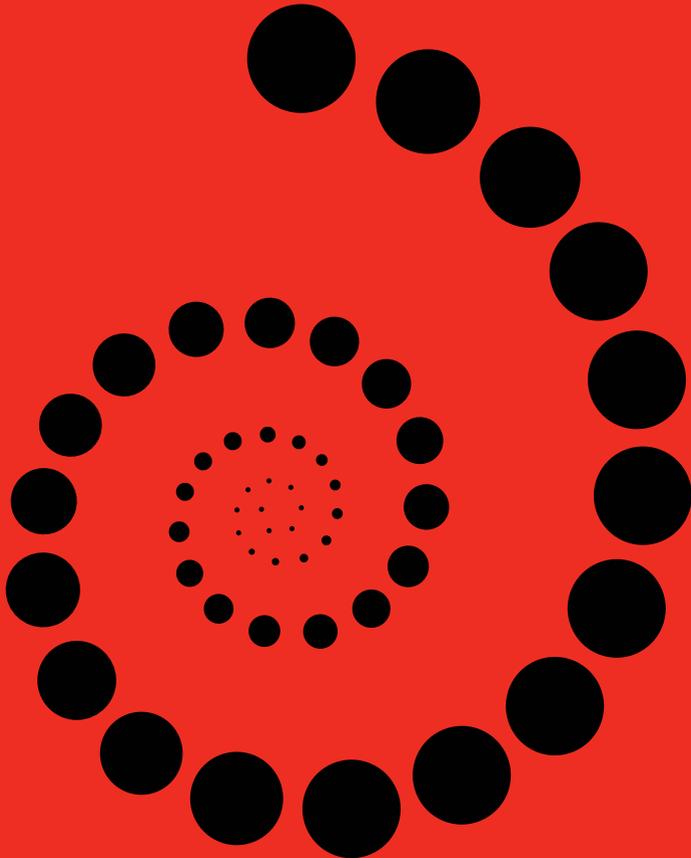
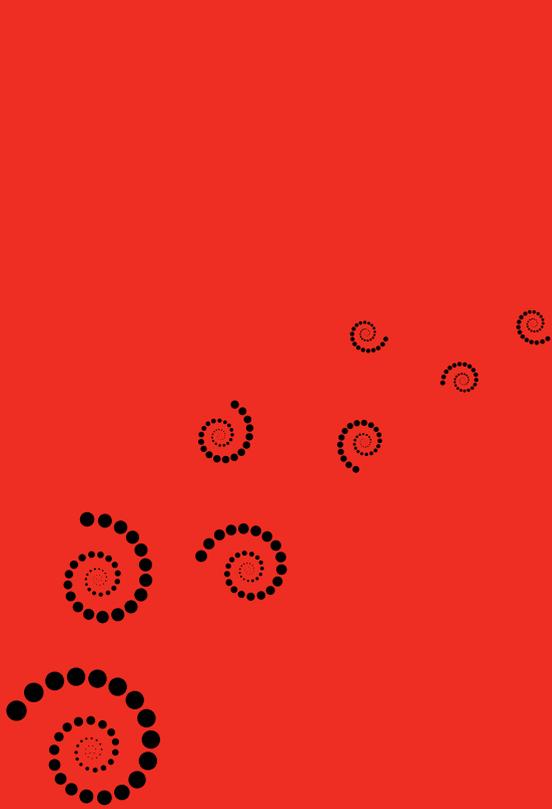


Demanding Innovation

Lead markets, public procurement
and innovation

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NESTA is the National Endowment for Science, Technology and the Arts. Our aim is to transform the UK's capacity for innovation. We invest in early stage companies, inform innovation policy and encourage a culture that helps innovation to flourish.

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Demanding innovation

Imagine trying to cut a piece of paper with just one blade of a pair of scissors. It's near impossible. Yet that is what we try to do with innovation policy. We rely on supply side measures to push technology. We neglect the critical role that demand and markets play in pulling innovation through. We need to use both blades of the scissors.¹

What makes this neglect all the more troubling is that this is hardly a new insight. In 1957, a pioneering study of innovation in the UK stated that a favourable market is a vital element in taking an innovation from first success to market dominance. Market size, rate of growth, users willing to pay premium prices and first-mover advantage were all identified as success factors. The study also emphasised the critical role of government contracts or large firm sub-contracts for the success of innovative electronics and instruments firms. It is remarkable that it has taken us half a century to lose sight of this lesson and now, finally, to return to it.²

Innovations are the product of the creative interaction of supply and demand. However, in focussing on how to increase the supply of innovative businesses, policymakers have lost sight of the importance of demand. We should not throw away the benefits of the support we give to innovation through grants, incentives and advice, but complement it with efforts to create

‘lead markets’ – demanding consumers (including the public sector) who give innovators an early customer base from which to develop their products or services and diffuse them ahead of global competition.

In addition, this focus on demand for innovations will give us a tool to tackle one of the UK's most pressing problems – how to increase the productivity and effectiveness of our public services. Outside of the defence sector, the public sector has lagged behind consumer and industrial sectors in innovation, and yet they have the potential through their purchasing power and the regulatory powers of government to transform the markets for innovations.

For some, the notion of creating markets will raise spectres of closed markets and national champions propped up by subsidies, of failed efforts to impose standards such as the European HD-MAC standard for analogue HDTV in the 1980s, and of government procurements spiralling out of control while failing to meet their promised levels of performance.

While these horror stories must be treated with the utmost seriousness, they must also be balanced by the knowledge that the actions of governments were critical in the emergence of innovative technologies and services. These include the Internet, standards such as GSM for

mobile telephony, companies such as Vodafone and Nokia in communications, and of a whole variety of successful government initiatives in environmental protection – ranging from congestion charging to using regulation to encourage the development of catalytic converters. This is not to deny the central role of entrepreneurs and innovators in these stories – only to say that conditions were created which allowed their talents to flourish.

The aim in this *Provocation* is to identify the characteristics of an intelligent demand side policy for innovation which avoids the pitfalls and liberates the enormous potential benefits for the UK and its partners.

Innovators need demanding consumers

It is almost a cliché that many of the UK's most important inventions are exploited elsewhere, but this is usually used as a lead into a discussion about the availability of venture capital, willing entrepreneurs or the intellectual property protection system.

These are important factors but again neglect the ability of markets to provide a springboard for global domination. A long list of innovations (nuclear reactors, commercial computers, CT scanners...) were first installed in the UK, so it is not simply a story of being first to market. The issue is more whether that first market had the characteristics essential to the development of world-class innovations, and then provided the channels to propagate them around the world. In some cases there is clear evidence that it did not.³

The UK lacked demanding consumers: revisiting Porter after 17 years

Michael Porter's classic analysis of competitive advantage cites demand as a major determinant. He states, "Nations gain competitive advantage in industries or industry segments where the home demand gives local firms a clearer or earlier picture of buyer needs than foreign rivals can have."⁴

He gives a series of examples of why particular segments are strong in one

nation or another. For example, he cites Sweden, where long distance power transmission has become successful because of demand from remote paper mills and steel plants. It is possible to extend Porter's list – Austrian tunnelling expertise acquired in an Alpine environment comes to mind.

