

01: Research, practice and architectural knowledge

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1. A PREJUDICE

I must admit at once to a fundamental initial prejudice: while I am delighted that research is once again high on the agenda of the RIBA, I do not like the title of this symposium: *Design as Research*. From my perspective 'Design' is *not* 'Research' and never can be. Nor is 'Research' the same as 'Design'. All my experience, both as a practising architect and as someone for whom research continues to be an enormously important part of my professional life, tells me that each of these activities has a different objective, requires a distinctly different mode of thinking and operates in a very different way. Of course, both 'Design' and 'Research' are vitally important to the profession and teaching of architecture. However, conflating these two essentially different activities is, to say the least, confusing and unhelpful.

Why is the distinction between design and research so important? Buildings are often very large, complex entities that last for a very long time. It is not surprising that the mental processes involved in conceiving buildings and the mental processes that are necessary to understand their properties, potential and impact on people are so different. The initial design, procurement, and construction of buildings involve many skills, disciplines and processes. The management of buildings over time, as they are appropriated by generations of users, demands yet more different skills. Even more different is research into such fascinating questions as how people use buildings over time, what effect buildings may or may not have on organisational performance or how buildings can be used to convey values and ideas. Research into how buildings perform, what they contribute and what they mean is very different from both the design and the management of buildings. Of the three, research, in my opinion, is the most demanding and yet, in architectural practice and even in Schools of Architecture, probably the most neglected.

2. A POSITION

John Zeisel, one of the most able and interesting commentators on the value of research for designers, argues that the design of buildings is a complex process involving 'imaging', i.e. forming a mental image of what could and what ought to be done, 'presenting' such ideas in ways that make them visible - such as sketching, drawing plans and building physical or computer generated models - and then 'testing' the results in a simultaneous feed-back and feed-forward process, constantly adjusting the relation between the emerging design of a building against the many criteria and qualities the end product is intended to meet.¹

I shall use my experience both as an architect and a researcher in the field of office design to illustrate the differences between a) the process of 'imaging', 'presenting' and 'testing' a specific proposition for the design of a particular building and b) developing and testing hypotheses about the design and performance of building types in general. Office design is particularly interesting in this respect because office buildings, like cities, are very rarely the product of a single design programme. Instead they are constructed of so many design programmes of different degrees of longevity

¹ Zeisel, J. *Inquiry by design: tools for environment-behaviour research*, Cambridge University Press, Cambridge, 1984, pages 22-24.

that it is difficult to determine exactly what the essence of an office building actually is.

Compared to the skills that an architect needs to be successful in ‘imaging’, ‘presenting’ and ‘testing’ an individual design project, those that are required to conduct cumulatively valuable research within a building type, such as the office, are very different. I do not want to deny the possibility of one and the same person having the capacity to shift mental gears from design to research. Such a combination of skills, although somewhat schizophrenic, is highly desirable. However, being a successful designer doesn’t necessarily guarantee the intellectual discipline to carry out a research project. And being a successful researcher certainly does not give instant access to the wonderful gift of design imagination.

Getting the interplay right between ‘design’ and ‘research’ is particularly important in office design. Many designers assume that an office design project can be instantaneously evaluated within the restricted terms of an individual client’s initial brief. From the perspective of architectural research the development of valid conclusions more often depends on data in the form of multiple cases, comparisons and categorisations.

Moreover, in office design, enquiry cannot stop at the moment a client moves in – longitudinal studies of clients’ space use over time are essential if office space is to be used economically and sustainably to achieve ever changing business priorities. Office design is never complete. Evaluation inevitably transcends individual authorship. Generations of design and redesign – and indeed of designers themselves – accumulate throughout the life of an office building as users continually modify the building shell, engineers adjust the mechanical and electrical services, and interior designers continually rearrange short term interior designs or ‘scenery’ since this layer of design rapidly becomes obsolescent, more quickly than building services and much more quickly than building structures.² The implication of these cycles of continual change is that, to be useful, research itself must also be an ongoing process.

