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NESTA Making Innovation Flourish

# Hidden Innovation

## How innovation happens in six 'low innovation' sectors

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### Foreword

Innovation is essential to ensuring the UK's future economic competitiveness and social wellbeing. Last October, NESTA's report, *The Innovation Gap,* identified a gulf between how innovation happens in the UK and how policy supports it. *Hidden Innovation* helps to bridge that gap by taking a detailed look at the innovation systems of six 'low innovation' sectors.

Over the next few years, we need to develop policy to support innovation above and beyond its traditional home in science and technology. Should we do this, the prize is considerable – world-class industries, high-performing public services and an international reputation as a thought leader in a critical area of competitive advantage.

I believe that this report makes an important contribution – both in terms of evidence and analysis. But its main message is that no single agency can deliver innovation policy, fully-formed, onto an unsuspecting country. NESTA will continue to investigate how innovation happens through its research, its programmes and its investments, but most importantly, it will seek to learn and to play its part in fostering all elements of the UK's ecology of innovation.

As always, we welcome your involvement and your views.

**Jonathan Kestenbaum**
CEO, NESTA

**June, 2007**

**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.**

# Executive summary

**The innovation that matters most differs between sectors. It includes the development of new exploration techniques in oil production, modular accommodation systems in construction, or new, more successful programmes for the rehabilitation of offenders. This innovation frequently relies on collaborations between disciplines, across sectors and beyond regions – and it is often affected more by mainstream policies than by those aimed directly at innovation.**

**Policymakers need to understand these increasingly important dynamics of innovation – but government can't be expected to do this alone. Achieving maximum productivity will require taking a sector-wide view – led by industry, supported by government and bringing in users and suppliers where appropriate. Sometimes it will involve the extension of existing policies beyond their historic focus on science and technology. Most often, it will mean government ensuring the right conditions for innovation – through intelligent regulation, taxation, procurement and education policy.**

### The UK has responded to the importance of innovation by stimulating science-based innovation and knowledge transfer

Innovation is increasingly important to a mature economy like the UK and has been recognised by HM Treasury as one of its five drivers of productivity. It is equally essential in developing new approaches to seemingly intractable social challenges such as climate change, inequality and an ageing population.

Historically, the UK has suffered from poor performance against its major competitors on traditional measures of innovation. For example, adjusted for the size of our economy, the UK's investment in formal research and development (R&D) is barely half that of Japan and only two-thirds that of the Unites States. Consequently, policymakers have responded by incentivising R&D, encouraging businesses to collaborate with universities and substantially increasing public investment in scientific research.

### The UK is in the early stages of developing innovation policy for a service-based economy

These interventions have been timely and necessary, but science-based innovation represents only one important dimension of innovation. Science-based innovation – in the form of new-to-the-world products and technological processes – primarily takes place in only six per cent of the UK's economy (although the benefits may later spread to other parts of the economy). An 'innovation gap' has opened up between the types of innovation that matter most directly to the rest of the UK economy and the established policy interventions that are intended to promote innovation – particularly given the size and importance of the UK's service-based sectors and public sector.

Responding to this, UK policymakers have begun to address these new and important dimensions of innovation. In particular, the Department of Trade and Industry (DTI) is investigating broader categories of innovation including innovation in services. The Technology Strategy Board's Innovation Platforms build cross-sector interdisciplinary groups aimed at solving specific challenges, and the new mission of the TSB encompasses the impact of technology across the UK economy.

### 'Hidden innovation' is underexplored and vital to the future development of the UK

NESTA's previous work on *The Innovation Gap* (published in October 2006) developed the concept of 'hidden innovation' – the innovation activities that are not reflected in traditional indicators such as investments in formal R&D or patents awarded.

Despite not being measured, hidden innovation often represents the innovation that matters – the innovation that most directly contributes to the real practice and performance of a sector. For instance, it includes the development of new drilling techniques in oil production,

back-office technologies in financial services, or new, more successful programmes for the rehabilitation of offenders.