Where does the UK sit in this analysis? In 1990, Porter was quite damning. Having conceded that we have competitive advantage in areas related to luxury, leisure, entertainment and wealth (through international brand names such as Burberry) and also in business services and retail, he goes on to state: "More often than not, however, British firms have faced growing disadvantages in local demand conditions... The average British consumer today has become a less demanding buyer than consumers in many other nations, and more resigned to poor service or substandard quality."⁵ A history of state ownership and regulation and undemanding traditional export markets were cited as further reasons for a lack of demand-side pressure.

Seventeen years on: a mixed picture

In one respect (and with hindsight), one can see that Porter missed the point. The UK's competitive financial services sector is praised in one short paragraph while there are several pages criticising declining manufacturing sectors.

As NESTA's report *The Innovation Gap* stresses, the business and financial services sector accounts for 31.7 per cent of the total Gross Value Added (GVA) of the UK economy, over twice that of manufacturing which is on a falling trend.⁶

Anecdotally, one might observe some social trends which suggest that UK consumers have become more demanding of services. For example, the restaurant sector has moved from being the butt of international jokes with the Berni Inn as a prawn-cocktailed flagship to a point where the Fat Duck in Bray is voted the world's best restaurant at the leading edge of highly innovative menus (and means of preparation involving 'molecular gastronomy').⁷ The eating out market in the UK grew by £5.5 billion (20 per cent) in the five years to 2005 in parallel with increasingly demanding and scrupulous consumers.⁸

On the other hand, the economic study underpinning the DTI's 2003 *Innovation Report* notes that some commentators have suggested that the UK's innovation performance is held back by a lack of demand for innovative products and services.⁹ It went on to say, though, that evidence that customers for UK produced goods and services are less demanding or sophisticated is hard to find, partly because it is hard to distinguish between the effects of domestic and global markets in an economy which is highly export-oriented.¹⁰

The other negative factors cited by Porter (state ownership and regulation and formerly captive export markets in

the ex-colonies lingering on) are largely consigned to history in the wake of privatisation and globalisation of markets and competition.

Businesses know that they need demanding consumers

The importance of demanding customers in driving innovation is underlined in a study for the European Commission.¹¹ This found that changing customer needs were three times more important than other factors in creating innovation opportunities for companies and that more than half the companies used customers to obtain feedback on ideas.

Innovation-intensive companies identified a number of structural and cultural pre-conditions that must be met before customers will purchase. Of particular importance were favourable attitudes to risk-taking and new technologies and the ready availability of the skills needed to use the new products.

On the other hand, more than half the companies surveyed considered that there were obstacles associated with a lack of customer skills to use new products and services and a lack of technical standardisation.

Public policy was also criticised for its lack of focus on demand, in particular on the need to introduce standards and norms to encourage the use of new products and to create markets for innovations.

Finally, businesses are putting their money where their mouth is: companies replying

to the *EU 2005 Survey of R&D Trends* indicated that market demand for new products and services is by far the most important factor influencing the level of R&D investment, while market access is the most important factor influencing mobile R&D location decisions.¹²

Early users: customers ahead of the game

The term ‘lead user’ was coined by Eric von Hippel in 1986 to describe users who express strong needs that become general in a marketplace months or years in the future.¹³ Since that time, von Hippel and others have gone on to identify the importance of lead users in the development of many products, from medical devices to semiconductors to mountain bikes and equipment for extreme sports.

Of course, at the time when these users are pioneering and making ever-greater demands on innovators, no-one knows whether their needs are representative of other, ‘normal’ users in the future. As such, it is perhaps better to refer to those first adopting an innovation as ‘early users.’

These early users take the risk of working with an innovation that may not be fully optimised (or indeed even fully functional) in return for the possibility of solving a problem more quickly. Because of their strong needs and the importance of the early revenue they provide, they also have the opportunity to shape the nascent innovation through the feedback they offer.

Innovations are not static and the to-and-fro of a lead market provides a unique opportunity for multiple generations of the product or service each embodying important improvements.¹⁴ Through this process, by

the time the innovation is rolling out to other markets it may have substantially enhanced its functionality or reliability.

A frequent cause of failure among innovative start-up firms is an inability to get a foothold in the market, even if the product, process or service is technically superior to its rivals. This reluctance on behalf of customers is often based on concerns about the viability of the firm and the innovation.

An early user can solve this by providing the credibility that an installation of the innovation gives. This is the beginning of the firm’s ‘reference list.’ In effect, the early user has not only had the benefit of using the technology first, but provided revenue to the innovator, assuaged the concerns of the second purchaser, and (assuming that the innovation is successful) allowed the second purchaser to enjoy the benefits of the innovation which they would not otherwise have purchased. The innovator and the second purchaser have much to be thankful for.

From early user to lead market

Moving from an early user to a 'lead market' requires early adoption of an innovation by multiple users, or else by a single user with sufficient purchasing power to constitute a market on its own.¹⁵

The existence of a lead market means that the learning benefits for the innovator are supplemented by reduced risk in the up-front investment in innovation. With dominance established in one market, the innovator can reasonably expect that other markets will follow suit, thus giving it international dominance.¹⁶

Beise and Gemünden developed a taxonomy of the attributes of lead markets which makes an important distinction between:¹⁷

- advantages which lead to early take-up or adoption of an innovation in the market; and
- transfer advantages which cause the adopted innovation to spread to other markets and become a 'dominant design'.¹⁸

Characteristics of lead markets: wealth, infrastructure and scale

A lead market needs customers willing to pay a premium for the innovation, or even for its novelty per se. This could result from a high degree of customer 'intelligence' in anticipating the

technology. It could also arise because of the general wealth of the population or sectors of it (for example the 'grey market' of goods and services targeted at wealthy over-50s).

However, the core of the 'premium demand' attribute lies in the socio-economic, cultural or geographic characteristics of the market. For example, the difficulty of sending messages in Japanese script via a keyboard meant that an analogue system for sending handwritten messages was at a premium. This created the conditions for a lead market in fax machines. However, the head start for Japan also relied on legislative changes in the early 1970s, when deregulation of the telephone network allowed non-voice uses on subscriber lines. Rapid diffusion followed in a highly competitive environment which saw fast equipment innovation. By the time world diffusion was under way, the fax had achieved superiority over text-based alternatives, displacing for example the telex.¹⁹

The proportion of national wealth spent on healthcare products is another example of a condition favouring a premium – in this case for pharmaceutical products in the USA which has the highest healthcare spend at 14 per cent of GDP. Unsurprisingly, this premium develops a strong incentive for innovation and the USA therefore benefits from the world's

most rapid innovation in pharmaceutical products.²⁰

Compatible infrastructure is frequently a factor. The demand for online services closely relates to the penetration of broadband access. Alternative fuels for motor vehicles require an appropriate infrastructure of stations equipped with the fuel or charging facility. There is some expectation that the initial take-off of such vehicles may be in commercial fleets which have their own infrastructure at the depot.

