Innovation and the workplace

David Leon

With the increasing pressures on the pharmaceutical industry to meet the challenges of producing more drugs, in less time and at lower costs, all aspects of streamlining the process of discovery and development need to be addressed. The author discusses how a design process that focuses on process change, on key workplace characteristics and on setting clear performance targets will create the right framework for delivering innovative solutions to workplace design for drug discovery. He explains how, in an industry where time means more money than one likes to think about, such solutions will help the pharmaceutical community optimize performance and reduce costs.

Drug discovery laboratory buildings are large. They are large, we are told, because they need a lot of plant and services to support their activities. They are also large because those who design and build them have little incentive to keep them small. Glaxo Wellcome has an enormous research complex at Stevenage, UK, as most people know. SmithKline Beecham has just completed a large building not far away. Last summer Pfizer started constructing a multimillion-pound discovery building in Sandwich, UK.

These buildings, and many more designed to the same benchmark, equate with providing each scientist with up to 100 m^2 (1100 sq. ft) when everything is taken into account, even though the scientists themselves will actually only occupy a tenth of this. The rest goes on storage, circulation, common facilities and plant space.

Discovery buildings can cost some £2500–£3000 per m^2 to build and sometimes more. If 100 m^2 is built for each scientist, the construction cost per scientist is around £250,000. That is a lot of money. It is the same story with running costs, which can range between £200 and £300 per m^2 per annum or, to put it another way, between £20,000 and £30,000 per scientist per annum at current levels. Most discovery buildings will have a life of 30 years. Given that each scientist at a personal level ends up with only ~9 m^2 (100 sq. ft) of laboratory space and given that the scientist measures the place where he personally works as the highest priority on his list, is it not time to seriously review this profligate state of affairs?

There is another reason too – possibly more important. Everyone in drug discovery knows how important speed to market is – but large, inflexible buildings of the genre now being built work against speed. They reduce scientists' ability to collaborate, to exchange knowledge, to consult and to communicate. In spite of telephones and Intranets, the time wasted looking for someone or something can be enormous. Travel distances in these large buildings are so long that few contemplate a journey unless it is essential.

Innovative building design

What the drug discovery community needs is innovation, not in its drug discovery because it has that in abundance, but in its building design. Part of the trouble is that large discovery buildings are designed and built by a building and engineering industry that cannot help but see a building as an end in itself, rather than as a sophisticated tool to support discovery. Building and building services engineering is also one of the least innovative in industry.

However, it is increasingly recognized in scientific and business communities that there is a vital performance link between innovation and workspace design. EIRMA – the European Industrial Research Management Association – is setting up a working party to look into this, and the Research & Development Society of the UK has recently run a forum on the same topic. What is necessary is to break the mould of conventional thinking in building design.

At British Nuclear Fuels' (BNFL) new research centre at Sellafield, UK, expensive laboratory space will be reduced

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by 40% of what they have already. On a like-for-like basis, the building itself will be 25% smaller than existing facilities. These reductions will save BNFL millions of pounds in capital and running costs. As important to BNFL, however, is the fact that the laboratories, and indeed the whole building, have been designed to support and enable major process and cultural changes aimed at optimizing innovation and effectiveness. BNFL's objectives for the new centre are:

- In an industry where there are stringent safety and security regulations, to create a working environment that is people-friendly and transparent
- To support a new matrix management mode of working
- To create one integrated community
- To design a centre that is highly energy efficient and environmentally friendly

These objectives are all connected with process and people behaviour and will lead to increased creativity, innovation and speed of delivery. No one can say that nuclear science is any the less environmentally or security complex than the pharmaceutical industry.

Borax (Guildford, UK) is the largest extractor and processor of borax in the world. Several years ago they merged their headquarters business functions with their research functions, and they moved to a new purpose-designed building on the Surrey Research Park. A couple of years after the relocation, Ken Taylor, Director of Technology, was able to say, 'We have doubled our output with a third less people'. Independent self-assessed staff surveys one year after the move highlighted an increase in personal productivity by 87% of the staff. Of these increases, 18% were as high as 30% and a further 25% as high as 20%.

Softer, less-quantifiable factors pointed towards the theme of increased people-effectiveness. 'Decision-making accelerated', 'given a unity of purpose', 'greater team-building environment' were some of the comments that came out of the survey. There were few negative comments. The key success factor, however, was that with the right building and workspace design, 'more' could be achieved with 'less'. The new building as a consequence could be 38% smaller than the company's original facilities.