This hidden innovation is important. To give two examples, the legal aid budget per head in the UK is ten times that of Germany and France, and more than four times that of the Netherlands; innovation in new organisational forms and the application of ICT could hold the key to reducing costs and improving access. In the UK's oil production sector there exist two challenges that only innovation can solve: 'mature' fields from which the 'easy' oil has been extracted, and 'frontier' fields that pose challenges of deep water or turbulent subsea conditions; both therefore depend on new techniques for future oil recovery.

### Detailed sectoral analysis reveals four types of hidden innovation

To understand the dynamics of hidden innovation, NESTA conducted a detailed analysis of six sectors that perform poorly on traditional metrics of innovation: oil production, retail banking, construction, legal aid services, education and the rehabilitation of offenders. None of these six sectors invests heavily in formal R&D; nor do they produce many patents. Three represent publicly-funded services that are typically not included in studies of innovation at all.

This research has revealed at least four types of hidden innovation:

- Type I: Innovation that is identical or similar to activities that are measured by traditional indicators, but which is excluded from measurement. For example, the development of new technologies in oil exploration;

- Type II: Innovation without a major scientific and technological basis, such as innovation in organisational forms or business models. For example, the development of new contractual relationships between suppliers and clients on major construction projects;

- Type III: Innovation created from the novel combination of existing technologies and processes. For example, the way in which banks have integrated their various back office IT systems to deliver innovative customer services such as internet banking;

- Type IV: Locally-developed, small-scale innovations that take place 'under the radar', not only of traditional indicators but often also of many of the organisations and individuals working in a sector. For example, the everyday innovation that occurs in classrooms and multidisciplinary construction teams.

### Hidden innovation is often more about absorbing ideas than creating new ones – and is greatly affected by non-innovation policies

The innovation that matters most in these six sectors suggests that:

- Innovation rarely happens at one time in one place: it depends heavily on a sector's ability to draw on a 'hinterland' of ideas from related sectors and is frequently a global process;

- Innovation often involves melding existing technologies and matching those with organisational change to deliver innovative services;

- Innovation is often stimulated or blocked by framework conditions such as taxation, skills and regulation, and wider political conditions. Despite their influence on innovation, the policies that shape these conditions are rarely considered 'innovation policy'.

### Developing relevant metrics for hidden innovation is valuable and possible

Evidence-based policy demands measurement of baselines and of performance against those baselines. Historically, the development of metrics has proven a substantial barrier to the extension of innovation policy beyond science and technology. However, some metrics that more accurately capture hidden innovation are available.

In oil production, for instance, innovation is normally driven by the demands of exploration and often happens in the development of a technique through application in the field. As a result, investment in technologies for exploration is a better proxy for innovation than traditional R&D. Instead of characterising the oil sector as being 70 times less innovative than pharmaceuticals (the result of relying on R&D spend), this recognises the £600 million spent on exploration in the UK alone as a more accurate measure of oil companies' commitment to innovation.

In construction, metrics like the use of modern methods of construction (MMC) would produce a better measure of innovative activity than the rate at which construction companies patent

new inventions. Instead of characterising the sector according to its low patenting rate (only one per cent of construction firms apply for patents), this would focus attention (and policy) on the rate at which MMC spread through the sector – and how much money they save (so far, more than £800 million in central Government procurement alone).

## Recommendations: Innovation policy needs to be sensitive to the sectoral systems of innovation already at work

**Where it has a role, innovation policy needs to support systems and focus on promotion and diffusion, not just invention**
It is more efficient and effective for government to improve a sector's capacity for innovation than to support the creation of specific innovations. Alongside improving a sector's generation of innovation, this will mean increasing its absorptive capacity to draw innovations in from elsewhere, and strengthening its internal processes for developing and diffusing them.