However, perhaps the most critical attribute of lead markets is that they need to be of sufficient scale to support the costs of innovation and to defray production costs and operating costs such as service and support. For users, benefits can grow with scale (for example, videophones increase in value to the user the more other users are connected). The existence of a workforce that can support the innovation may also be important.

The scale of a market is not always dependent upon country size – for example, Nordic mobile telephony markets were the largest in the world before the emergence of GSM-based mass markets. Concentrations of particular industries may also provide a basis for scale – for example, the large number of pump manufacturers in the Netherlands (resulting from the need to keep low lying terrain dry) creates a market for those selling specialised components or complementary goods and services.

More generally, it is necessary that a lead market provide general conditions favourable to innovation such as an efficient and responsive regulatory structure, access to risk capital and security for intellectual property. Competitive conditions can have mixed effects. A high degree of competition generates variety and accelerates the selection process by increasing the probability that hidden user needs will be revealed by one of the new solutions available – think of the unforeseen emergence of SMS text messaging as a means of communication and a major revenue generator for mobile phone operators. Excessive competition on the other hand may discourage the entry of new players and may delay achievement of economies of scale. Competitive conditions among purchasers are beneficial as they have a greater incentive to improve performance through the application of innovations.

Transmitting innovations: the transfer characteristics of lead markets

A lead market of significant scale is often a determining factor not only in growing an innovation but in helping it spread to new markets. With the revenue from a large lead market, the innovation can be reduced in price to a level where it becomes attractive to customers who are not willing to pay the premium-level price, thus helping to transfer the innovation from early adopters to what Rogers called the ‘early majority.’²¹

However, although the early-users must have honed the innovation, they cannot

be allowed to make it too specialised to their own purposes. In transferring from one market to many, generic market requirements are necessary. If the lead market requires product or service characteristics that are too idiosyncratic, the possibility of extension to other markets is foreclosed. Both the UK's System X telephone exchange developed by the then Post Office and launched in 1980 and the French Minitel service are examples where over-specific development for a domestic market precluded export success in the face of competition.

Receiving innovations: the receptive characteristics of secondary markets

For a secondary market, the critical issue is one of similarity of requirements with the lead market. The innovation emerging from the lead market must have characteristics that suit the needs of other markets, even if it is not optimised for them. The price and functionality achieved through rapid early development in a lead market mean that it will be dominant over later attempts to develop indigenous alternatives. This similarity may hark back to the socio-economic, cultural and geographic factors mentioned earlier. Language, shared values, similar levels of wealth could all be factors. Other similarities could be more structural. For example, medical equipment is purchased in very different ways between countries, depending partly upon the degree to which their health services are centralised.

Eco-innovation: similarity of regulatory requirements

In the field of eco-innovation the issue of similarity has been pursued mainly in terms of the transfer of the regulatory environment which defines the performance characteristics demanded of the innovation – for example, the level of water quality that purification equipment must achieve. This issue is explored in detail by Beise and Rennings²² who use case-studies of fuel-efficient passenger cars and wind energy to conclude in the first case that lower diesel prices in France and Germany favoured the diffusion of these cars but only when comparable performance to petrol engines was available through high pressure direct injection engines.

For wind energy, substantial market share was only achieved in countries which adopted Renewable Energy Feed Tariffs (REFITs). These imposed fixed prices for green electricity, creating an effective subsidy and minimising risk for investors in comparison with more liberalised market approaches. The overall conclusion is that strict regulation and anticipating the international trend were the major success factors for Denmark as the lead market for wind energy.

The perceived risk of adopting a new technology is reduced if other similar users can be seen to have benefited from it and the cumulative experience that they represent. This was shown to be an important driver of the diffusion of innovations by Griliches who showed that different market potential and an evolving product created different patterns of diffusion of hybrid corn seeds across farms in different states.²³ To some extent, this effect has been understood by policymakers who sponsor demonstrator projects to promote the adoption of new technologies, particularly among small firms.

Reaching new markets: channels for the adoption of innovations

Unless the benefits of an innovation are communicated to potential purchasers in other markets, transfer will not occur. The most direct communication channel is the effort made by exporters through normal marketing channels such as advertising.

A second channel is the multinational organisation, company or non-governmental organisation (NGO). If these are present in a lead market and adopt a superior solution they are in a position to roll it out to other areas in which they operate, with the added advantage of setting them in a common business process. Collaborators and competitors in these other markets may then become aware of the innovation and seek to emulate it.

Communication channels may also be more diffuse, operating through the

media or through mobility of individuals such as tourists who notice innovations on their travels. A well-known example in the UK was the early cloning of the Starbucks coffee chain (customised coffee and relaxed personal space) as the UK-based Seattle Coffee Company. It became so successful that Starbucks eventually bought its 65 outlets as a means of market entry. Similarly, Japanese culture helped Karaoke spread around the world, and American films and TV programmes may increase aspirations to adopt the lifestyle and devices depicted in them.

What role (if any) for policy?

A naïve approach to the issue of lead markets would be to say that the market will find its own solutions; that firms should seek out lead users to work with, that they should launch their innovations in lead markets and that with this good advice the role of government is complete.

This caricature is fundamentally flawed. Governments are major purchasers in many markets and intentionally or otherwise structure markets through regulation and other actions. Thus, whether it is an explicit consideration or not, they affect the possibilities for innovation.

The need for government action

Government support for building lead markets has a sound economic rationale.²⁴ Markets are often fragmented. Prospective buyers of innovations are frequently unable to coordinate or standardise their demand, in part because they lack knowledge about future innovations – they don't (indeed can't) know what they want. This prevents the stimulation of cheaper and more innovative solutions that demand could incentivise. The government, therefore, should act to help structure and articulate societal demand in ways that the market is not be capable of doing.²⁵ Convergence on a technical standard such as GSM stops firms from spreading their efforts over too wide a variety of user demands,

reduces the probability of investing in a technology that will not 'win' and hence increases the incentive to invest in R&D (see Information, regulation and standards-setting p16).

Most governments of advanced economies now recognise that innovation operates in a system in which there is a need for effective linkages between the actors and institutions – for example, firms and universities. In a fragmented market, such information is unlikely to flow smoothly from user to innovator and hence the value of the information – say, on customer requirements – is diminished by its being only of relevance to a single consumer. Regulation is one way in which governments can signal to those in a market the specification on which they should converge.

Demand-side policy is gaining ground

There has been a growing realisation that innovation policy has been out of balance for some time. A series of European Union (EU) studies, initially charged to look at the supply-side concluded that demand was being neglected.²⁶ Early in 2004, the UK, German and French governments issued a position paper which called for public procurement to be used across Europe to spur more innovation.²⁷ Later that year the *Kok Report*, in its review of progress on the Lisbon strategy, recognised that procurement could be used to provide pioneer markets for

new research and innovation-intensive products.²⁸ The current impetus for demand-side innovation policies has come from the Aho Group Report *Creating an Innovative Europe* presented to European leaders at their Spring summit in 2006.²⁹

A similar direction of debate has occurred in the UK, focussed heavily on the role of public procurement. Central and local government purchases around £125 billion worth of goods and services per annum.³⁰ The government is the single most significant customer in the country for IT services and systems, accounting for 55 per cent of all spend, and for more than 30 per cent of construction (excluding PFI).

