new project could usefully explore these connections and provide incentives for clients to embrace feedback as a valuable tool for improving the efficiency of their businesses.

We were also eager to use the research to enlarge the vocabulary of techniques available for evaluating building performance. Experience of operational research during the Second World War had demonstrated the power of feedback as an essential element of the scientific method in improving the performance of complicated weapon systems depending on the successful design of the human-machine interface. The results, like the Spitfire fighter plane had sometimes been beautiful. When it came to the re-design of our feedback research project Bill and I hoped therefore that we would be able to investigate the possibility of extending the Probe methodology into the more subjective and difficult areas of design quality and environmental impact. Many hiccups were still to come but meanwhile Bill's skill in producing a logical and sensibly costed proposal, and recruiting a convincing project team, eventually won the day and we were at last awarded a grant under the aegis of what was now called the Partners in Innovation (PII) programme with Bill as project Director and the Construction Clients' Forum (CCF) as our sponsors.

CCF - Kiss of Death?

Our relationship with the CCF had begun earlier when we learnt that two of the four independent advisers who had adjudicated on our failed submission for the PIT programme had in fact been favourably impressed, and one of them was in charge of administration at the CCF. When we went to see him to discuss how we might do better next time he told us that the CCF believed in feedback and included in its manifesto a commitment to support research aimed at promoting its use. He undertook to try and persuade his governing body to support our next attempt and become our sponsors and in this he succeeded.

The support of the CCF seemed to us to set the seal on our ultimate success, and made it possible for us to design a convincing closure to our proposal in the shape of a series of case studies which would be mounted by CCF members to explore the use of the Feedback Guidelines over a whole range of different building projects. We intended that this would not only sharpen up the Guideline tool but also provide a sufficient number of culture carriers to cross the threshold beyond which feedback would become second nature.

The involvement of the CCF meant that representatives of major clients were the main constituents of our Project Steering Group and I can now see in hindsight that their advice tempted us into a diversion from our primary task. Instead of getting on with extending the awareness of existing techniques and developing new ones for examining the more subjective issues I have already mentioned, we were persuaded to concentrate on finding ways of making a business case for feedback which would charm chairmen, boards and managing directors out of their lack of interest and persuade them to take it seriously. While this is a worthy aim it was beyond our means. We spent a lot of valuable time on this only to discover that the top management of client companies were typically not only not interested in feedback, they weren't even interested in buildings. They regarded them as remote from the primary purpose of their business activities and gave them very low priority. In any case they took the view that feedback was entirely the responsibility of the industry and that its costs should be included in the offer price just as the cost of market research was an integral part of their own concerns. It gradually dawned on us that the group who could most easily be persuaded that feedback was in their own interest were in the supply side of the industry, and the only sector in the group with the intellectual curiosity to have a go were the designers. We were later able to take advantage of this lesson, but only after disaster struck.

The CCF, which by this time had become the Confederation of Construction Clients (CCC) ran out of money. So we were suddenly left with a potentially dead project because the Government funds were predicated on an equal contribution of time and money from the CCC without which we had no means with which to carry on. These were dark days when it looked as though yet another attempt to engender construction feedback was going to bite the dust.

We had however at least one reason to be cheerful. The Building Research and Information Journal published an edition devoted to Probe with comment from overseas and this country (Volume 29 no 2, March-April 2001). It received a most encouraging reception and established without doubt that fears of adverse reactions, including law suits, which would follow inevitably from the publication of independent objective assessments of building performance were without foundation. One of the apparently more cogent reasons for not doing feedback thus disappeared.

DTI to the Rescue

So, once again, my hopes were raised and the publicly acclaimed success of Probe, with the many

supportive meetings which were held to celebrate, may have had something to do with what happened next. Bill Bordass, determined to rescue something from the wreckage, managed to persuade the Department of Trade and Industry (DTI) who were our new masters, (DETR having been abolished after the 2001 election), that the project had achieved enough to be worth their continuing support and they agreed to carry on with their grant to the end of our programme, although CCC's disappearance of course left a big black hole in our budget.

Fortunately we had now reached the stage by which we were clear about the portfolio of feedback techniques which we thought worth including in our Guidelines and Adrian Leaman had brilliantly incorporated them in a user friendly website which, thanks to the Usable Buildings Trust (UBT), was ready to go at : www.usablebuildings.co.uk/fp/index.html. The latest crisis, coupled with the earlier distractions involved in the fruitless search for the business case, had however wreaked two significant areas of damage: one was the loss of the cohort of eager clients which we had assumed CCC would provide to run the case studies to trial the Guidelines; the other was that we had failed to develop any techniques for assessing design quality. The first was dealt with by the setting up of a Users' Group as proxy for the missing cohort of clients. The members were a number of architects, engineers and clients whom we had recognised as potential culture carriers and their job was to test the performance of the Website Guidelines on a number of real projects.