3. ARCHITECTURE AND SOCIAL SCIENCE

Architecture as a discipline is essentially integrative: connecting past, present and future, drawing on art, science and the social sciences, balancing qualitative with quantitative factors. Moreover, architectural practice is both action orientated and reflective, has a deontic as well as an analytical responsibility and must continually balance user demands against often conflicting supply side considerations.³ This mixture of the theoretical and the practical, the normative and the responsive, the long term and the short term, the general and the specific, the artistic and the scientific, which are the characteristics of Architectural Knowledge, explains why the discipline of Architecture sits so uneasily within conventional academic structures.

Architecture comprises, straddles and co-opts many other disciplines. Compared to the process of ‘imaging’, ‘testing’ and ‘presenting’ within the context of a particular project, the task of generating and testing generalised hypotheses demands additional skills and resources. More often than not, rather than expanding an area of enquiry, the strategy of researchers is generally to narrow a field down so that they can focus on exploring relationships between limited numbers of variables. Rather than tangle

² Stewart Brand, *How Buildings Learn: What Happens After They’re Built*, Viking, New York, 1994 in which Brand builds on ideas first published in Duffy Cave and Worthington, *Planning Office Space*, The Architectural Press, London, 1976.

³ Francis Duffy with Les Hutton, *Architectural Knowledge: The Idea of a Profession*, E & FN Spon, London and New York, 1998.

with what *ought* to be, researchers' training is to focus on what *is* or perhaps even *was*. Rather than searching like architects in an open-ended way for the ideal and the ineffable, researchers like to frame and refine hypotheses until they are fully bounded and can be tested empirically. Again Zeisel puts it well: 'Presented with a problem, researchers draw on theory, training, accumulated knowledge, and experience to generate tentative ideas about how to solve it. Exploratory hypotheses serve as the basis first for observing and gathering data about the topic and then for describing and understanding it. Making visible the implications of the data leads to improved hypotheses, further data gathering, and so on until the problem is sufficiently redefined and a tenable solution found.'⁴

In short: while Social Science researchers tend to focus, simplify, test and stay for the long run, Architects tend to aspire, open up ever wider opportunities, pick up the design award and move on. The differences between these two operating modes are so stark that they prompt a highly optimistic conclusion: architectural and social science skills are essentially complementary. They need each other.

4. PURPOSES AND CONTEXTS

The discipline of Architecture is essentially political in the broadest sense: architectural work can never be divorced from clients' *Purposes* and *Contexts*. The architectural design process starts by an architect seeking to satisfy an individual user's requirements within a specific situation. Building on the sum of these specific encounters is where Social Science should be most useful to Architecture: the extent of individual architectural achievements should be capable of being measured in the context of generic client purposes within generic contexts.

The extent to which social aspirations are achieved through design can be tested, reformulated and tested again. On the one hand, in Architecture there are very few, if any, absolutes. On the other hand, Social Science methods do make possible provisional generalisations about how architecture may be used to make more probable the achievement through design of certain social purposes within certain well defined contexts. Such over-arching hypotheses must be expressed in ways that permit continual testing and, if appropriate, refutation. Operationally the process of modelling the ever developing relationship between social variables that are to do with purpose and contexts and physical variables that describe the allocation of material and resources can be the basis for a fruitful relationship between Social Scientists and Architects, *provided* adequate allowances are made for differences between two very different world views, values and modes of operation. Social Scientists must not make the mistake of behaving or even, God forbid, thinking like Architects. Architects must not make the reciprocal mistake of believing that Social Science has all the answers up its sleeve.

Compared to Architects, Social Scientists have the benefit of a relatively well developed epistemology. Hence, the urgent importance of articulating what is special about Architectural Knowledge: the frame of reference, values, thinking processes, methods of enquiry and exposition, forms of validation and data bases that distinguish Architecture from other disciplines and professions.

⁴ Zeisel, op cit. p. 33.

5. EDUCATION AND EXPERIENCE

The origins of these reflections are best illustrated within an autobiographical context. In this way parts of my own experience are presented for no other purpose than to illustrate the wider methodological issues discussed earlier.

Compared to most office architects and even within my own practice, DEGW, my work has been particularly specialised: strategic consultancy and brief writing for very large international corporations, mostly occupying multiple buildings on multiple sites.

