IG/02 / **Published:** October 2006

Policy Briefing

NESTA Making Innovation Flourish

The Innovation Gap: Why policy needs to reflect the reality of innovation in the UK

Innovation is vital to the future economic prosperity and social well-being of mature economies such as the United Kingdom. As the UK becomes more reliant on services, confronts national challenges such as an aging population and environmental sustainability, and as international information flows progressively make knowledge a commodity, we must develop a tailor-made national innovation policy.

We need to focus on embedding a culture of innovation as well as the creation of specific innovations. We need a broad-based innovation policy that reaches beyond science and technology to embrace the 'hidden innovation' that occurs in all sectors of our economy and society. Finally and most importantly, we need to invest in the intermediate skills that will allow us to effectively absorb and use the knowledge that we create, and that is increasingly created elsewhere.

The UK performs poorly on traditional innovation metrics

Traditionally, the UK appears to perform poorly with regard to innovation. For example, UK business consistently spends less on R&D than its competitors in the US, France and Germany. Overall per capita expenditure on R&D in the UK ($566) is just half that in the US ($1,005), Sweden ($1,154) and Finland ($999).[1] In 2002, as part of its Lisbon Agenda, the European Council established a target for R&D investment in the EU of three per cent of GDP by 2010.[2] By comparison, in 2003 the UK spent only 1.9 per cent of GDP, a fall since the early 1990s, when it was around 2.1 per cent of GDP.[3]

Given the UK's comparatively low investment in research and development, it might not be a surprise that it lags behind Germany and Japan in another traditional measure of innovation, patenting activity. The UK has a triadic patenting rate of 36.7 patents per million population, while Germany achieves a rate of 90.7 and Japan reaches 92.3.[4]

Traditional innovation metrics are out-dated and largely irrelevant to the UK

Traditional metrics measure the wrong things

However, this 'poor performance' is largely because traditional innovation metrics measure the wrong things. The results do little more than describe the sectoral make-up of the UK economy rather than measuring the innovation performance of those sectors.

They measure *inputs* like spending on tightly-defined research and development tasks that exclude the vast majority of the UK economy and that look favourably on economies such as Germany that have large medium-tech manufacturing sectors (such as car manufacture).

They also measure *outputs* like patents that are chiefly relevant to high and medium-high-tech manufacturing, sectors that together account for only six per cent of the UK economy.

Traditional metrics ignore important sections of the UK economy

Simultaneously, they ignore the innovation that occurs in sectors such as financial services, retail, consultancy and the public sector, that together account for 94 per cent of the UK economy. The accepted definition of R&D even ignores expenditure on oil exploration activities (that industry's version of R&D), another sector that is vital to the UK.

Finally, although the UK performs exceptionally well on pharmaceutical research and development (a sector where R&D expenditure *is* directly relevant to innovation), this performance is lost when aggregate indicators are compiled and other sectors where R&D is less relevant are mixed in.

1. Organisation for Economic Co-operation and Development (2005), Main Science and Technology Indicators (MSTI): 2005/2 Edition, (OECD, Paris).
2. European Commission (2002), 'More Research For Europe, Towards 3% of GDP'. (European Commission, Brussels).
3. All data from Organisation for Economic Co-operation and Development (2005), OECD Science, Technology and Industry Scoreboard 2005, (OECD, Paris).
4. 'Triadic' patents are sets of patents taken at the European Patent Office (EPO), the Japanese Patent Office (JPO) and the US Patent & Trademark Office (USPTO).

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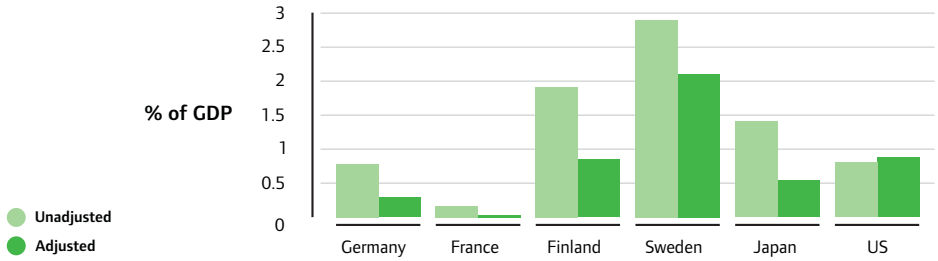
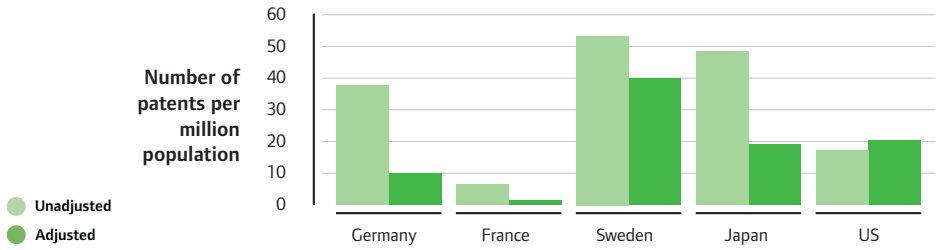
Figure 1: Business R&D intensity gap adjusted for sectoral composition