Unilever Research has laboratories in Port Sunlight, UK, for over 1000 scientists. When they had a major reorganization of their laboratories some years back, they increased space utilization by 33%. Instead of accommodating 650 scientists, changes in the way they worked together with physical changes to their workplace enabled them to increase capacity to over 1000 scientists with a consequential increase in output. At a personal level, no one had less space than they had had previously.

Take a leaf from the Coca-Cola Company. About the design for a new technology centre in Brussels, Belgium, André Teixeira – then Operations Director Europe – said: 'We will not just save space, but headcount too. We will be able to increase effectiveness and output'.

It is rare that you hear these kinds of performance gains or savings attributed to buildings connected with drug discovery. Frequently, it is the reverse that is true. Somehow the enormous sums of money linked with drug discovery and the intensive acceleration of research seems to spawn buildings that are expensive, lumbering giants. However, it is not true to say that drug discovery always fails in this task.

People and environment

Ten years ago Leslie Iversen, then Director of Merck Sharp & Dohme's NeuroScience Research Laboratories (Harlow, UK), was one of the first to recognize the performance link between his people and his new laboratory at Terlings Park. When I first met him at the Medical Research Council's research laboratories at Cambridge, innovative front-line science was being carried out in a dynamic environment. It certainly was no showpiece, but it had a buzz and an immediacy that you do not see in the oversized clinically designed giants of the pharmaceutical industry.

William Jenkins, Head of Clinical Development & Regulatory Affairs at Novartis Pharma in Basel, Switzerland, also recognized the strong link between workplace design and people when he began amalgamating the development activities of Ciba Geigy and Sandoz. But, on the whole, scientists in the pharmaceutical world and builders have failed to bridge the gap between what scientists really need and the limited innovation on offer from the building and services engineering trade.

What therefore do the research buildings of BNFL, Borax, Coca-Cola, Merck Sharp & Dohme and Unilever Research have in common? Certainly they have visionary champions such as Dr Sue Ion of BNFL and Professor Richard Duggan of Unilever, but there is something else too. When they have designed new buildings or refurbished workspace they have followed a particular design process that uses three interrelated factors:

- Process change
- Key workplace characteristics
- Setting the right performance targets

Their thesis is that the shape and layout of a building or workspace has a major influence on the way in which

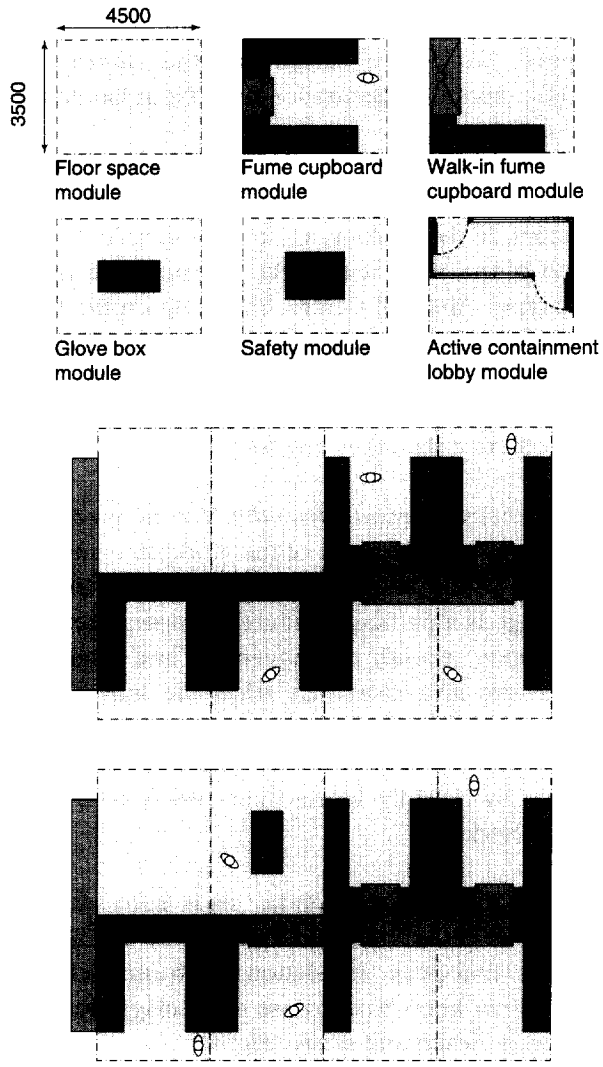

Figure 1. *At British Nuclear Fuels (Sellafield, UK), the challenge of establishing a successful multidiscipline project-team and reducing laboratory space led to an innovative laboratory design solution. By using a modular approach to laboratory space, when one project ends it can be quickly and easily re-equipped for a new project. Moreover, it provided a 40% reduction in laboratory space.*