I spent five years (1959 – 1964) in the hot house atmosphere of the studios of the Architectural Association School of Architecture in London, which was independent of any other institution and divorced from other disciplines. What we did term after term, year after year, was simply designing and presenting projects, one after the other. Three circumstances mitigated this narrow professional focus: first, talented contemporaries many of whom became lifelong friends and two lifetime partners in practice; second, sophisticated teachers of whom I shall mention only two, Cedric Price and Royston Landau, both of whom in very different but complementary ways brought into the studios an international and critical view of what architecture could become; and third, access through tutoring, crits, lectures, exhibitions and events to London's professional architectural and engineering elite.

My second formative educational experience was three years later as a Harkness Fellow in the USA, firstly at the Berkeley Campus of the University of California and then at Princeton (1967 – 71). At both these institutions, confident of my design ability, and enormously helped among many others at Berkeley by Horst Rittel and Christopher Alexander and at Princeton by Robert Gutman and Robert Geddes, I experienced the exact opposite of the AA: abundant access to courses in a wide range of other disciplines, particularly the Social Sciences, that were enormously useful in throwing light on various aspects of what I had already determined would be my research topic: the relationship between organisational structure and office design.

My third and perhaps most critical educational experience in this period of my life was in New York when I was invited in 1968 to become a part time consultant to a firm of office space planners and interior designers, JFN. Here, at the same time as continuing my theoretical studies and field work at Princeton, I was exposed in the field to the practical realities of brief writing and designing offices for large international companies within the great tradition of North American office design, then at its peak. Of the many lessons I learned there the most important was the differential longevity⁵ of different elements of office design – shell, services, scenery, sets – a process designed to accommodate the inevitability of organisational and technological change. Little of this was then understood within the much more architecturally constrained and backward office design practices of the Europe to which I returned in 1971.

Subsequently working for many generically similar, but in actuality very different, large organisations, widely distributed globally, has given me a life-time's opportunity to collate and compare the impact of very different organisational and national cultures and of emerging technologies on how office space is provided and used.

⁵ First described in Francis Duffy, Colin Cave, John Worthington, *op.cit.* 1976 and subsequently elaborated in Stewart Brand, *op.cit.* 1994.

6. DECADES OF WASTED EFFORT

Two diametrically opposite tendencies are evident in architectural research into the relationship between the physical environment of office work and social phenomena. The first tendency, towards minutiae and abstraction, tends to be most evident when scientific endeavour is carried out in Universities and research institutes which are almost always somewhat distant from design practice. The second tendency, towards generality and optimism, is characteristic of designers' attempts to popularise and make accessible findings from what is widely acknowledged to be a notoriously complex and difficult area of social science. A survey of research findings on the impact of office design on building performance study commissioned by the Commission for Architecture and the Environment (CABE) manages to demonstrate both tendencies simultaneously in the two versions in which it was published – the first, an extensive literature survey aimed at academics⁶ abundantly illustrates many examples of the first tendency and the summary of the same findings intended for a lay audience⁷ is an excellent example of the second.

Demonstrating direct causal links between the working environment and output is well known as the research equivalent of the North West Passage. Attempts can be traced back to the famous Hawthorne Studies carried out in the late Twenties at the Western Electric Company⁸ by Elton Mayo and his colleagues and even earlier to the investigations in the UK in First World War by the Industrial Fatigue Research Board. Such attempts to relate productivity directly to physical working conditions have been continually frustrated by numerous intervening variables. Measuring the output of knowledge workers and relating it to the physical working environment in the first decade of the 21st Century is no easier and, in fact, has become even more difficult since universal information technology and distributed work have eroded conventional definitions of the workplace. The concept of place in an increasingly virtual world is no longer what it used to be.

Reviewing the studies discussed in the longer version of the CABE/BCO review could make a saint despair of ever charting a way forward. It is hard to tell which is worse: giving design variables too much attention or undervaluing them. Relating environmental and social variables in the world of work is a notoriously difficult field of research particularly because a mechanistic relationship is often assumed. More importantly business purpose and contextual factors are rarely given enough attention. Technological and social changes are also underestimated and under-documented⁹.

It is hard to avoid the conclusion that decades of frustrated scientific effort have thrown very little light on the relationship between design and business performance. My own view is that the principal reason for the cumulative failure of these efforts has been not achieving sufficient equivalence between the importance of physical and the social realms that would have led to a robust and ongoing dialogue between the two. This failure is hardly surprising given the different worldviews, experiences and expectations of social scientists and designers.