Source: OECD.

Figure 2: Triadic patenting activity per capita gap adjusted for sectoral composition



Source: OECD.

By using OECD analysis to reinterpret the raw data provided by traditional innovation metrics, the gap between the UK and Finland on Business Expenditure on Research and Development (BERD) halves from 1.9% to 0.8%. The gap with Germany on triadic patents produced per million of population reduces from 38 to 10. On business R&D intensity, the gap between the UK and France closes by 80 per cent.

Traditional metrics are based on an out-dated view of innovation

Traditional metrics implicitly follow a model of innovation that has little relevance to the modern world. The 'pipeline' view of innovation, where traditional research and development in an isolated laboratory results in patentable inventions that are then commercialised, is no longer universally applicable. Innovation now is a multi-directional and iterative process that involves multiple actors. It encompasses not only new components and products but new services, technical standards, business models and processes. It is a feature of developments in the public and non-profit sectors as much as in the private sector. Furthermore, much of the economic benefit from innovation comes from the diffusion of knowledge and technology, resulting in many incremental innovations.

Recognising and stimulating 'hidden innovation' is vital to the UK's future prosperity

Traditional innovation metrics lead to a logical focus by policymakers on scientific and technological invention and of the importance of university-industry links to maximise 'knowledge transfer' and commercialisation. However, these policies are of no use to sectors that rely on different forms of innovative activity. We call this 'hidden innovation'. It tends to display the following characteristics:

- *Innovation is not always driven by commercial incentives.* Traditionally, certain commercial apparatus (such as intellectual property, formal R&D spend and venture capital) is thought necessary to facilitate innovation. Yet, the 50,000 medical scientists who are employed by the NHS effectively operate as a 'hidden research system' that has produced over 300 tests for genetic

disorders. These are produced informally and non-commercially, benefiting from the personal drive of highly-specialised scientists and the exploitation of 'slack' in the formal system.

- *Clients are often partners in innovation.* In engineering consultancy, major firms have developed to encompass a wide range of highly-specialised skills to solve novel and complex client problems. As such, a client is buying the ability to innovate: innovation itself is a product and the client is a partner in developing the solution. The management consultancy industry operates in a similar way.

- *Innovation is iterative, multidirectional and reactive.* The development of genetic tests in the NHS involves an iterative process of development, testing and research before the 'product' is complete. In the development of tax planning products, one product is developed to minimise tax exposure. This is frequently responded-to by revised government regulation designed to maximise tax revenue. As a result, the product is developed, and the regulation changes in response. This represents a specific form of competitive innovation in which regulation plays a major role and in which each side is attempting to 'out-innovate' the other.

- *Innovative organisational techniques can efficiently solve very difficult problems.* The National Cycle Network is in reality a collection of 1,000 separate local projects organised under a national umbrella. This distributed innovation approach was necessary to efficiently cope with the wide variety of local regulations and specific conditions that would have mired a centrally-planned initiative. The innovation, therefore, is not in the low-tech methods of manufacture and delivery but in the 'business model' used and overall quality of the network relationships that were developed.

Science and technology policy has **become** innovation policy

Increased public investment in science and technology has been necessary and valuable. But it is now possible to draw a direct line between the traditional indicators that are supposed to capture innovation and the various policies that have been developed in response to the UK's poor performance on these indicators. In effect, the indicators have themselves become policy, in the sense that increasing R&D expenditure is policy, as is increasing knowledge transfer from universities, and so on.

This is understandable. First, innovation policy grew out of science and technology policy, but has subsequently absorbed aspects of enterprise policy, and education and skills policy as well. This process of absorption has allowed science and technology to remain dominant in innovation policy. In other words, areas such as education and skills have been grafted onto a framework for innovation policy that remains focused on SET, rather than causing this framework to be radically revised.

