

# BACK TO THE DRAWING BOARD?

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## 1. INTRODUCTION

I am starting my presentation with some slides of architecture as a reminder that above all else we are involved in the education of future architects. Such is the enthusiasm of many of us for our specialist subject that computers dominate any discussion of architecture. We must not lose sight of the fact that we are using computers to assist in the manipulation of space, form, light, texture and colour, and in communicating our ideas. They should also be helping us and our students to understand and deal with the relationship of built form to its environment, its users and other buildings. The use of computers should not get in the way of this. In the final analysis the image on a computer screen is only that - an image, a representation of a building. It is not the building itself. It is a means to an end and not an end in itself. The image must not be a substitute for the physical building. We must remember that we use most of our other senses when experiencing a building and it is just as important to be able to touch, hear and smell a piece of architecture as well as being able to see it. Who knows, perhaps even taste is important.

How much does the use of computers affect the design process and the final appearance of the building? Would these buildings have been substantially different if a system of working in three dimensions, similar to computer aided design, had been available to these architects. To what degree has the design process and method of working shaped the architecture of designers like Frank Lloyd Wright, Carlo Scarpa, Louis Sullivan, Charles Rennie Mackintosh or Alvar Aalto.

## 2. LIVING WITHOUT DRAWING BOARDS - DIGITAL ARCHITECTURE

### PAPERLESS STUDIOS

I wasn't sure whether the metaphor in "Back to the Drawing Board" would be apparent outside the UK so I will start by clarifying the intention behind the title. As well as its literal meaning it also conveys the idea that a process, product or idea requires fundamental re-evaluation and that it might be necessary to start again from the beginning or at least some way back. I suppose it could also mean that we have turned our backs on traditional methods of representing and communicating ideas.

There are practices and design studios in schools of architecture that claim to have abandoned the drawing board and committed themselves to an exclusively computer-based system and will profess themselves to be a "Paperless Office" or "Paperless Studio". This is a curious notion as anyone who is involved with computers will know that computer-based processes generate far more paper than manual processes. Because so many more options can be explored with computers - they are. The theory is that in a paperless office all information exists in digital format only, and is distributed and accessed by subscribers across electronic networks, never materialising as hard copy. This is difficult to achieve in practice for many reasons, not least being that we find it culturally difficult to adapt.

As a society that has been used to recording data on paper and other permanent media for thousands of years it is extremely difficult to adapt to a media that has an ephemeral presence and does not exist in a tangible form. Information on paper is portable, wonderfully accessible, instantly recognisable, and its relationship in terms of position and size to other information is intuitively gauged. When we pick up a book its size and weight immediately informs us of the total amount of information that we are exploring. Having identified the position in the book of the information we can see its relative size and location in relation to the overall body of information. We can access it randomly and even put our fingers between the leaves as a temporary marker.

### THE ACT OF DRAWING

It is very difficult for us as a profession to abandon completely a method of working that has become so intuitive and instinctive over the centuries. As designers how many of us find it impossible to discuss a design without a pencil in our hand? Carlo Scarpa said "I draw because I want to see". He was very aware of the connection between seeing and knowing in his mind. He was similarly aware of that magical interaction between eye, brain, hand, pencil and paper. Laurie Lee, the British writer expressed similar thoughts on representing his ideas. He rejected any mechanical means of recording his words, and wrote using a paper and pencil because he needed to "be able to feel the thoughts as they flow from my brain through my arm and on to the paper". We must not forget the power of the quick, minimal, intuitive mark on paper that in spite of its brevity can convey so much. I do not believe there is an electronic equivalent.

A great deal of important architecture started life on a piece of paper, an envelope, napkin or back of a cigarette packet. Where is the digital equivalent of the back of an envelope? It was through spontaneous and intuitive expression of the designers thoughts, directly on to the medium that enabled an idea to be captured in an accessible but eloquent manner. The mastering of and interaction with technology as an intermediary or interpreter did not interfere with the process.