The DTI *Innovation Report* of 2003 and its supporting study introduced the use of public procurement as an innovation policy instrument and noted the potential for government to be an influential and demanding customer.³¹ To date, however, effort has focused predominantly on the National Health Service where Derek Wanless described the UK in his review of future resources for the NHS:

“as a ‘late’ and ‘slow’ adopter of new technology, compared with ‘early’ and ‘rapid’ adoption of technology in the US. While Australia, Canada and France tend to be classified as ‘late’ adopters of technology, once they start to adopt a new technology, they are found to do so rapidly.”³²

Recently, the CBI³³ and the Conservative Party³⁴ have also identified procurement as an area for action.

Information, regulation and standards-setting

Improving information and anticipating demand

Policies that try to influence the development of the innovation system (such as creating clusters) stimulate dialogue between users, producers and other innovation actors such as regulators, so as to increase their levels of coordination and cooperation and thus smooth the path of innovation and subsequent take-up. More recently we have seen the emergence of ‘Technology Platforms’ at the European level and the DTI’s ‘Innovation Platforms’ at the national level.³⁵

However, building an accurate vision of the future is not a straightforward task. The DTI’s *Foresight*³⁶ programme and its derivatives such as horizon-scanning and technology road-mapping have a role here, but these approaches must not restrict themselves to technology-driven outlooks (participation is historically dominated by technologists). Instead, they must make strenuous efforts to engage with those who can give a perspective on future needs and demand – they too need to engage with lead markets.

Regulation for innovation

Regulations can successfully drive innovation either indirectly through altering market structure and affecting the funds available for investment, or directly through boosting or limiting demand

for particular products and services. ‘Performance based regulation’ sets targets beyond current market capabilities in an attempt to anticipate and stimulate innovation, currently used most obviously in the area of environmental emissions.

From the perspective of businesses, regulations can raise the quality of new products and services and provide protection from liability claims.³⁷ They can also increase user acceptance, as minimum safety and quality standards raise confidence in innovations by reducing the risk to early adopters. The negative impacts of regulation are mainly on the costs of labour, energy and materials.

However, there is also a strong consensus among firms that the approval procedures for innovations are both too costly and too long, that support to businesses regarding the fulfillment of regulations is insufficient and that regulations are too numerous, inflexible and non-transparent. Their impact is often to delay the launch of a product to market. In a globalised world, the consequence of this could be that an innovation emanating from another country could gain a competitive advantage by getting to market first.

The UK needs to use the regulatory system in an appropriate way that uses *Foresight* and other approaches to anticipate technological development and then fosters the development of new products and services through a

Broadband Diffusion: regulation aiding diffusion

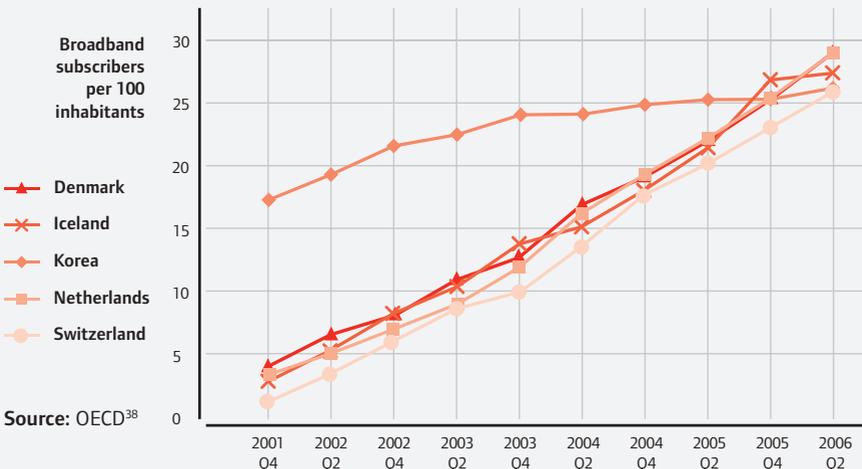


Figure 1: Broadband penetration, historic, top five OECD countries for June 2006

An example of how regulation can aid diffusion of innovation comes from the relative rates of penetration of broadband in OECD countries. The top five are shown in Figure 1.

Why did the USA with its wealth and economic strength lag these nations and come in 12th? A study by Frieden concluded that nations achieving greater success in ICT development (in this case Canada, Japan and Korea) had a specific mission, achievable goals and policies designed to achieve success.

At the macro level, their governments articulated a vision of what ICT could do for beneficiaries

in both public and private sectors and legislated to create incentives for risk taking and innovation. Correspondingly, they penalised litigation and strategies that delayed necessary investments in capital-intensive projects. At the micro-level, they launched initiatives that aggregated demand, generated matching private funds and justified the installation of ICT even in geographically unattractive locales. The government was “cheerleader, referee, loan guarantor, grant funder and anchor tenant.” By contrast, the US avoided active governmental involvement in a sector that many believed warranted little if any government intervention.³⁹

rapid, appropriate and internationally harmonised regulatory regime. This should be achieved in part by bringing regulators into more regular contact with innovators.

European and international regulation

Many regulations are now enacted at the transnational level, most often through the EU, but also through global organisations such as WIPO and the WTO.⁴⁰ Industry frequently complains that the EU fails to overcome the fragmentation of markets that is a significant disincentive to investment in innovative activities. For example, the recent report of the ICT Competitiveness Task-Force cites digital signatures and e-invoicing as cases where multiple standards and solutions are prevalent.⁴¹

The ability of the UK government to influence EU regulation in directions favourable to innovation, and of the EU in turn to influence global agreements are critical aspects in building competitive performance.

Building market power through standards-setting

Standards such as GSM and ADSL⁴² (both European success stories) create market power by combining demand for innovations that might otherwise be spread too widely over multiple solutions.⁴³ Instead of manufacturers competing to sell completely different products to consumers, the agreed standard ensures that the risk taken by both early adopters and innovators is lower (by ensuring that they won't bet on

a redundant technology), thus increasing investment in the innovation. Building in compatibility with previous standards also eases the transition to new technologies.

Standards can act to encourage innovation through procurement if they are set at a demanding level of functionality without specifying which solution must be followed. They thereby incentivise innovation but do not prescribe the specific route to achieving it. This can, of course, have unexpected results – the most famous of which is John Harrison's longitude-measuring chronometer.⁴⁴

However, as an instrument, standards need to be used carefully. Timing is a matter of fine judgement – too soon means that a technology may not be sufficiently advanced to deliver high performance and too late may allow unwanted divergence in standards to emerge. Both outcomes create significant waste in the market.