things are done – far more than we imagine. Physical layout and environment influence almost every organization's process and the behaviour of its people. In many cases this can be detrimental to performance.

Process change

Process change involves a real understanding of the processes and culture of an organization, and then exploration of how the processes can be streamlined once the physical constraints of buildings are removed and people are given the right tools and space to do the job. Take away physical constraints – and this is where builders fumble – and it is surprising what is possible. 'Release the creative talent of our scientists, internationalize the laboratory', said Sir Geoffrey Allen when setting the brief for the Unilever project.

At BNFL the twin challenges of establishing a successful multidiscipline project-team and reducing laboratory space, led to an innovative research process and an innovative laboratory solution. No one will 'own' a laboratory, so when a project team needs laboratory space they will 'lease' it for the duration of the project. Laboratory space is entirely modular and flexible and at the end of the project it can be quickly and easily reassembled with the alternative equipment for another project team and another project (Fig. 1). Naturally, everyone has his or her own workspace and no one is left 'homeless'.

The link between process change and physical workspace is crucial. Physical change will enable process change to succeed and then provide the catalyst for further change. With few exceptions, this will also lead to significant space savings – in the region of 20–30% – and, in the case of BNFL, 40%.

Change will have an impact on the behavioural patterns and the working culture of those directly involved. Indeed, it is for this reason that many organizations seek to make the changes. This is a reiterative process, best described in the diagram shown in Fig. 2.

Key workplace characteristics

In spite of the fact that each organization and its facilities are unique, experience has shown that there are at least ten workplace characteristics that influence performance in a working environment; although, each of these characteristics will be applied differently in different organizations and situations.

Transparency. The ability to be aware of what else is going on around you. We rarely work in isolation these days. With today's technology, transparency, privacy and security are not mutually exclusive (Fig. 3).

Encouragement of interaction. Nobody is in doubt that the interchange of knowledge, whether planned or random, is an essential part of the research process. Design and layout have the power to encourage or hinder interaction.

Mobility. Gone are the days when scientists sat in their laboratories and everything came to them. We are much more

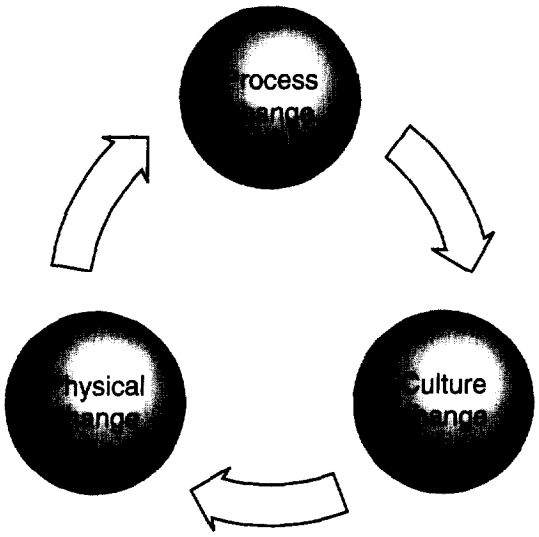

Figure 2. *Process change, culture change and physical change should be part of a reiterative design process.*

Figure 3. *The ability to be aware of what else is going on around you is important, as we rarely work in isolation these days.*

mobile. Time is divided into different types of work too. Open plan is no longer a theological imperative. We need time to ourselves and we need space for that. Equally, there are times when we need to get together with colleagues and we need the right sort of space for that too.

Culture. There are still wide differences in culture from one part of Europe to another. For example, Germans guard their privacy far more than the British do. Despite the cost of buildings, people are rightly more valuable than space. Workspace design and the culture of the individuals and their organization must be in harmony.