### CHALLENGING EXCLUSIVE CAD PROCESSES

From my experience as a designer and teacher it is my belief that the act of design cannot be accomplished purely in digital format. I am convinced that although it is a very powerful and persuasive tool it is inadequate on its own. Exclusive use of computers in the design process can actually have a negative effect on the design and the designer. As part of a wider palette it is a formidable tool. I am sceptical about the assertion that architects not using computers are disadvantaged and that they will lose their competitive edge. Nobody should feel compelled to use computers. There is a view amongst many practitioners that the computer is indispensable, when many of them have rarely employed manual three-dimensional techniques during a scheme design, and even fewer use conventional model-making techniques. When these practices do embrace digital technology it isn't utilised to design buildings, but as an electronic drawing board to speed up production, using a vector based program that knows nothing of architectural form.

Incidentally, it is the same practices that then complain that we as schools are not producing computer aided design-proficient students. If, by this they mean that we are not churning out a steady supply of drawing office fodder, proficient in the use of Autocad, then their dissatisfaction should continue. Our graduates should be designers not electronic draughting machine operators.

It is my contention that it is not possible to design comprehensively using nothing but a computer. I believe that we possess an instinctive ability to interpret our thoughts through an interaction between brain, eye and hand, representing them finally as an image on paper. The co-ordination between the various elements is seamless. It is the free-form, analogue nature of this act, our control over it and its accessibility and permanence that makes it so unique and utterly indispensable. Similarly, we can manipulate materials of differing characteristics, assembling them to communicate our ideas in a true three-dimensional representation. Physical models are an extremely valuable tool for anyone dealing with form and space and should be seen as an essential part of any design process involving computers. They are absolutely complementary rather than supplementary.

### 3. COMPUTER AIDED DESIGN - EXCLUSIVE PROCESSES

This is not a scientifically conducted study but rather an ongoing analysis of computer aided design that is continually reshaping the way I think about and approach design using computers. It is a result of my observations over the past ten years both in practice and as a tutor at the Birmingham School of Architecture. It has also been influenced by the experience of other practitioners and educationalists mainly in the UK but also in the United States. My proposition relates to the use of computers for three-dimensional modelling and does not address computer-aided draughting which for me is peripheral to the discussion.

## SIMPLE SYSTEMS

Of all the three-dimensional modelling programs written over the past ten years, for me the most influential, in both education and practice has been Modelshop. It was a seminal piece of software and was cheap and cheerful with an intuitive interface, simple primitives, and would run on the humblest of Macintosh computers. Students who were used to building real-world models found it simple to move this process on to the computer. It gave maximum output for minimal investment in time. As a design tool it did not get in the way of designing buildings. Students could learn how to use it in the morning and by the afternoon they would be modelling their latest project. They quickly established the capabilities of the program and could get it to do most of what they wanted. By the following week they had printed out three-dimensional views on the Imagewriter, stuck them together with drafting tape, coloured them, drawn over them, and stuck them on the wall together with drawings and models. They had found another tool and were using it alongside other, more familiar tools. Most students did not abandon their other more familiar modelling techniques in favour of Modelshop, they just used it alongside the others. It simply widened their scope.

For a great many students the computer was a great liberator, not least for those who had difficulty in expressing their ideas in conventional graphic form. They were able design in a three-dimensional environment in the way architects should always work. It actually forced people to think about many aspects of building design from an early stage, particularly in the areas of design that were ignored by even experienced designers until towards the end of a project. They were compelled to consider materials and their colour and texture, relationships between structure and envelope and relationships between space and form.