**Developing a full innovation strategy will require sectoral understanding that only industry can provide**
The innovation that matters to these six sectors, and the policy required to support it (or even whether policy has a role at all), differs greatly. Policymakers need to understand these increasingly important dynamics of innovation – but government can't be expected to do this alone.

Government should call for evidence on how innovation happens in the most critical sectors of the UK economy. Where possible, this process should be conducted through existing industry groups, although government should actively seek out the input of non-industry stakeholders essential to innovation: consumer groups, regulators and representatives of a sector's 'innovation hinterland.' The result is not expected to be a raft of new innovation policies but more likely that existing policies will be interpreted differently and deployed in different measures for different sectors. Judging by the experience of the industry partnership Constructing Excellence, many of the resultant recommendations will be for industry itself.

**A sector-relevant Innovation Index would better guide policy development**
The UK should develop its own annual Innovation Index. By using sector-specific indicators, this would be better-able to capture both the traditional and hidden innovation in major sectors than the current generic indicators, and provide a better health-check of the capacity of the UK's innovation system.

**Innovation must be a distributed goal but with a high-level champion in the machinery of government**
Innovation is a fundamental economic priority that should be at the heart of government.

- The importance of hidden innovation means that innovation policy needs to extend beyond stimulating scientific invention to include the adoption and exploitation of technologies, organisational innovation and innovation in services (including public services). As a result, innovation policy should encompass science and technology policy and not the other way around.

- The influence of framework conditions means that innovation is inherently a cross-departmental issue. This is, of course, a case made for a number of other policy areas, but the criticality of innovation to the future economic and social well-being of the UK gives added weight to it being made a distributed aim. All government departments should have a brief to be innovative themselves and to act to stimulate or be hospitable to innovation elsewhere in the economy. Mechanisms that should be considered to achieve this include innovation being included in Ministerial responsibilities, departmental strategic objectives, Public Service Agreements (PSAs) and a consideration of the impact on innovation being added to the Regulatory Impact Assessment.

- Distributed goals have historically not fared well in government and therefore it is essential that this broader innovation agenda has a senior departmental home. This should be within (or closely linked to) the department that is primarily responsible for the productivity of the UK economy.

- The development of intelligent innovation policy across the economy requires sustained and informed engagement with industry, a deep understanding of economics and the ability to formulate effective long-term innovation strategy. The department responsible for innovation must therefore include a highly skilled strategy and policy unit that can provide the deep theoretical background and evidence required for such a complex and important area of economic policy.

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# Hidden Innovation

## How innovation happens in six 'low innovation' sectors

### 1. The UK appears to perform poorly with regard to innovation

#### 1.1. Innovation is vital to the future of the UK's economy and society

In an increasingly competitive global economy, innovation – the successful exploitation of new ideas[1] – is regarded as the major source of competitive advantage for mature economies like the UK. Comparing internationally, variations in levels of innovation are related to economic growth and trade performance.[2] For businesses, investments in innovation enable enterprises to outperform their competitors. As a result, HM Treasury has identified innovation as one of its five drivers of productivity.[3] Further, innovation has an important role to play in finding solutions to seemingly intractable social problems, in improving quality of life and in providing greater economic and social opportunities for more UK citizens.[4]

#### 1.2. But the UK performs poorly compared to its competitors

According to traditional innovation indicators, such as public and private investment in formal research and development (R&D), private sector engagement in innovation activity, and the number of patents registered, the UK performs poorly.[5]

According to the Fourth Community Innovation Survey (CIS 4), 43 per cent of UK enterprises were engaged in 'innovation activities'; two percentage points below the EU-15 average and well below Germany (65 per cent), Sweden (50 per cent), Austria (53 per cent) and Denmark (52 per cent).[6] Similarly, UK businesses consistently spend less on R&D than businesses in the US, France and Germany, and the OECD average.[7] Given the UK's comparatively low investment in innovation, it is no surprise that it lags behind other leading countries on patenting.[8]

