

A GAP IN THE INNOVATION MARKET



David Dent
Chief Executive Dent Associates Ltd
Vice President, Parliamentary and
Scientific Committee

Political rhetoric addressing the nations future economic prospects is always littered with an enthusiastic commitment to the process of scientific innovation. This is because economic growth is dependent on an ongoing ability to innovate, to develop new technologies and services.

Scientific innovation is of course a key component of this process, which should be reflected in the funding and organisation of our research base and supporting infrastructure. Given its significance to our future prosperity, the review and scrutiny of the processes, structures and financing of scientific innovation is essential to ensure we are achieving what we need in the most efficient and cost effective way. With this in mind it was with some excitement that I anticipated in March of this year, the publication of three reports; the Royal Society *The Scientific Century: securing our prosperity*, and Sir James Dyson's *Ingenious Britain: Making the UK the leading high tech exporter in Europe*, and the Council of Science and Technology's report *A Vision for UK Research*, which potentially offered, individually and as a whole, the prospect of a fresh look and appraisal of the UK's process of scientific innovation.

I am constantly amazed that despite the importance of the market in all other aspects of UK politics and economics, how little influence it appears to have in debates about scientific innovation and the organisation of our research base, one of the issues I had hoped to find addressed in the March reports. The market seems to have only a very limited role in our nation's innovation process which is very much science supply-led rather than market demand-led. The market appears to be viewed only as a beneficiary of outputs of a process which may or may not meet particular market opportunities rather than the main driver of demand for specific scientific innovations. Even the terminology we use when we refer to "translational activities" implies that there is no expectation that research has or should be directed towards a specific market opportunity.

The science supply-led model of innovation functions with research priorities determined by scientists according to measures

of scientific excellence as opposed to market or business criteria. The subsequent outputs of research, undertaken in universities and national research institutes, is then monitored for commercial potential, if these happen to be identified then intellectual property is usually, but not always, protected prior to scientific publication; commercial and funding partners are sought and innovations then licensed to industry or spin-off companies are created. No one really believes that this complex system is as effective as it needs to be, hence the plethora of initiatives to improve knowledge transfer and so called translational activities to improve the harvesting of the products of research. Most recently with the Research Excellence Framework (REF) the emphasis has been placed on the need for scientists to consider the impact of their work to ensure that the potential commercial and social benefits of their research are not overlooked. This whole process of science supply-led innovation is analogous to building a bridge across a ravine without knowing the required span, its load bearing requirements, necessary materials or the cost of the build – certainly not a bridge on which I would want to be reliant in order to cross any ravine - nor a process on which I would wish

... a number of decisions in the last 30 years have made it more difficult than necessary to develop a market-led innovation process ...

to rely for the future prosperity of a nation.

The science supply-led process of scientific innovation which dominates the UK research base can at best be described as ad hoc, unfocused and an indirect means of developing commercially viable products, technologies and services. We in the UK, have never been good at commercialising our innovations, something recently emphasised by a number of eminent politicians and scientists at the Royal Society of Chemistry's Parliamentary Links Day in June and acknowledged in the March reports. It is my belief, that because of the value we in the UK have always placed on academic "pure", "blue skies research", serendipity and scientific excellence, we have been corralled down a single route into our current process. I have certainly struggled to identify where and when we have actually considered alternative, potentially more effective routes to delivery of scientific innovation whereby the market becomes the driver of demand for specific scientific innovations rather than scientific supply - harvested for commercial purpose.

Also a number of decisions in the last 30 years have made it more difficult than necessary to develop a market-led innovation process; one of which was the political dogma in the 80's that believed publicly funded research should not address "near-market" issues and a

second; the more recent emphasis on scientific excellence and publication in high impact journals, mediated through the research assessment exercise (RAE).

The result of the "near market" dogma was that our national "applied" research institutes were effectively robbed of their mandate and we divested ourselves of a research capability and infrastructure that continues to serve other nations very well in deed (e.g. USA, China, Thailand and India) with a near-market research mandate. The subsequent introduction of the RAE across all publicly funded research also meant that the performance of those national "applied" research institutes that remained after the 80's, were and are assessed on the same terms as an academic department - an exercise which continues to facilitate their integration into the university system. And no one seems to question that a research institutes mandate and performance measures might benefit the nation more by being different from those of a university department!

The RAE has assisted many of our universities to justifiably claim their world class status - something which serves us all well as they deliver to their primary purpose of high calibre scientific research adding to the wealth of knowledge and understanding which underpins our whole culture and way of life. Secondly, and often with the benefit of serendipity,

... a change in mandate is a bit like needing a performing aquarium seal to become a circus trapeze artist ...