## CAD BIASED STUDIOS

At Birmingham, in 1990, we established a CAD orientated studio, Virtual Architecture, and a programme of unashamed, digitally based projects. Enthusiastically embracing all aspects of the ever more powerful machines we utilised graphics, animation, multimedia and the Internet, the students producing increasingly sophisticated and visually stunning images. Our students were winning national competitions and we were all enjoying exploring new territories. But we were aware that in the midst of all the excitement we were becoming victims of our own success. In our enthusiasm for the technology and its liberating influence for those with little natural conventional drawing abilities and its enabling effects for the brighter students we were blind to some of the emerging problems.

## COMPUTERS OR DESIGN?

There is evident, among students and staff alike, a preoccupation and fascination with the technology for its own sake. It is obscuring the purpose for which it is being used. It is becoming an end in itself. Students are now more concerned with the process of constructing a three-dimensional model than with the architecture of the model.

Weaker students are producing work on the computer, the content, scale and complexity of which they do not really comprehend and eventually cannot relate to. Difficulties of comprehension and manipulation of space are far greater on the computer for the weaker student than on a physical model and a great deal of time can be spent unsuccessfully trying to deal with spatial concepts through the computer. This is often accompanied with a complete misreading of, or disregard for scale. Neither does it force them to engage with the issues of context any more than conventional systems. It is apparent that some students are spending valuable studio time on the machines solving not design problems but computer problems. Many hours of computer time are spent resolving the best way to represent a particular element rather than considering its architectonic significance. They are using the software to address issues of architectural form and composition that are often better dealt with using alternative means. There is a perception that once a building is in digital format all aspects of its design have to be tackled and represented in that format. These students deceive themselves, and often others, into believing that they have a building when they do not.

Stronger students, on the other hand become obsessed with images that cease to be buildings. The work becomes steadily less accessible to others, and becomes more difficult for its designer to interact with. Many hours will be spent refining images rather than aspects of architectural design. New features in a program will be eagerly embraced, whether they are relevant or not. They lose sight of the purpose of a particular stage in the design process and the appropriate response in terms of communication and representation. There is a distorted view of presentation that is generated by the capabilities of the software rather than the requirements of the design stage.

We are producing a generation of computer aided design-dependent graduates who, when in practice, will find it more difficult to embrace other media and methods of working. Interacting with a computer keyboard and screen can be an solitary pursuit and mitigates against involvement of others. They will find team participation more difficult and are more likely to find themselves running IT systems than designing buildings.

### RESTRICTIVE SOFTWARE

In many ways computer aided design is as restrictive as a drawing board. Many of the well-established programs encourage a rectilinear approach to building design and any curves incorporated in a design are in plan only. The third dimension is often achieved by extrusion or is restricted by a bias to verticality. Vector-based software knows nothing of three-dimensional elements restricting modelling options and discouraging free-form or sculptural shapes. Buildings will to some extent reflect the software used to model them. If a particular form is difficult to achieve on a given piece of software the design will often be adapted to accommodate the program.

Would the work of Gaudi or Bruce Goff been as it was if it had been computer designed? For a number of years the standard routine to test the flexibility of modelling software was to model Le Corbusier's Ronchamp Chapel. Form•Z illustrates this on its package but visualising an existing building is not the same as designing it.

The creation and modification of, and access to, computer models is still largely controlled by the originator of the model. In spite of advanced virtual reality, animation and multi-media techniques computer models are difficult for third parties to access and control. Anyone wishing to interact with the model requires knowledge of the software or the assistance of the designer.

### IMAGE IS ALL

The interface and complexity of some current software can be daunting with a bewildering array of tools and windows. They often offer a lot more than they can deliver, tying themselves in knots when asked to do complex renders and surface mapping, quickly frustrating and alienating users. Programs are conceived on the principle that the best software is that with the most features, and that we all want to be movie directors, diverting us from the main business of designing buildings. I am bored with fly-overs, walk-throughs and exploding and self assembly buildings. Photo-realism produces a peculiar sense of detachment and lack of engagement. It is now so commonplace that it has lost its ability to influence. I am no longer impressed by its technical accomplishment and as a means of conveying a feeling of reality it fails surprisingly. Photo unrealism or surrealism might be more appropriate. Buildings are just too perfect, streets devoid of rubbish and the lighting of a pure renaissance quality. Our computer room takes on a surreal appearance itself, with 20 Macintosh computers humming away to themselves with no sign of human presence. Of students the only evidence being notes (on paper) stuck to the screen warning "Don't Touch - Kev's walk through generating" and "Please leave, rendering".