DQI Happenstance

The second area of damage was dealt with by a piece of serendipity which became yet another reason to be cheerful about the long term prospects for feedback. This is the subject of a recent Building Research and Information Journal issue (vol 31, no 5) - the Construction Industry Council's initiative to develop Design Quality Indicators (DQIs). They arrived just in time for us to include them in our portfolio and are now being tested in parallel with the other techniques which are available on our website. The DQIs have evinced an encouraging amount of support particularly in government - enough to confirm my hunch that the feedback bandwagon is beginning to roll.

So far the members of our User Group who have employed the DQI technique report that it is most helpful in stimulating discussion about client and design objectives at the beginning of a building project and reviewing the design as it evolves, though the questionnaire is I think too long and people find some of the language difficult. When it comes to an appraisal of the building after occupation it appears to be less satisfactory, and certainly any ambition of giving the building a

robust design quality rating has not yet been achieved. However, as a spur to discussion and reflection it again does a useful job.

Our research leads us to believe that many people want feedback techniques to be simple, reliable, cheap and quick. It is important therefore that they should fit easily within existing budgets and established procedures for design team and construction management. Although the DQIs, which now form part of the Feedback Portfolio available on the UBT website, do not entirely satisfy these criteria they do break new ground in attempting to assess design quality, including environmental impact and functionality and perhaps surprisingly, they have managed to attract a lot of political support. In my opinion it is important that their future development concentrates on avoiding avoid duplication with other evaluation techniques and- produces a clearer, shorter questionnaire. What is important is that the DQIs and the other techniques in the portfolio should complement each other and develop in potency as experience of using them grows.

The Architectural Dilemma

If it is true that what feedback has done for science it can do for construction we can be encouraged by the increasing show of interest in the subject. There is a danger however that many people will jump on the bandwagon, tick the boxes and embrace the fashion without really seeing the point and understanding the wider implications. The challenge is to put intellectual curiosity about the objective measurement of our work, and the feedback of its lessons, at the centre of our design expertise and as the inspiration of our intuition. That way the journeyman architect like me can do a good job without feeling guilty that he's not a genius.

For many architects however it has always been difficult to resolve the tension between the need to design rationally and the ambition to produce large scale sculpture, and perhaps increasingly so today as architecture has been embraced by the world of marketing. Clients, led by the media, are now demanding what are called iconic buildings with a "wow factor". Architectural design with its wide ranging social implications is not as simple as this. It is an activity which has to combine the rational energy of the left brain (right hand) with the emotional/intuitive powers of the right brain (left hand). For some uniquely gifted people this comes naturally - think of Nicholas Hawksmoor and Charles Rennie Macintosh - but for most of us it is damned hard work. So hard in fact that many educators are tempted to concentrate on what looks like the soft, easy bit of intuitive form-giving, and leave the hard rational bit to the engineers. The result is an architecture that bends to the fleeting winds of fashion and neglects the tough intellectual effort of producing buildings which

act as efficient and cost-effective transformers of energy flows (heat, light, electricity and gravity) so as quite simply to give people a comfortable and enjoyable place to be in.

I mentioned earlier the way in which architectural education at the beginning of the peace shrugged off the formalistic rigours of the Beaux Arts tradition and embraced the rationality of the modern movement. Since then however the revolution has faltered. Efforts to inaugurate a teaching office at Sheffield University for example failed in the face of opposition from the local architects jealous of the competition. Bill Allen, my old boss at the BRS, took on the job of Principal at the AA, tried to reintroduce the essential elements of building science into the curriculum, and got the sack for his pains. And now when we look at the field of architectural education we all too often see originality as the first criterion of student success and the realities of money, time, buildability, sustainability and user comfort often reacted to with disdain.

The Future

If I end on a low note as far as architectural education is concerned I finish more hopeful that the opportunities for the growth of a feedback habit, at least on the design side of construction, are looking better than I can remember during the whole of my career. If practitioners come to recognise that they need to learn systematically on the job, which is all that the scientific method amounts to, the academics will have to follow.

In the long run it is also possible that the availability in the public domain of independently researched facts about the performance of buildings will provide the raw material for the regular publication of uninhibited and honest criticism of the kind which nourishes the worlds of visual art, theatre, music, and literature.

Bill Bordass has described in his paper our hopes that the Usable Buildings Trust will safeguard and nurture the future development of the feedback project. This will need money, people and organisation. I believe that the Trustees under their chairman Ian Laing will be able to grasp this opportunity and raise the necessary funds through a widening membership to make it possible. Dare I add to my other expectations the hope that some schools of architecture might join the club not only to add their academic expertise but also find there a rich source of teaching material?