Second, the audit culture that prevails within government encourages a reliance on existing metrics whether or not they are representative. This is not necessarily a case of 'measuring the easily measurable,' because traditional indicators are bound by hundreds of pages of definitions and exclusions. But it does encourage an over-reliance on easy-to-represent measures that can be measured year-on-year.

Third, without innovation being identified as a major cross-cutting priority (in the manner of social inclusion), the existing remits of government departments and agencies have discouraged the cross-governmental thinking that modern understandings of innovation require.

The UK needs a broad-based innovation policy

1. We need a **broad** view of where innovation comes from and where it applies. Otherwise, we will fail to exploit the full innovative potential of the vast majority of our economy. We need to see innovation as a broadly-spread capacity that applies across the economy, including within public services, and not just in traditional science and technology-intensive areas. Greater attention should be paid to the complex processes involved in innovation, the importance of incremental changes, and the role of diffusion.[5]

2. We should consider the **drivers** of this new and broader understanding of innovation, in particular, the skills that build our collective capacity to initiate, absorb, support, organise, manage, and exploit innovation in its many forms. This would include developing an education system and

5. Mowery, D., and Rosenberg, N. (1998), Paths of Innovation, Technological Change in 20th-Century America, (Cambridge University Press, Cambridge).

curriculum that prioritises the foundation skills for innovation – analysis, problem-solving, creativity, imagination, resourcefulness and flexibility – and recognises that these skills are not only present in science and technology subjects. For example, we need to worry relatively more about lagging behind France and Germany on the proportion of our population with intermediate skills (the skills that the OECD says build a country's innovative capacity) and relatively less about the production of top-flight advanced scientists and technologists.

3. We need a **textured** innovation policy that recognises that one size does not fit all sectors. For example, we need a much better understanding of the dynamics driving innovation in areas such as the City of London, popular music and construction. In particular, we must identify those sectors where innovation may be lacking, and develop targeted policy interventions to suit.

4. Our innovation policy needs to be **imaginative** and to encompass a wide range of interventions that are relevant to stimulating and supporting innovation. For instance, we should consider the role of prizes, managed challenges, and procurement in transforming the UK's capacity for innovation. We must also consider the role of open innovation and of the multi-directional flows within and between different actors such as architects and developers, designers and producers, government and industry, management and engineering, universities and industry, customers and suppliers.

5. We should create innovation policy that is **appropriate** to UK conditions. A striking feature of most innovation policies around the world is their similarity. In the past, we have learned and borrowed from Japan, Scandinavia and the United States. A distinctive UK innovation system would focus on sectors that play a marginal role in policies that are relevant to countries with larger manufacturing industries. It would also build on our successful track record in stimulating innovation through regulation (or in many sectors, our light regulatory touch). Examples range from stem cell research to opening telecoms markets through privatisation. Within the financial services, intelligent regulation has enabled a myriad of innovations in financial products and services, including complex derivatives, software for secure transactions, and an explosion in available investment vehicles, all of which have enabled greater efficiency and consumer choice.

6. Finally, we need a greater clarity regarding our desired **outcomes** from innovation (rather than just the outputs). The focus of the UK's innovation policy should be determined by what we want from innovation, rather than focusing on innovation as an end in itself. Innovation policy should be driven by and aligned to the country's overall policy agenda, rather than viewed simply as a driver of productivity. We should assess each of our national policy objectives and major social, environmental, and business concerns, and clearly establish the role that innovation can play in addressing them.

Toward a national mission for innovation

The UK is not alone in grappling for the understandings, metrics and policies that will effectively capture and stimulate the reality of innovation in the 21st century. Moreover, the UK has some considerable strengths as it faces up to the challenge. We have a strong background in innovation studies and policymakers across the UK are increasingly realising that policy and measurement have fallen out of sync with the reality of innovation. What is needed is the articulation of a national mission around innovation, one that encompasses the complexity of innovation while remaining a simplified guide to action.

The UK is well-placed to be a leader of an international shift in innovation policy. Aside from the intrinsic benefits of becoming a more skilled, more innovative country, the creative, open nature of our society combined with our developed system of regional and national government means that the UK is well positioned to take advantage of innovations developed elsewhere. The ability to generate knowledge and to be able to exploit the knowledge of others is a powerful combination and represents what it means to be a hub in the future global economy. By embarking upon a considered, concerted drive towards a national mission for innovation, the UK will be well-positioned to lead the world in the application of knowledge, enterprise and creativity and to meet the national challenges of the 21st century.

For a full copy of *The Innovation Gap*, please visit our website: **www.nesta.org.uk**