⁶ DEGW, the Centre for Building Performance and Diagnostics at Carnegie Mellon and Arup, *The Impact of Office design on Building Performance*, available to download from: www.cabe.org.uk and www.bco.org.uk 2004

⁷ CABE and British Council for Offices, *The Impact of Office Design on Business Performance*, BCO 2004

⁸ Roethlisberger, F.J. and Dixon, W.J. *Management and the Worker*, Cambridge: Harvard University Press, 1939.

⁹ The most notable exception is the work by Eric Trist and others at the Tavistock Institute in the Fifties leading to the invaluable concept of the 'open socio-technical system'.

7. FOUR INITIATIVES

What follows is intended to be a brief account, with a very limited number of examples, of how the problem of bridging the gap between Design and Social Science has been addressed in one particular context. The four examples of research into the relationship between office work and the office environment were all carried out within the orbit of DEGW, a design and consultancy practice that I helped to found in 1973 and which, from the beginning, has specialised in workplace design and has maintained for almost four decades a social science presence and research capacity. I do not pretend that the work I shall briefly outline resolves all the issues raised in this paper. Nor do I want to claim that either the work of DEGW, nor for a decade of our ally, Building Use Studies (BUS) should necessarily be a model for others. As will soon become evident, despite all our efforts, in our very own data mill we have let far too much precious grain slip through our fingers and through the floor boards to indulge in complacency.

Office Interiors and Organizations 1973 USA

I had become interested in office design in the Fourth Year at the AA because I had come across the emergence in Germany in the early Sixties of the phenomenon of *burolandschaft* (which translates roughly as ‘office landscaping’) i.e. open plan, non orthogonal, generously planted, flowing office layouts claimed to be derived from an analysis of internal interactions and communications so that the architectural forms of office buildings themselves were shaped directly by clients’ operational briefs.¹⁰

What fascinated me was that the office landscapes that I had observed seemed to be all equally open and equally non hierarchical in physical terms. This seemed anomalous since the physical form of the office landscape was claimed to have been empirically derived in each instance directly from organisational data. Could all office organisations be operationally so similar that one design formula could suit all equally well? Surely, I argued, there must be differences in degrees of intensity of interaction and of dependency on hierarchical distinctions between different categories or types of organisation which would suggest the possibility of at least some legitimate variation in the physical form of office layouts?

This observation was the genesis of my attempt in my Princeton dissertation¹¹ to create a model in which organisational and physical typologies could be empirically measured in parallel and systematically related to one another. The outcome of this investigation was that the measured relationship between intensity of interaction and physical subdivision was so weak and the measured relationship between degrees of bureaucracy and physical differentiation was relatively so strong that the arguments inherent in office landscaping ideology that played down the importance of status symbols to claim that interaction is the key to the design of office layouts, were substantially contradicted. In other words, at least in the case of office design – and, of course, at the time and in the place that the study was carried out - the symbolic properties of architecture were demonstrated to have precedence over functionality.

The three best things about this study were 1) that social and physical variables were given equal importance, 2) it was based on a model which acknowledged a parallel range of both organisational and physical solutions and 3) it was empirically testable in the field with real measures. In retrospect the three major weaknesses of the study

¹⁰ Frank Duffy, *Office Landscaping: A New Approach to Office Planning*, London, Anbar Publications Ltd, 1966

¹¹ Francis Duffy, *Office Interiors and Organizations – A Comparative Study of the Relation Between Organizational Structure and the Use of Interior Space in Sixteen Office Organizations*, Princeton University, 1974

were that it 1) did not cover enough physical or social variables, 2) ignored office technology and 3) made no attempt to address the possibility of organisational or physical change.

Nevertheless, this model was very useful in the early days of DEGW as an example of a quantitative, typological approach to office design firmly based on the acceptance of a rough equivalence between physical and organisational variables. The model at least kept our design thinking straight by opening our eyes to a wider range of possible office layouts and by undermining the credibility of simple design formulae such as office landscaping.

The ORBIT Studies – 1983 and 1985, UK and USA

By the early Eighties computers were escaping from the computer room to invade the general office, dragging their cables and their unprecedented environmental demands behind them. In the UK and especially in London the existing office stock, much of it constructed too rapidly and cheaply in the Sixties and Seventies, was unable to accommodate not just the new wave of technology but, more importantly, the demand for much larger amounts and higher standards of office accommodation stimulated by the globalising consequences of the same technology. Of particular importance in London was the rapid modernisation and expansion of the Financial Services industry.