The UK ranks sixteenth amongst OECD countries in its per capita investments in Higher Education Investments in R&D (HERD).[9] This is about half the amount of Sweden and Switzerland, just under two-thirds that of the US and slightly less than in Germany and France. However, this low spend does at least appear to be highly productive: compared to the US, France and Germany, the UK consistently scores highly on numbers of scientific papers produced and citations per capita.[10]

The impression created by these indicators is that the UK wastes its innovative potential by failing to commercially exploit its ideas, despite its strength in developing them in the first place. The specific implication is that the UK is sowing the seeds of a future prolonged economic decline relative to other, more innovative economies, particularly emerging powers such as China and India.[11]

#### 1.3. Unsurprisingly, policy has focused on improving poor performance on these indicators

As a result of an increasing awareness of the importance of innovation and in response to figures such as those quoted above, the last ten years have seen innovation become a high priority for policymakers across the UK. Compounded by analyses that have pointed to a persistent 'productivity gap' with main competitors,[12] the result has been a comprehensive range of central initiatives that have focused on science, engineering and technology (SET) areas.[13] Scotland, Wales and Northern Ireland have reflected a similar emphasis on SET, R&D in advanced

1. As defined by the Department of Trade and Industry (DTI), see Department of Trade and Industry (2003), Innovation Report, Competing in the Global Economy: The Innovation Challenge, (DTI, London). For discussion of this definition, see section 4, below.
2. See Metcalf, J. S. (1998), Evolutionary Economics and Creative Destruction, (Routledge, London). Also Fagerberg, J. (1987), 'A Technology Gap Approach to Why Growth Rates Differ', Research Policy, 16, pp.87–99, and Fagerberg, J. (2002), Technology, Growth and Competitiveness: Selected Essays, (Edward Elgar, Cheltenham).
3. HM Treasury (2000), Productivity in the UK: The Evidence and the Government's Approach, (HM Treasury, London).
4. National Endowment for Science, Technology and the Arts (2007), Innovation in Response to Social Challenges, (NESTA, London). See also Mulgan, G. (2007), Ready or Not?, Taking Innovation in the Public Sector Seriously, (NESTA, London).
5. The UK's 'R&D intensity' (total expenditure on R&D as a percentage of national GDP) at 1.73 per cent of GDP in 2004, is below that of Japan (3.18 per cent), Germany (2.5 per cent), France (2.14 per cent), and the United States (2.68 per cent). Public sector R&D expenditure also remains comparatively low despite significant increases in the UK's science budget in the last few years; net expenditure on science, engineering and technology by UK Government departments has risen in real terms from £1.45 billion in 1997-8 to an estimated £3.45 billion by 2007-8, see Department of Trade and Industry (2005) Science Budget Allocations 2005-06 to 2007-08, May 26 2007, (DTI, London).
6. Eurostat (2007), Fourth Community Innovation Survey, More Than 40 Per Cent of EU 27 Enterprises are Active in Innovation, press release (Eurostat, Luxembourg).
7. UK businesses consistently spend less on R&D than businesses in the US, France and Germany, and the OECD average, see Organisation for Economic Co-operation and Development (2005), OECD Science, Technology and Industry Scoreboard 2005, Briefing Note for the United Kingdom, (OECD, Paris).

technologies, and university-business collaborations, as have the initiatives of the English regions.[14]

## 2. Traditional metrics are based on a model of innovation that is increasingly less relevant – especially to the UK

### 2.1. Traditional indicators are based on a specific model of science-based innovation led by formal R&D

Internationally-agreed innovation indicators like R&D expenditure and patent production reflect a view that innovation is synonymous with scientific and technological invention.[15] In this model, formal R&D leads to new discoveries that are then incorporated into a new-to-the-world product or process and then 'pushed out' to consumers. This is the linear or 'pipeline' model of innovation. Its development was largely a reflection of the professionalisation of R&D in industrial laboratories that began in the late 19th Century, became prevalent in the first half of the 20th Century and was then institutionalised in the military and civilian 'big science' projects of the 1940s and 1950s.[16] Consequently, it was not designed to anticipate the emergence of new sectors and the new forms of innovation that accompany them.