Unlike regulation, the setting of standards is largely the responsibility of industry bodies – those companies or groups of companies that have already developed *de facto* standards (like Blu-Ray and HD-DVD). Therefore, to a significant extent the need for a more agile standards system is the responsibility of industry. Procedures in standards bodies can be slow and bureaucratic and are often held up by competitive positioning. This is even more so when disagreements take place over issues such as open source versus proprietary software, going to the heart of firms' business models.

Government's role is to be a more pro-active facilitator and coordinator through its ability to take a long-term and economy-wide view of developments.

Driving innovation through procurement

One simple reason that public procurement should not be ignored is its sheer scale – as noted earlier, £125 billion worth of goods and services per annum. This is an order of magnitude greater than all measures directed at the supply side of innovation.

Edler et al identify three main categories of procurement policy:⁴⁵

- Public procurement of innovative goods and services;
- Public procurement of R&D and demonstrators (pre-commercial procurement); and
- Support for more effective private procurement of goods, services or R&D through measures such as catalytic procurement, initiatives in e-procurement or training of private procurers in innovative procurement.

Public procurement of innovative goods and services relies on inducing innovation by specifying levels of performance or functionality that are not achievable with 'off-the-shelf' solutions and hence require an innovation to meet the demand. Historically, procurement was seen as a significant instrument for innovation policy, but it virtually disappeared before the present cycle of interest.⁴⁶ Until recently, more stringent competition regulations across Europe prevented (outside the exempted defence sector)

the necessary close contact between customer and supplier that innovative procurement requires.⁴⁷

Today, the situation has eased with the introduction of new EU procurement directives that go some way towards restoring the possibility for innovation. In particular, they allow:

- Possibilities for technical and competitive dialogues between purchaser and supplier, a necessary condition if each side is to understand the other;
- The facility to specify requirements in terms of functional performance or standards, which allows suppliers to produce any configuration of technology they feel can meet the need;
- Options to permit variants, thus opening up bids to alternative ideas; and
- Conditions that allow transfer of intellectual property to the suppliers, and hence allow them to exploit their innovations in wider markets.⁴⁸

There seems to be a consensus that the new directives (now in effect in the UK) should be given a chance to work, but the likelihood is that they do not go far enough in creating the conditions for procurement to drive innovation. It is an anomaly that procurers can favour local suppliers on the grounds of local

employment-related or environmental considerations, but not on any argument connected with promotion of innovative capacity. The UK should monitor this closely and be ready to push for further reform.

Pre-commercial procurement

A relatively recent addition to the debate is public ‘pre-commercial procurement.’ This is procurement of goods or services for which R&D still needs to be done, with the technological risk shared between procurers and potential suppliers. In consequence, the procurement is actually an R&D service contract, given to a future supplier in a multi-stage process, from exploration and feasibility to prototyping, field tests with first batches and then, finally, commercialisation.

This approach is close to the US’s ARPA/DARPA⁴⁹ approach which is credited with being a major driver of innovation and claims credit for a long list of major innovations including “between a third and a half of all the major innovations in computer science and technology.”⁵⁰ This success recently led the CBI and QinetiQ to call for the foundation of a UK ARPA (emphasising the civilian remit) through the ongoing revamping of the DTI’s Technology Strategy Board. In addition, the Conservative Party STEM Taskforce has called for an ‘Innovative Projects Agency’ to be set up in the UK, using DARPA as a role model.⁵¹ The pivotal issue, however, is one of budget. DARPA’s annual \$3 billion is enough to move the market – present UK spending (£370 million over three years for the Technology

Programme) has no chance of achieving such effects.

Cooperative procurement, catalytic procurement and other measures to stimulate private demand

The third variety of procurement-related policy involves stimulation of private demand. In many cases there is not a clear distinction between the needs of public and private sector clients. Indeed, these provide the ideal conditions in which to stimulate lead markets as the eventual population of users is greater.

Edler et al⁵² refer to this as ‘cooperative procurement’ and cite energy efficient or environmentally sustainable office equipment as an example for which government acts as launch customer, but which then diffuses more widely, thus meeting public/societal goals for sustainability.

‘Catalytic public procurement’ occurs when the state acts as the initial buyer but it does not purchase the innovations in question for its own, direct use. Instead the aim is to support private purchasers by providing them with the opportunity to buy innovative solutions. The real market penetration effect is achieved by follow-on private demand.

One example is the market transformation programmes in the energy sector that were carried out in Sweden and elsewhere during the 1990s. The aim of these programmes was to use measures centred on technology procurement to introduce new (or under-utilised) products and

services and to increase their adoption. Such programmes involved, for instance, the procurement of energy-efficient home appliances for consumers. Measures included bringing together small and fragmented end-users in residential, service and industrial sectors and supporting them in initiating a technology procurement process.⁵³ The private benefit was reduced energy costs; the public benefit was reduced consumption and pollution. The UK has equally pressing needs to promote areas such as energy conservation and would do well to follow this track.

There are other measures government should take to stimulate innovation through private procurement. Credit guarantees for innovative procurement contracts between firms could encourage greater technological risk-taking. Training of purchasers in innovative procurement principles could also apply here, as could promotion of buyer consortia to create larger markets and hence greater incentives for innovation.

Remaining challenges regarding public procurement

One tension that remains is between bundling and unbundling contracts. On the one hand, demand needs to be coordinated or aggregated to create sufficiently large orders to make innovation worthwhile. On the other hand, innovative Small and Medium Enterprises (SMEs) must have the chance to bid for parts of the larger packages. Various initiatives including the SBRI are in hand to increase the share SMEs

obtain from public contracts⁵⁴ and quite separately it is now recognised that certain types of SMEs are highly innovative and more likely to bring solutions that could transform a public service. What is lacking are measures that bring these two concepts together in a powerful way – for example, ‘second sourcing.’ Here, the procurer issues two contracts for the same work, with the second one (albeit at a small scale) sourcing a radical alternative solution from an SME. If this proves superior either the whole radical technology or elements of it can be transferred to the mainstream product or service.

A study for the Small Business Service points out that some of the inherent advantages of larger firms such as technological economies of scale, broader expertise, and distribution mechanisms are desirable and should not be ignored. On the other hand, the public procurement mechanism itself may fail smaller firms through restrictive and burdensome information requirements or being insufficiently curious about alternative sources of supply.⁵⁵ The government’s focus should be on improving procurer skills in ways that benefit all potential suppliers and SMEs in particular.

Continuing this theme, probably the most critical component of successful procurement for innovation is the ‘intelligent customer’ who is able to be aware of potential new solutions, and can specify and manage contracts of this kind throughout their lifecycle. Achieving this requires actions to develop a cohort of

trained professionals and to support them through networks to exchange ideas and raise skills.

The rewards and penalties for those involved in procurement must be re-appraised – in the public sector these are asymmetric with the punishment for failure being far greater than the reward for success, particularly if judgement has to be made within an electoral cycle. Hence there is a pressing need for a new attitude to risk among public authorities, matched with an emphasis on the whole-life costs of their purchases rather than the lowest price at the point of purchase.

High profile awards for successful innovative procurement, at individual and corporate level are one way to redress the risk/reward balance. Awards could be both for outstanding individual examples and for overall performance. The latter would require another essential change – the systematic collection of statistics on the extent of innovative procurement – in effect a procurement innovation index.