The UK ORBIT¹² study was carried out by DEGW, by BUS, a social science consultancy which DEGW had set up with another architectural practice, ABK, and EOSYS, office automation consultants. The study was funded by a wide range of sponsors – developers and suppliers of office space, building services engineers, furniture manufacturers, building contractors as well as telecommunications and governmental regulatory interests. One of the most important and unexpected aspects of the multi-client study method turned out to be monthly input from seminars and presentations involving all sponsors. Other inputs included a taxonomy of information technology in all the forms that existed at that time, analyses of trends, organisational case studies of advanced users of technology conducted in the field, interviews with big users of IT, and, perhaps most importantly, the development of key criteria to judge the practical performance of a wide variety of office buildings in terms of their capacity to accommodate information technology. This last output developed into the evaluative technique we called 'Building Appraisal', much used by developers for well over a decade after ORBIT was published

ORBIT²¹³ was carried out in the USA by the Harbinger Group (a subsidiary of Xerox), Frank Becker and William Sims from Cornell University as well as DEGW. The same multi client strategy was deployed with equivalent success. In addition, models of organisational change and Facilities Management strategies were developed. Computerised survey techniques were deployed. However, in retrospect ORBIT 1 had greater impact than its North American successor probably because the results were targeted on one city, London, and one sector, Financial Services. The consequences of ORBIT 2 are harder to assess: not least because the American office building stock at the time was more robust compared to UK offices built in the Sixties and Seventies and, at least for the time being, less obviously vulnerable to the challenge of rampant Information Technology.

¹² Francis Duffy, *The Orbit Study: Information Technology and Office Design*, Eosys, Slough, 1983

¹³ Gerald Davis, Franklin Becker, Francis Duffy, William Sims, *ORBIT 2 Executive Overview*, Harbinger Group Inc., Norwalk, CT, 1985

The best things about the ORBIT studies were 1) the rapid absorption of the findings, in the UK at least, by the supply side, 2) the creation of a temporarily powerful evaluative tool, Building Appraisal, 3) a stimulus to the professionalisation of Facilities Management in both the UK and the USA. The worst aspects were 1) the failure to anticipate that Building Appraisal in the course of little more than a decade would develop a life of its own, atrophy and become an outdated orthodoxy and 2) the failure, probably due to the commercial nature of the funding and publication of the studies, to achieve any lasting impact on either the Social Sciences or the teaching of architecture.

New Environments for Working 1998, UK

New Environments for Working (the NEW Study)¹⁴ was another multi client study carried out by DEGW, this time in collaboration with the Building Research Establishment (BRE). Following the model of ORBIT the study was typologically based – firstly on a categorisation of work patterns derived from *The New Office*¹⁵ (den, hive, cell and club – based on two organisational dimensions: organisational interaction and organisational autonomy). The second typology was a categorisation of a range of typical office building shells based on depth of floor plate and location of cores. The third typology was a categorisation of environmental systems – HVAC, lighting and office furniture. The method was to overlay these three typologies to determine for which organisational type a particular building shell configuration or environmental system would be most appropriate.

The typical building shells were illustrated with layouts from actual buildings. ‘Affinities’ between organisational types, office building shells and environmental systems were used to generate environmental and cost implications which facilitated systematic comparisons between architectural and environmental design strategies.

The study concluded with a series of recommendations on product directions for environmental systems, lighting, space planning and furniture. In this way the design implications of the phenomenon of increasing mobility at the workplace began to be addressed practically as well as theoretically.

The best features of the NEW study were 1) a user perspective on a notoriously supply side driven market, 2) holding together organisational and physical variables in one model, 3) the quantification and comparison of the environmental and cost consequences between generic design strategies. The weakest features were 1) the axes of the organisational model were relative rather than strictly quantifiable, 2) over complexity – too many variables to be easily held in anyone’s head, 3) failure to anticipate the full implications of the sustainability on both office building design and office building use.