Now the image is all important it seems, and it is better to spend hours on the computer making the glass transparent and reflective, creating accurate shadows and shading, and most important of all ensuring that anything remotely reflective is really shiny, than refining the architecture and gearing the communication to the particular stage.

I do not believe that constantly improving programs with more and more features really help in the creative process. However exciting new versions of software are, I cannot help feeling that they interfere with creative thought.

## LIMITING CAD

On its own, in education and practice, the computer model has limitations. It cannot exist usefully outside the computer. On paper it is three-dimensional representation but in two-dimensional form. Very often much time is spent solving computer problems rather than design issues. Because it can do so much, often of a spurious nature, it is frequently asked to, without significantly contributing to the architectural design. The absence of gravity in computer aided design software is not always appreciated by students and can result in ambivalent attitudes to structural design. Time and energy is wasted in dealing with problems of computer hardware and software resulting in frustration and disillusionment. In many schools an integrated approach to architectural design is hampered by the computers isolation. Instead of being part of the studio it is often located in a remote situation that automatically separates its use in the minds of many students. There is studio based design and computer room based modelling. Its separation from mainstream design studio activity effectively sets it apart in the minds of the students as a discrete and often remote activity. This often results in students seeing it as a technical pursuit more appropriate to people in anoraks. It can have an image problem. An unwelcome side effect of powerful computer aided design tools in education and practice is that more poor architecture can be produced more quickly.

## CYBER-BABBLE

I was pleased to read that William Gibson has finally disowned his lexi-creation, "Cyberspace". It was fun for a bit and made us address this new spatial concept but now it has been pronounced dead, and I for one will not be mourning its passing. May I also suggest some other contenders for mortality as their useful life is now at an end. Top of my list would be Virtual Reality as it appears that everything is now being transferred from video monitor to miniscreens built into a pair of specs. Photorealism and Web or Net anything also qualifies for burial. As an early and enthusiastic user of the Internet I am disappointed at its appropriation by commerce and its trivialisation. Surely its the largest repository of garbage in the world. It is a pity that this potentially enabling resource cannot be used more imaginatively. We could enjoy a conducted tour of Fallingwater, Bavinger House or The Castelvechio museum from the comfort of our own studio.

#### 4. INTEGRATED MEDIA

I have been designing with computers for about ten years. My initial enthusiasm for the newly-discovered tools led me into an increasingly dependent and exclusive relationship with computers and I was convinced that a totally digital design environment was the way forward. I gradually realised that I was surreptitiously making small sketches on the laser prints I was producing. At first I felt guilty, as if I was surrendering to some sort of subversive practice of which I should be ashamed. But eventually I accepted that I was actually drawing and was very relieved to come out of the closet. I restored my drawing board to its rightful position, to the great amusement of colleagues in front of whom I had professed a total commitment to digital design. I have subsequently modified my approach to architectural design with the computer at both practice and school level. I believe that my experience in practice has helped me formulate a more integrated approach to the computer.

#### A WAY OF WORKING

In practice I work at early design stages primarily with pencil and paper and rough card working models. Typically, after investigating preliminary ideas at sketch and physical model level a skeletal computer model is constructed that can contain varying degrees of detail. Physical and computer models are worked up together with additional sketches on paper where appropriate or more expedient. More detail is added to the computer model where appropriate. Complex geometries have often been resolved by using physical and computer modelling feeding directly one to the other. The computer model is infinitely more accessible when used with a physical model and problems far more readily resolved. Most importantly, non-computer literate members of the design team, and client body are not excluded or dependent on others to interrogate the design.