... Our whole system of science supply-led innovation is based on a number of presumptions ...

research can also innovate to develop concepts and technologies of potential commercial value. However, it has become increasingly apparent in recent years and with the introduction of the REF with its emphasis on impact, that this secondary purpose is becoming more of a priority as we strive to generate greater economic wealth from our research base; a move which may in reality, drive this truly valuable asset away from properly achieving its main purpose.

Such a change in mandate is a bit like needing a performing aquarium seal to become a circus trapeze artist; a different animal altogether, with different attributes and skill set, performing to a different audience with its own set of standards, encompassing different rewards and levels of risk. Of course there will always be some performing seals who may become trapeze artists, given the right circumstances, but most will not, could not and might even in the attempt, end up destroying the very thing for which they excelled. It might just be better to leave the performing seal to do what it

does best, and look to find potential trapeze artists elsewhere and work with them to deliver a focused and singly mesmerizing performance.

In other words what we have to ask ourselves in relation to scientific innovation for economic and social impact, is whether there is an alternative model which is market-led rather than science supply-led that will better deliver economic and social prosperity for the nation.

Our whole system of science supply-led innovation is based on a number of presumptions which include:

- the emphasis on scientific excellence is the most efficient and cost-effective route to scientific innovation
- science supply is more important for innovation, than market opportunity
- that our best scientific innovators remain within the current system and achieve academic excellence
- that the skill sets and training needs of all types of scientists are essentially the same



. . . in our science supply-led process of innovation, the market has become an after-thought rather than the driver of innovation. . .

- academic culture and organisational structure encourages and supports innovation
- contracts and reward systems meet innovators needs and aspirations
- the Haldane principle prevails for all project proposals
- technologies based on excellent science will eventually find a niche in the market place

We adhere to such presumptions because our whole process of scientific innovation is locked within a paradigm where the same terms, concepts and priorities are reiterated as a given - among which are the need for:

- nurturing a world-class research base
- scientific excellence as an imperative
- an attractive base for international research
- translating research into economic and social benefit

If we refocus these widely used terms towards a more goal oriented approach driven by the market where science becomes

the tool of innovation, then an alternative to the above paradigm becomes apparent with the need for:

- nurturing of world class innovation
- excellent innovations based on sound science as an imperative
- an attractive business base for scientific innovation
- translating market opportunity into commercially and socially beneficial scientific innovations

It was this kind of thinking - of realigning our perspective to what is central to the whole concept of innovation, the market, that I had hoped to find, at least in some sense, in one or all of the three reports. The CST report does argue that *"translating into economic or social outcome can arise from any part in the spectrum, from long established or newly discovered basic understanding, from strategic exploration of potential applications, or in response to market driven imperatives"* but the fact of the matter is that in our science supply-led process of innovation, the market has become an after-thought rather than the driver of innovation.

Such an emphasis on science supply-led innovation has to be challenged if only to confirm that the processes selected are the best, most cost effective and the ones most likely to drive growth in our economy. Also putting forward alternative processes does not mean that we transfer the whole research base over to market-led scientific innovation. There is no reason to risk the scientific excellence of our world class institutions by prioritising market oriented activities but rather to build an independent capability to ensure we fully meet commercial business opportunities with appropriate innovation. Refreshingly the CST report did argue for platform technology centres with, it appears, the potential to meet such a requirement.

One of the questions we have to ask ourselves is the one Sir James Dyson continues to ask - are we providing the right training opportunities, infrastructure, career routes, means of assessment and the environment for those scientists and engineers who are motivated, not by scientific excellence and a higher pursuit of knowledge, but by generating solutions of economic and social benefit? Are these people even the same or are we talking about the difference between performing seals and trapeze artists?

Perhaps we need to encourage scientific skill sets that require an entrepreneurial flare, an ability to identify gaps in a market, combined with a commercial solution mind-set, risk taking, a motivation led by business and potential revenues, rather than knowledge generation, scientific excellence, publications and an academic status. Combine this with an infrastructure oriented towards specific market sectors focusing on identifying market

gaps and defining the parameters of required innovations, with groups of scientists and engineers whose project proposals are assessed according to business criteria and where they work in a hot-house of entrepreneurship to develop, design and test technologies, products and services that address market need. Then maybe, just maybe, such an approach may provide more immediate and higher financial returns per pound invested for our hard pressed UK economy, than the rather diffuse, ad hoc science supply-led process to which we are currently completely wedded. Even if it doesn't, we have to ask the question and while there were glimmers of hope in this respect in each of the reports provided in March by the Royal Society, Sir James Dyson and the Council of Science and Technology, I did not feel any one of them fundamentally challenged the idea that the future of the UK economy should be dependent on the probability of serendipity delivering the occasional technology to an unsuspecting market rather than the deliberate focused intent of research to develop a technology designed for a specific market opportunity. We have to ask ourselves if we can afford not to consider alternative models of scientific innovation in a country which is, more than ever over the next decade, going to be dependent on innovation and export as a driver of our economy and our nation's prosperity.