Instrumental Research – UK, USA, Asia Pacific 1980s onwards

The final example of DEGW’s practice-based contribution to research is, unlike the previous three examples, mainly instrumental, i.e. methodological rather than directly related to testing hypotheses. Preparing design briefs for office buildings and interiors involves large numbers of people. In order to facilitate observations, workshops and interview sessions, we have developed a number of ways to help respondents and interviewees communicate various aspects of their use of space and time as well as

¹⁴ Andrew Laing, Francis Duffy, Denice Jaunzens, Steve Willis, *New Environments for Working*, Construction Research Communications Ltd, London, 1998.

¹⁵ Francis Duffy, *The New Office*, Conran Octopus, 1997.

their aspirations for and fears about their working environments. Three such techniques are:

- Time Utilisation Studies (TUS): an observational technique to measure incidences and types of office occupancy (e.g. of workplaces and meeting rooms), and activities, (e.g. concentrated individual work, group work, mobile activities) through surveys carried out by observers, using hand held electronic devices, following prescribed routes, usually over ten working days;
- Workplace Performance Survey (WPS): a self recorded survey of activities performed in the workplace combined with the users' appraisal of the relative importance and contribution to achieving business objectives (or not as the case may be) of various features of the physical working environment;
- Briefing Cards: a deck of cards displaying a wide variety of images, some beautiful, some less so, but all interesting, from which respondents in group situations are asked to select those images which provide the closest descriptors of or metaphors about the most salient features of their existing and their ideal workplace.

The best features of these and similar techniques are that 1) they act as icebreakers in group discussions, 2) they provide an incontrovertible record of activities and feelings; 3) they profile and quantify both good and bad features of existing and proposed working environments; 4) they invariably lead in group discussions to yet fuller articulations of peoples' experiences of and aspirations for workplace environments. The worst features of these techniques – or at least of our use of them – are that 1) we have tended to use them to describe specific situations rather than general categories of space use or spatial qualities; 2) we have not always been able to absorb the full implications of our findings into actual projects and 3) the theoretical implications of the methods have not yet been pushed hard enough.

8. A CONCLUSION

'Design as Research' is the title of this conference. Some listeners may think that the four examples I have presented represent exactly that – environmental research carried out in a way that is so closely integrated with the design process that the two are indistinguishable. To come to that conclusion would be to confuse the proximity of research thinking and design imagination with the conclusion that these two very different mental processes are equivalent and identical. Far from it. My initial prejudice remains as strong as ever. It is precisely because design and research are so very different that their combination in the context of action is so powerful.

Two things from this semi-autobiographical account should be absolutely clear by now. After four decades of not inconsiderable involvement with both Research and Design, I have plenty of reason to believe 1) that these two extremely important activities are completely and diametrically different in tradition, method, process, objectives and rewards and 2) that both desperately need each other if architectural knowledge is to be advanced. From my point of view Design needs Research and Research needs Design. The tragedy is that, given the present institutional context of both design professions and academic structures, it is so very difficult to bring the two wonderful ways of thinking together in a complementary way.

Calling 'Design' Research and 'Research' Design will not solve the problem. Nor will granting 'PhDs through Design'. The craft of design and the craft of research are essentially different. Universities and Research Institutes will always tend to go their

own sweet, centripetal way. Architectural practice, left on its own, will always continue to trend in the same direction. Unless, that is, the catalytic but contrasted contributions of Design imagination and Research methodology are forced to work together to achieve benefits for practice, for users and clients and for cumulative development of knowledge.

This is my final point: contact with real users and real clients with real purposes in real contexts is critical in the conduct of architectural research. The common features of all the experiences I have described, including my own doctoral research, are 1) they were all carried out in the context of action, 2) they were all related to practical, urgent design choices and 3) they were all designed to be contributions to the longer term development of Architectural Knowledge. Of the three features the most important is the value of conducting research in the context of action. Because in the world of work real decisions always have to be made, client pressure and user involvement are essential components of both Design and Research. In my world clients and users are both drivers and audience. They provide the motive, the matter, the money and the means. Above all, their interest, intelligence and involvement are essential to keeping both Architects and Researchers thinking together.

Some examples of DEGW's design work:



The Montevetro project, Dublin. (photo by Digital Studio 2)



The BBC Worldwide, London (photo by Inga Powilleit)



Boots, Nottingham (photo by Richard Bryant)



The Google building, Amsterdam (photo by Inga Powilleit)