Taking the lead with lead markets

The pressures of globalisation, the rise of the service economy and the so far unmet challenges of improving productivity all suggest that past approaches to innovation policy are insufficient. To make the UK a more attractive environment for innovation, we need to develop the demand-side of innovation policy: we need to use both blades of the scissors.

Given the predominance of the English language and the strong cultural influence it exerts through its creative and media industries on both the USA and continental Europe (and to a lesser extent in Asia), the UK is exceptionally well placed to transfer innovations that have been developed here. However, if we are to believe the national characterisation as undemanding consumers, we lack the ability to create lead markets in the first place. The UK therefore needs to find better ways of eliciting future social and private needs and communicating them to innovators.

1. Policies must be made to work in combination even when they have different administrative homes

There is no single natural home for demand-led innovation policy in government, since demand is affected by the actions of all ministries with purchasing or regulatory remits. What has been missing is any large-scale effort to combine supply-side measures with

a concerted effort to create a demand for innovations. The challenge for government is coordination.

2. Develop a national strategy for the identification and reinforcement of existing lead markets

The key characteristics of lead markets are customers who are willing to pay a premium price, provide feedback, and who have sufficiently generic requirements that roll out elsewhere is feasible. A demand-led innovation policy will have as its guiding principle the identification of users with common needs and ensuring that this is turned into coordinated demand which is linked to a pool of innovators. Both public and private markets can be transformed in this way.

3. Regulate intelligently

The UK is not currently fully exploiting the opportunities that exist to stimulate new markets through intelligent regulation. For example, when the energy utilities were privatised, stimulating innovation came a poor second to squeezing out short term price reductions. Competition policy is itself an area of regulation which does not always favour innovation, especially when there is excessive competition. Too many players in a market may result in insufficient profit to pay for the level of innovation which would allow a leading player to pull away from the pack and establish a

globally dominant design. To overcome this:

- **Those responsible for regulation must put innovation higher on their agendas.** This will involve much more contact with those at the leading edge of technology and those seeking creative market solutions – perhaps through new business or government models.
- **The UK should seek to increase its influence on international and EU regulations.** Regulation is an area where relations with other countries are crucial, and where extending successful national regulation can take with it the innovations stimulated by that regulation. A first requirement is a team of regulators well-supported by research to enhance their negotiating positions and who strive to engage with the present and future needs of business and other stakeholders.
- **The implementation of regulations should be harmonised.** The present system of EU directives is failing to provide the single markets sought by firms, as national variants spring up. Deregulation is also needed in many sectors, but this too needs to be harmonised if the necessary market scale is to be reached.

4. Use procurement to stimulate innovation

Procurement is a multi-faceted instrument. It should always be remembered that procurement primarily

exists to meet the needs of the purchasers; the stimulation of innovation will always be a secondary goal, but one that can normally be achieved without damaging the primary one. The task is to educate the purchasers to understand that procurement of innovation ultimately gives them a superior solution to their original need. As well as this direct positive benefit, the procurement of innovative solutions can also contribute to the development of a stronger economy and a more creative society.

Public procurement for innovative goods is best suited to areas where there is high public spending such as health, transport and information systems. The need here is to achieve a scale of activity which matches that of the challenges faced in improving public services.

- **Overcome risk aversion and correctly motivate procurement professionals**

Techniques to manage risk and uncertainty are available. They are also reduced if procurers make it their business to be aware of the range of technologies and solutions which may become relevant to them. This means developing relations with both the existing and potential supply communities and being an active participant in foresight and horizon scanning activities.

Bringing innovative SMEs into the picture is a constant challenge. Quotas are often suggested as a solution, but a better way forward is to create areas of larger contracts that are suitably scaled

and specified for SME participation, and ensuring that businesses are aware of the opportunities.

Shifting the risk-reward spectrum in the public services is a further challenge. High profile awards for innovative procurement are one way forward – both at individual and organisational level. The latter would require much better statistics on

innovative procurement – we must work towards a reporting requirement for government departments and public agencies which identifies the proportion of their procurement activity which is innovative.

The public's imagination must be captured. This may perhaps involve a television competition on the lines of *Restoration*, but with the projects

Reacting to lead markets – a private sector perspective

What should a firm in search of lead markets do? For multinational organisations and for the more mobile of smaller firms, the answer is to move their innovative activities as close to that lead market as they can manage. For others, being in a lead market is a natural part of their environment which they may well not perceive in these terms.

The success of the British popular music sector has depended on vibrant teenage cultures in a constant state of renewal with the centre of gravity moving from one city to another but always with a network of clubs, bars and students as the early outlet. The enormous success of the City of London is a classic example of a cluster but it also ensures ready take-up of financial innovations and the emergence of markets in which they may trade.

Other firm strategies are also available, including being the 'fast follower' into newly-identified lead markets. While the lead market favours the rapid development of an innovation, it is not necessarily the original innovator who is most successful in delivering the innovation or developing the next version and capturing new markets.

Firms should also be widely networked and agile enough to adapt to changes in the market landscape. Successful firms are likely to be those who work to maintain their networks and where possible engage in collective visions of the future (beyond the immediate competitive horizon). Identifying the future dominant designs and working within that framework may be essential to survival. It may also involve letting go of a current solution which may be temporarily viable but where lock-in will ultimately result in failure.

competing for better futures rather than a restored past.

- **Pre-commercial public procurement offers the potential for targeting innovation support more locally.**

As such it may help to bring local government into the picture. It is also well-suited to areas where very close interaction is needed between customer and supplier – notably in the service sector. Finally, by dint of its offering R&D funding, it has a natural home with the new Technology Strategy Board which should be encouraged to make full use of this instrument in partnership with public sector users. The ‘UK ARPA’ suggestion is a good one but only if serious resources are made available – a starting budget of £1 billion per year should be used as a benchmark.

- **Using policies such as catalytic procurement**

Measures to stimulate private innovative procurement may be applied in areas where government wants socially desirable goods to emerge (as with the energy conservation examples) but could also be seen as a more general means of stimulating the transformation to a more innovative society. Specific measures which should be used include:

Market transformation initiatives focussed on creating buyer consortia which provide larger markets and greater purchasing expertise.

Credit guarantees for innovative procurement contracts between firms

to encourage greater technological risk-taking.

Extending training of purchasers in innovative procurement approaches to the private sector.

5. Make standards-setting more agile

Though principally a private sector responsibility, standards setting needs to become much more agile. Government should become a more proactive facilitator in national and international arenas.

6. Target initiatives at the appropriate level of governance

Most of the above recommendations have a UK-wide focus, but in a globalised economy it is essential to be fully aware of the international picture. There are many market areas such as transport telematics which are potentially best dealt with through the EU so that sufficient critical size can be reached to be globally competitive (and to avoid national initiatives leading to further fragmentation). Having this option will require continuous pressure on European institutions to achieve a true single market and to ensure that it is one based on a dynamic model of competition which gives full recognition to the benefits of innovation. However, in contrast, there are many lead markets such as waste disposal that should be national, or even others such as restaurants or theatre that will operate at a level of a city or region.