Information technology (IT). IT is almost the fourth dimension on workspace design and its importance will increase in the future. In the banking world, for example, IT caused the death of the High Street Branch. The result is a new building type – the Call Centre. Shopping on the Internet may sound the death knell of the supermarket. The impact of IT can be that fundamental. Who will bet that, in ten years' time, drug discovery buildings will not be fundamentally different than they are now?

User- and environmentally friendly. Too frequently great effort is put into the concept of the workplace and too little attention is paid to ergonomic detail at the individual level. Storage is a particular failure. Temperature control, light, humidity, sound, air movement and energy consciousness are all factors that affect the individual and should be carefully designed with them in mind. Everyone assumes the roof will not leak but is ready to judge their workspace by a badly located coat hook or a draught down their necks.

Health and safety. User-friendly leads automatically to health and safety, and is underpinned by an increasing amount of European legislation. Unfortunately, most builders do not know how to use their imagination in the application of health and safety (Fig. 4).

Flexibility. The need to change layout and services quickly, inexpensively and without difficulty is vital today. A good analogy is an orchestra that can rearrange itself in minutes depending upon what it has to play. Look to the long term, too. It is not so easy to make fundamental changes of function – say from laboratories to offices – in the lifetime of a building, but essential to do so nevertheless.

Effective use of space. Effective space will become scarcer and increasingly expensive. Energy, maintenance and running costs all depend upon building size. Most R&D facilities are between 20% and 30% larger than they need to be.

The building as a marketing tool. Traditionally, buildings belong to the world of real estate, but a well-designed environment can become an exceptional marketing tool, helping to generate a customer's perception of the organization.

Figure 4. *Clear visibility through shatter-proof glass between laboratories and office areas improve safety and supervision.*

Setting the right performance targets

It is true to say that most organizations go through a rational investment appraisal to reach every business decision, with the exception of buildings. Then they seem to become irrational. Too frequently potential benefits are overstated and poorly substantiated. There is too little understanding by high-level decision-makers as to how the business objective is actually going to be achieved through a new building. Regrettably, with few exceptions, the building and engineering industries do not make the essential link between business innovation and performance output and the buildings themselves. Briefs for buildings, whether they are new or existing, are based solely on 'input' targets, such as 'how many people?' and 'how many fume cupboards?' But setting 'output' targets will focus everyone's minds on the right objectives and, equally, what must be designed to achieve those objectives. A good example is when TWI (Abingdon, UK – the world's leader in materials joinery technology) commissioned a new technology centre in Cambridge; their brief contained clear and simple business 'output' targets that the design team could focus on in the design process:

- Increase contract sales by 15% growth per annum
- Increase the number and value of billable hours by between 15% and 20%
- Increase space effectiveness by not less than 25%
- Reduce running costs by 25%

Given these objectives the building project is increasingly becoming a process change project in which the building is a fundamental part.

Conclusion

How long can the pharmaceutical industry continue to throw money at their facilities without the recognition that there is a more effective and cheaper way of designing the workplace? Without an understanding that discovery buildings should be designed to be flexible tools of science – to encourage research and innovation – rather than monuments to the construction industry, the pharmaceutical industry will continue to spend too much money on their buildings and facilities.

In short...

NewBiotics (San Diego, CA, USA) have demonstrated the effectiveness of their novel compound, NB1011, in targeting colorectal cancer cells resistant to treatment by 5-fluorouracil (5FU) chemotherapy. In a presentation at the European Cancer Center, International Conference on Chemotherapeutic Strategies for Treatment of Colorectal Cancer (12 February 1999), researchers from NewBiotics described a novel technology named enzyme catalysed therapeutic agents (ECTA), with which they can target the resistance mechanism blocking the full therapeutic effects of 5FU.

Accordingly, 5FU resistance is caused by overexpression of thymidylate synthase in tumour cells, but this is used as a handle to activate non-toxic drugs into their toxic form. In preliminary studies conducted with Dennis Slamon and Mark Pegram (UCLA, CA, USA), and Michael Groziak (SRI International, Menlo Park, CA, USA), NewBiotics has shown that the ECTA process has selectivity for 5FU-resistant colon cancer cells, as compared with normal colon cells. 'NewBiotics has technology which is extremely promising in helping future cancer patients,' said Pegram, 'in particular, these drugs have the potential to be far less toxic and more effective than chemotherapy currently in use. We have already studied some of NewBiotics ECTA compounds in the laboratory and they efficiently kill cancer cells that have already developed resistance to conventional chemotherapy treatment.'