### 2.2. Traditional metrics are particularly inappropriate for the UK with its lower reliance on manufacturing and greater reliance on services

The UK's 'R&D intensity' (total expenditure on R&D as a percentage of national GDP) is lower than many other countries largely because the composition of its economy is skewed towards industries (particularly services) where R&D intensity is lower. The UK has relatively fewer businesses in sectors such as automotive production and electronics that tend to have high or medium-high R&D intensities, and 'high-tech manufacturing' comprises only 2.5 per cent of the UK economy (medium-high tech manufacturing a further 3.6 per cent).[17]

The rest of the UK's economy – nearly 94 per cent – is regarded (in official data, at least) as 'low tech'. Because of the conflation of R&D spend with innovation, the sectors that comprise this 94 per cent are consequently also regarded as 'low innovation'.

The growth of the UK's service sectors has been particularly pronounced compared to other countries.[18] Manufacturing now accounts

**Case study summary: Oil production**

Oil production in the UK Continental Shelf (UKCS) area makes a significant contribution to the UK economy. The UK Government received £10.3 billion in tax revenues from oil companies in 2006, and oil service companies operating in the UK earned £4 billion in export sales.

Innovation in oil production frequently depends on collaborations between production and service companies to develop new technologies and techniques that are required for exploration. In this way, exploration activity is almost inseparable from innovation, especially exploration in the more difficult conditions found in mature (already developed) or frontier (difficult to develop) fields.

Two examples of important innovations are Nuclear Magnetic Resonance (NMR) measurement and four-dimensional seismic surveys, both of which reduce exploration costs and optimise production from wells. Following some initial research in the oil sector, the full potential of NMR was recognised by a team of American medical researchers before being developed in collaboration with teams from both oil service and production companies. Due to the requirement for expertise from many fields including geology, engineering, and data processing and analysis, four-dimensional seismic surveys (three dimensions plus time) were developed through partnership between production companies and highly specialised supplier companies.

Expenditure on exploration activity – and hence demand for innovative technologies and techniques – is determined by economic calculations by production companies, which are affected by the present and projected oil price, as well as taxation and regulation.

See Appendix A for further detail.

8. The UK was granted 3.76 per cent of triadic patent families in 2003, far lower than the US (37.56 per cent) but also lower than Germany (13.82 per cent) and Japan (25.85 per cent). All data from Organisation for Economic Co-operation and Development (2006), Main Science and Technology Indicators (MSTI): 2006/2 Edition, (OECD, Paris). A 'patent family' is a set of patents taken out in various countries for the purposes of protecting a single invention. Triadic patents are filed at the European Patent Office, the Japan Patent Office, and granted by the US Patent and Trademark Office.

9. According to a study published in 2000, see Salter, A., D'Este, P., Martin, B., Geuna, A., Scott, A., Pavitt, K., Patel, P., and Nightingale, P. (2000), Talent, Not Technology: Publicly Funded Research and Innovation in the UK, (Science and Technology Policy Research, University of Sussex, Brighton).

10. Organisation for Economic Co-operation and Development (2005), Main Science and Technology Indicators (MSTI): 2005/2 Edition, (OECD, Paris).

11. The Guardian (2006), 'Long-term Threat to Economy as UK Runs Out of Scientists, CBI Warns', 14th August.

12. For example, the review conducted by Michael Porter and Christian Ketels, see Department of Trade and Industry (2003), UK Competitiveness: Moving to the Next Stage, (DTI, London).