7. Create a culture that allows lead markets to form

Finally, the UK needs a culture that allows for lead markets to form – one that celebrates innovation. Porter’s 1990 criticisms of the UK gave a sense of a post-rationing, queuing and rather grey country in which poor service and shoddy goods were routinely tolerated. Fair or not, such characteristics are aptly described as cultural and hence policy for lead markets should not neglect the need to stimulate cultural change, especially among the general public.

The Aho Group’s most media-friendly suggestion was to accord celebrity status to innovators. Two critical changes which build upon this are harder to digest:

- *Instilling the same desire for change, improvement and having the best among consumers of services* (public and private) as exists in the markets for, say, electronic consumer goods; and
- *Instilling through education and any other means a clear sense that it is better to try and fail than to accept a slow cycle of decline.* It is natural and indeed healthy that the media are deeply critical of failing public sector purchasing decisions (notably in IT systems) but such criticism is rarely constructive and leads inevitably to reinforcing over-cautious public sector purchasing.

This type of society will give the UK’s innovators the kind of market which allows their talents to flourish and provides a home base from which they

can succeed against world competition. Indeed, if we get this right, that world competition will be beating a path to our door, wanting to be close to our lead market and needing a presence here for its own innovative activities. The approach put forward here is not an easy one – there are many pitfalls which only an intelligent and adaptive approach can negotiate. The reward is a deeply rooted culture of innovation offering better goods and services to citizens and a sound base for a productive economy.

Endnotes

1. The celebrated economist Alfred Marshall first wrote of the scissors of supply and demand to stress their equal and inter-dependent role in influencing price.
2. Carter C.F. and Williams B.R., (1957) *Industry and Technical Progress – Factors Governing the Speed of Application of Science*, London: Oxford University Press.
3. See, for example Robin Cowan's account of how the initially technologically inferior light water reactors came to dominate the market because of the early adoption and development by the US Navy of light water for submarine propulsion (Cowan, Robin. 'Nuclear Power Reactors: A Study of Technological Lock-In' *Journal of Economic History*, vol 50, pp541-566, Sept, 1990).
4. Porter, Michael (1990) *The Competitive Advantage of Nations* London: MacMillan p86.
5. Ibid. p500.
6. NESTA (2006) *Research Report: The Innovation Gap – Why Policy Needs to Reflect the Reality of Innovation in the UK*, October 2006.
7. *The World's 50 Best Restaurants 2005* available at http://www.theworlds50best.com/previous_winners.aspx?awardyear=2005
8. Menu Trends UK, <http://www.marketresearch.com/product/print/default.asp?g=1&productid=1213775>
9. Department of Trade and Industry (2003) DTI Economics Paper No. 7, *Competing in the Global Economy – the Innovation Challenge*.
10. When the report comes to public procurement it cites a speech by Peter Gershon, Chief Executive of the Office of Government Commerce suggesting that Government is a relatively undemanding customer.
11. Business Decisions Limited (2003) *The Power of Customers to Drive Innovation*, Report to the Enterprise Directorate General, European Commission.
12. European Commission Directorate General Joint Research Centre and Directorate General Research, *Monitoring Industrial Research: the 2005 EU Survey on R&D Investment Trends in 10 Sectors*, <http://iri.jrc.eu/>
13. von Hippel, Eric (1986) 'Lead Users: A Source of Novel Product Concepts,' *Management Science* 32, no. 7 (July):791–805, a paper which built on a decade of work on the importance of users in the innovation process. More recently this theme has extended to the notion of 'democratising innovation' where users, often in cooperation with like-minded associates, become actively engaged in innovation in place of manufacturers, open source software being the classic example (von Hippel, Eric (2005) *Democratising Innovation*, Cambridge Mass.: MIT Press). This participative theme was taken up and extended in the previous NESTA Provocation on mass innovation by Charles Leadbeater (Leadbeater, Charles 'The Ten Habits of Mass Innovation,' NESTA Provocation 01 November 2006).
14. Georghiou, Luke, Metcalfe, Stan, Gibbons, Michael, Ray, Timothy and Evans, Janet, (1986) *Post Innovation Performance*, Basingstoke: MacMillan.
15. Georghiou, Luke (2006) *Effective Innovation Policies for Europe – the Missing Demand-Side*, Prime Minister's Office, Economic Council of Finland.
16. In this paper the discussion will focus on national markets but a lead market could equally be regional or supra-national (for example European or Asian). The national significance of such markets was marked out by Porter in *The Competitive Advantage of Nations* where he argued that conditions of domestic demand are a critical element in determining the attractiveness and performance of locations (Porter, Michael (1990) *The Competitive Advantage of Nations* New York: Free Press). Earlier still Mowery and Rosenberg had emphasised the influence of demand upon innovation (Mowery, D and Rosenberg, N: (1979): *The influence of market demand upon innovation: A critical review of some recent empirical studies*; in: *Research Policy* 8 (2), pp102-153; Demand is also emphasised in Nelson, R. (1982): *Government and Technical Progress*; New York).
17. Beise, Marian and Gemünden, Hans Georg (2004) *Lead Markets: A New Framework for the International Diffusion of Innovation*, *Management International Review* Vol 44 No 3 pp83-102.
18. A dominant design is a basic architecture for a product, process or service that becomes the accepted market standard after an earlier period of technological competition. In the model originally put forward by Abernathy and Utterback the early period has many firms competing but once a dominant design such as the QWERTY keyboard, all-steel closed body cars, the DC3 and Boeing 707 aircraft emerges, the number of firms in the market tends to fall dramatically and competing products resemble each other much more closely. They eventually reach a mature phase when they become commoditised and competition is dominated by price rather than functionality. (Abernathy William & Utterback, James (1978) 'Patterns of Innovation in Industry', *Technology Review*, 80(7): June-July, pp40-47).