Our studio teaching is now firmly process-based and embraces a mixed-media approach to design. We encourage a design process oriented towards the use of drawings, real-world models and computer models. Students work between each method the one feeding into and informing the other. It is the blurring the edges of each tool that assists them in seeing beyond the method being used and concentrating on the design.

#### REAL-WORLD MODELS

I believe that physical models, as well as manual drawings, play an essential role. Card models have an accessibility and immediacy that is impossible to obtain on the computer. But more importantly they are truly three-dimensional. The image representing a three-dimensional model on the computer is still only an image and is viewed on a flat two-dimensional plane. Third parties can access and gain control of physical models without intervention from the designer and more importantly they can exist independent of any digital infrastructure. The process of modelling is more creative and satisfying than computer modelling. Working directly with different materials is far more responsive and informative. The relationship to the model is immediate with no problems of interpretation. Physical models are particularly good for exploring free-form or plastic shapes, particularly with mesh, plaster and clay.

Some years ago I remember reading about a Swedish program that used the three-dimensional data from ModelShop to produce a two-dimensional foldout template of the three-dimensional model. This could be printed out, transferred to card, and cut out and assembled into a physical version of the computer model. It was a bit like the cut-outs on the back of Weetabix packs when I was a lad. I am also aware of scanners that enable the transfer of data from a physical model into digital format. Greater accessibility to this type of hardware and software would enable a more seamless approach to working across media.

## IT IS ALRIGHT TO DRAW

Let us not forget Carlo Scarpa and Laurie Lee and the pleasure and feedback we get from placing words and pictures directly onto a surface by hand. Physically holding a stylus, moving it through space, applying varying degrees of pressure, constantly controlling its angle and direction, feeling the texture of the media, the hardness or softness of the tip of the stylus and responding constantly to the updated information received by the brain via the hand, the eye and even the ear, is a unique and very particular sensory experience. It is a very special and instinctive ability that should not be cast aside in favour of digital alternatives.

## FROM COMPLEXITY TO MODULARITY

I would like to see program design approached in a more modular way. Let us end the dominance of large, sexy, we-can-do-everything software in favour of small, discrete modules that achieve a particular task but can easily interact with other modules. We can then customise modelling software to our own requirements so that it does not interfere with designing buildings. There are many lost opportunities in architectural computing with computers being used as no more than passive tools. We should look at more imaginative and dynamic ways of using computers.

Let us see more computing power directed towards knowledge based integrated design systems, with more intelligent input from the technology into building design, with systems that have the knowledge to respond to our design decisions and interact in the process. Whilst we are manipulating form and space the software should be constantly updating us on the effects of our spatial control on other, important aspects of building design such as costs, energy use, sunlight penetration, daylighting and wind loading. We should also be experimenting with systems on a more theoretical and philosophical basis. Computers are immensely powerful tools that we should be using in a dynamic role, not merely as passive drawing and modelling machines.

## 5. CONCLUSION - RETURN TO OUR SENSES

We have been suffering increasingly from sensory deprivation. Touching and feeling, smelling, hearing and perhaps, even tasting, are all employed in our appreciation of architecture.

On many occasions I have flippantly alluded to my computer modelling as being the architectural equivalent of safe sex. You experience all the excitement and satisfaction of designing a building, can virtually occupy and move about it, but all without actually building it, with all the misery that entails, right down to never worrying about being sued because it leaks.

This however is not what architecture is about. As architects our purpose in life is to construct real buildings, buildings that you can occupy and experience through all five senses. Buildings you can see, hear, feel, smell and taste.

After all, experiencing and touching a building and seeing others interacting with it is far more important to us as architects than merely looking at seductive images.

We must therefore, first and foremost, be teaching future architects to design buildings and not be content with manipulating images. There is no soul in a mere computer image.

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