13. For example, Department of Trade and Industry (2003), Innovation Report, Competing in the Global Economy: The Innovation Challenge, (DTI, London); Department of Trade and Industry/HM Treasury/ Department for Education and Skills (2002), Investing in Innovation, A Strategy for Science, Engineering and Technology, (DTI/HM Treasury/DfES, London); and HM Treasury/Department of Trade and Industry/Department for Education and Skills (2004), Science & Innovation Investment Framework 2004-2014, (HM Treasury/DTI/DfES, London).

14. See Appendix B, National Endowment for Science, Technology and the Arts (2006), The Innovation Gap, (NESTA, London).

15. R&D statistics first emerged in the 1930s in countries such as the UK, the US, and Canada, but their subsequent development and adoption internationally owes much to the OECD, in particular the *Frascati Manual* which established a standard methodology for data collection. See Godin, B. (2002), 'The Number Makers: Fifty Years of Official Statistics on Science and Technology', Minerva, 40 (4), pp.375-397.

for less than 15 per cent of total GVA in the UK, and its contribution has fallen every year since 1995.[19] This is less than half that of the business and financial services sector, which forms the largest single sector of the UK economy, accounting for 33 per cent of total GVA in 2004. Business and financial services are continuing to increase in importance, growing by more than 8.1 per cent from 2003-2004, faster than the overall growth in total GVA of 5.9 per cent.[20] The innovation that matters most to services sectors is rarely science-based.

### 3. UK policy has identified this problem but is in the early stages of developing its understanding of how innovation happens in a broader set of sectors

UK policymakers have begun to investigate the nature of innovation in sectors that are beyond the traditional science-focus of innovation policy, and how policy might stimulate and support innovation there. The DTI has commissioned research on broader categories of innovation including innovation in services. The revamped Technology Strategy Board (TSB) includes in its remit a responsibility to support technology-based innovation across the whole economy. Indeed, in many respects, the UK is leading the way internationally in its engagement with a broader innovation agenda.

### 4. Many sectors are more dependent on 'hidden innovation' than on traditional science-based innovation

Innovation is perhaps best defined as 'the successful exploitation of new ideas.'[21] This explicitly includes 'traditional' science-based innovation that introduces products that are entirely new-to-the-world. However, it also encompasses other forms of innovation beyond new scientific discoveries. This is useful and important, as the case studies included in this research demonstrate.

However, a dividing line must be drawn between 'innovation' and incremental development that is indistinguishable from 'improvement' or 'change.' To avoid this over-inclusion, an innovation must involve an inventive step and result in meaningful improvement in the business or organisation concerned. (However, survey instruments that might appropriately record this inventive step in its different forms across sectors are still in the process of being developed).

This refined definition continues to include science-based innovation but also many other innovations that are neglected by traditional indicators of innovation such as investments in formal R&D or patents awarded.[22] This is 'hidden innovation.'

This 'hidden innovation' is by no means exclusive to 'low innovation' sectors: there may, indeed, be large amounts of hidden innovation underway in sectors that also innovate in the traditional manner and which are heavily dependent on science and technology. Despite going unmeasured, hidden innovation frequently represents the innovation that matters – the innovation that most directly contributes to the real practice and performance of a sector.

### 5. NESTA's research focused on investigating the way that innovation works in six important sectors of the UK's economy and society

To understand the dynamics of hidden innovation, NESTA analysed six sectors that perform poorly on traditional indicators: oil production, retail banking, legal aid services, construction, education and the rehabilitation of offenders (see Appendices A-F). None of these six sectors invests heavily in formal R&D, nor do they produce lots of patents, and three represent publicly funded or provided services which are typically not included in studies of innovation at all.