19. Kodama, F. (1995) *Emerging Patterns of Innovation – Sources of Japan’s Technological Edge*, Boston, Mass.: Harvard University Press pp237-277.
20. The European Federation of Pharmaceutical Industries and Associations states on its website that the USA has overtaken Europe’s previous leading positions in the amount of R&D spend, the share of new pharmaceutical launches and the pipeline of innovative medicines (especially those based on biomedicine) http://www.efpia.org/2_indust/europe_0.htm
21. Rogers E.M. (1962) *Diffusion of Technology* NY:Free Press.
22. Beise, M., Rennings, K. (2005) *Lead Markets for Environmental Innovations: A framework for Innovation and Environmental Economics, Ecological Economics*, Vol 52, No. 1, pp5-17.
23. Griliches Zvi, ‘Hybrid Corn: An Exploration of the Economics of Technological Change.’ In *Technology, Education and Productivity: Early Papers with Notes to Subsequent Literature*. pp27-52. New York, Basil Blackwell, 1988 [1957].
24. For a more technical version of these arguments see Georghiou, Luke (2006) *Effective Innovation Policies for Europe – the Missing Demand-Side*, Prime Minister’s Office, Economic Council of Finland.
25. Smits, Ruud, (2002) ‘Innovation studies in the 21st century. Questions from a users perspective’, in: *Technological Forecasting and Social Change*, Volume 69, Issue 9, pp861-883. Edler adds to this list the high entry costs for early users and the transaction costs involved in learning, on behalf also of future users (Edler, Jakob Demand Oriented Innovation Policy, Paper presented at the ProACT Conference, Tampere, Finland March 15-17 2006).
26. Georghiou et al (2003) *Raising EU R&D Intensity: Improving the Effectiveness of Public Support Mechanisms for Private Sector Research and Development: Direct Measures 2003*, EUR 20716.
27. French, German, UK Governments (2004) *Towards and Innovative Europe. A paper by the French, German and UK Governments*, February 2004, http://www.hm-treasury.gov.uk/media/C0B/BF/towards_innov_europe_200204.pdf
28. Kok, W., et al. (2004) *Facing the Challenge. The Lisbon Strategy for Growth and Employment. Report from a High Level Group*. November 2004, Luxembourg.
29. Aho, E., Cornu, J., Georghiou, L. and Subira, A. (2006) *Creating an Innovative Europe. Report of the Independent Expert Group on R&D and Innovation appointed following the Hampton Court Summit. Rapporteur: Luke Georghiou*, January 2006.
30. HM Treasury (2007) *Transforming Government Procurement* p1.
31. Department of Trade and Industry (2003) *DTI Economics Paper No. 7, Competing in the Global Economy – the Innovation Challenge*, and Department for Trade and Industry (2003) *Innovation Report, Competing in the Global Economy: the Innovation Challenge*.
32. Wanless, Derek, (2001) *Securing Our Future Health: Taking a Long-Term View, Interim Report*, HM Treasury, p163.
33. CBI/QinetiQ (2006) *Innovation and public procurement – A new approach to stimulating innovation*.
34. Ian Taylor MP, Chair of the Conservative Party Taskforce on Science, Technology, Engineering and Mathematics (2006) quoted at http://www.conservatives.com/tile.do?def=news.story.page&obj_id=131433
35. These initiatives have their origins in technological development strategies but have recently responded to growing interest in demand-side activity. This trend should be reinforced so that the demand element does not end up as an exercise in bemoaning the lack of user interest in adopting emergent technologies rather than innovations which truly meet their needs.
36. ‘*Foresight*, and its associated horizon scanning centre aims to provide challenging visions of the future, to ensure effective strategies now. It does this by providing a core of skills in science-based futures projects and unequalled access to leaders in government, business and science.’ Its activities are currently focused on ‘Mental capital and mental wellbeing,’ ‘Sustainable energy management and the built environment’ and ‘Tackling obesities: future choices.’ For more information, see <http://www.foresight.gov.uk/>
37. A comprehensive review of the role of regulation in innovation can be found in Blind K et al, *Fraunhofer Institute for Systems Research, New Products and Services: Analysis of Regulations Shaping New Markets*, European Commission, 2004.
38. OECD broadband statistics to June 2006 available at www.oecd.org/sti/ict/broadband
39. Frieden, Rob, *Lessons from broadband development in Canada, Japan, Korea and the United States Telecommunications Policy* 29 (2005) pp595–613.
40. The World Trade Organization and World Intellectual Property Organization.
41. Task-Force on ICT Competitiveness and ICT Uptake (2006) *Working Group 6 Achieving a Single Market* http://ec.europa.eu/enterprise/ict/policy/doc/wg6_report.pdf

42. Global Systems for Mobile Communication; Asymmetric Digital Subscriber Line.
43. Finnish EU Presidency (2006). Demand as a driver of innovation – towards a more effective European innovation policy. Discussion note for the informal meeting of the competitiveness ministers, Finland, July 10-11.
44. Sobel, Dava (1995) *Longitude*, New York: Penguin.
45. Edler, Jakob et al (2005) *Innovation and Public Procurement – Review of Issues at Stake*, Study for the European Commission ENTR/03/04.
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48. Nonetheless, to reap the benefits available within a framework that is still dominated by a static model of competition, significant complementary efforts are needed. Practical advice on working within this framework is available in two recent reports sponsored by the European Commission (Edler, J., Edquist, C., Georgiou, L., Hommen, L. Hafner, S., Papadakou, M., Rigby, J., Rolfstam, M., Ruhland, S., Tsiouri, L., (2006). *Innovation and Public Procurement. Review of Issues at Stake*, final report, Brussels [ftp://ftp.cordis.lu/pub/innovation-policy/studies/full_study.pdf] and Wilkinson R. Georgiou L, Cave J. et al (2005) *Public procurement for research and innovation*, DG Research, EUR 21793.
49. Advanced Research Projects Agency/Defense Advanced Research Projects Agency. ARPA was established in 1958, then renamed DARPA in 1972. In 1993, it was re-named ARPA, before once again becoming DARPA in 1996.
50. Quote from Michael Dertouzos (1997) *What Will Be – How the New World of Information Will Change Our Lives*, Harper Collins. The US Defense Advanced Research Projects Agency (DARPA) has pursued a mission of ensuring a US leading position in technology for military capabilities since 1958. A small, flexible and non-bureaucratic central office develops topics for funding and selects projects from contractors drawn from industry and often universities. Typical projects are in the range of \$10-40 million though many are smaller. DARPA played a key role in the emergence of areas as microelectronics, computing and network communications, influencing markets well beyond its defence remit. It is unusual in being able to support a technology area from academic research through to commercial success without gaps, so long as there is a clear defence objective. The idea of extending the scope of DARPA beyond defence has occasionally emerged and resulted in its name being temporarily changed to its original formulation (ARPA) from 1993 to 1996. DARPA claims a number of historical successes arising from its work, including “between a third and a half of all the major innovations in computer science and technology”. These innovations include timesharing, computer networks, landmark programming languages such as Lisp, operating systems like Multics (which led to Unix), virtual memory, computer security systems, parallel computer systems, distributed computer systems, computers that understand human speech, vision systems, and artificial intelligence.
51. <http://www.iantaylormp.com/type2show.asp?ref=373&ID=90>
52. Edler, Jakob et al (2005) *Innovation and Public Procurement – Review of Issues at Stake*, Study for the European Commission ENTR/03/04.
53. Neij, Lena, *Methods of Evaluating Market Transformation Programmes: experience in Sweden*, Energy Policy 29 (2001) pp67-79.
54. The Government announced in the 2005 Budget that it would guarantee at least 2.5 per cent of the value of Departments’ and agencies’ extra-mural R&D contracts would be placed with SMEs, building on the Small Business Research Initiative (SBRI). In 2004/05, of a proposed baseline of £2.5 billion, £269 million (10.6 per cent) went to small firms in the form of contracts. SMEs are now also able to access Government extramural R&D contracts with a value below £100,000, via a new Government procurement portal www.supply2.gov.uk, launched in March 2006 – HM Treasury Response to the science and innovation investment framework 2004-2014: Next steps.
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