#### 5.1. Much like traditional innovation sectors, those dependent on hidden innovation can have high or low innovation capacities

As with sectors that rely on more traditional forms of innovation, those that rely on hidden innovation demonstrate different levels of innovative capacity. For example, oil and financial services sectors have comparatively high capacities for innovation. When appropriate, significant resources can be devoted to developing and implementing innovative technologies and approaches, and the innovations developed in one location are often spread and replicated quickly. Construction and education have uneven but improving innovation systems: innovation is quite common on the front line of the classroom or individual project but those

16. The first work by the OECD on 'research-intensive industries' was published in the early 1960s, see Organisation for Economic Co-operation and Development (1963), Science, Economic Growth and Government Policy, (OECD, Paris).

17. Organisation for Economic Co-operation and Development (2005), OECD Science, Technology and Industry Scoreboard 2005, (OECD, Paris). The UK also has a particularly low R&D intensity within some manufacturing industries, such as communication equipment, transport equipment and computing machinery; see Ambramovsky, L., Griffith, R., and Harrison, R. (2005), Background Facts and Comments on "Supporting Growth in Innovation: Enhancing the R&D Tax Credit", (Institute for Fiscal Studies, London).

18. Organisation for Economic Co-operation and Development (2005), The Service Economy in OECD Countries, (OECD, Paris).

19. Manufacturing accounted for 21.7 per cent of GVA in 1995. See Office for National Statistics (2006), United Kingdom Input-Output Analyses, 2006 edition, (ONS, London). GVA measures the contribution to the economy of each individual producer or sector.

20. Office for National Statistics (2006), United Kingdom Input-Output Analyses, 2006 edition, (ONS, London).

21. Department of Trade and Industry (2003), Innovation Report, Competing in the Global Economy: The Innovation Challenge, (DTI, London).

22. National Endowment for Science, Technology and the Arts (2006), The Innovation Gap, (NESTA, London).

innovations aren't always diffused efficiently throughout the sector.

By contrast, legal aid services and the rehabilitation of offenders have relatively undeveloped innovation systems. Actors such as legal professionals and voluntary groups may be full of new ideas, but their locally-developed innovations often fail to get off the ground. In these sectors, innovation is sometimes regarded as a marginal activity at odds with the main job of delivery; innovation is an activity which most actors haven't got the time, resources or responsibility to engage with. (In contrast, in high innovation sectors – whether traditional or hidden innovation – innovation is increasingly 'part of the day job' across the whole organisation).

**5.2. This isn't as simple as suggesting that the private sector is good at innovation and the public sector is poor**

As these six case studies demonstrate, in a modern mixed economy there are very few private industries that remain unaffected by public policy and very few public services that have no dealings with the private sector. Many private sector areas are heavily affected by, for instance, public procurement or regulation. Indeed, in construction alone, the public sector accounts for over a third of the sector's UK revenues. By contrast, some 'public sector' areas can be primarily comprised of private providers (for example, lawyer practices in legal aid).

However, even between industries that do exist largely in one sector or the other, there is no rule as to their innovative capacity. Some private sector areas such as housebuilding are not wholly good at innovation, while the public sector areas are not wholly poor at innovation

**Case study summary: Construction**

Construction is the UK's largest industry. The sector generates around ten per cent of GDP – about £90 billion – from more than 182,000 firms employing 1.17 million people.

Innovation in construction often means developing new working practices through collaborative problem-solving on individual projects. Because of their scale and importance, some projects have led to major innovations and have been widely influential on the rest of the sector. BAA, the client for Heathrow Terminal 5, developed the T5 Agreement with its 60 main suppliers. By taking on all of the risk for the project, BAA enabled the establishment of fully-integrated expert teams that ensured that the various contractors could focus on working together effectively, and were able to share more information than they would be willing to under traditional arrangements. These innovative working practices have been influential in informing a sector-wide improvement agenda, led by the industry in partnership with government.

Innovations in construction also often represent applications of existing knowledge and materials rather than new-to-the-world inventions. For example, off-site manufacture (one form of a wider group of innovations called 'modern methods of construction' or MMC) is generally cheaper, faster, results in fewer faults, and reduces waste and transport costs. A leading supplier of off-site manufactured units is the steelmaker Corus, which realised that it could apply its existing production line expertise to develop a range of fully-fitted steel-framed accommodation modules called Living Solutions. This system has most recently been used for the Allen/Connaught project, a £1 billion development of accommodation for military and civilian personnel near Salisbury Plain and Aldershot. Choosing off-site manufacture has reduced construction costs by more than 30 per cent compared to traditional methods. In addition, construction was not delayed due to weather conditions, 50 per cent fewer deliveries to site were needed and on-site waste was significantly reduced.

The development and adoption of such innovations in construction is chiefly informed by clients' demands, government regulation and skills levels in the sector.

See Appendix B for further detail.

(for example, the development of legal advice outreach services). Competitive markets may be a major stimulus for innovation, but they do not guarantee it. Less than perfect conditions in these markets (like the poor expression of consumer demand in retail banking) can induce apparent deficits in innovation (widespread dissatisfaction by customers).[23] The introduction of private provision also does not in itself lead to increased levels of innovation: there has been relatively low innovation in the rehabilitation of offenders from prisons established under Private Finance Initiatives compared to the innovative actions of many voluntary groups in the sector.

## 6. The dynamics of hidden innovation vary across sectors, but similar characteristics can be identified

### 6.1. In detail, different sectors innovate differently

It is unsurprising that the detailed operation of each sector's innovation system is considerably different. In banking, innovation often relies on investments in ICT supplied by service companies which are then integrated to provide new services to customers. By contrast, in education the bulk of new practice is developed by individual schools and teachers. In oil production and the rehabilitation of offenders, it is frequently 'non-sector' groups that provide innovation (for oil, it is global service suppliers like Schlumberger; in rehabilitation of offenders, it is frequently voluntary groups). In construction, collaborative problem-solving with clients is a major source of innovation. This contrasts strongly with legal aid services, for instance, where there is currently limited innovation involving clients or the lawyers providing services to them.

However, this abundance of detail masks some broader themes around how innovation happens in sectors such as these.

### 6.2. Networks and collaboration are important to innovation

In all six of these sectors, innovation doesn't move in a linear way from 'laboratory to marketplace' within a single business or organisation. Indeed, innovation is not synonymous with research; it is more developmental, based around individual projects and conducted in response to particular challenges and problems. Collaborations between businesses, suppliers, contractors and (in some cases) clients and customers generate the majority of successful innovations.[24] This reinforces contemporary theoretical understandings of innovation that characterise it as a complex and interactive process involving multiple feedbacks between different services and functions as well as manifold interactions with customers and suppliers.[25]

For example, in the oil sector, BP worked with ten other businesses to develop a system called Life-of-Field Seismic that produces three-dimensional 'movies' of oil wells. On its own, this innovation – for a single company – is estimated to have the potential to increase recovery from fields worldwide by one billion barrels (equivalent to $63 billion at current prices) (see Appendix A Section 2.4).

In education, teachers have found that collaborations between schools can be a highly productive way of developing and evaluating innovative new practices – far more effective than other forms of continuing professional development. Such collaborations are often supported by intermediary organisations such as the National College for School Leadership (NCSL) and the Specialist Schools and Academies Trust (SSAT). The benefits can be substantial – for instance, those schools involved in the NCSL's Networked Learning Communities show attainment in Key Stage 2 tests in English and maths well above the average for non-participating schools. These organisations are also positioned to diffuse successful new practices far more widely than individual schools or teachers would ever be able to (see Appendix E Section 2.4).

### 6.3. Innovation depends heavily on the ability to draw on a 'hinterland' of related sectors and suppliers

Sectors don't necessarily need to develop innovations from scratch in order to be more innovative. Construction demonstrates particularly well that a sector can improve its capacity for innovation by adapting and exploiting the technologies and approaches developed in other sectors by, for example, fully utilising ICT project management tools.

Innovations also frequently draw on expertise that is present in traditionally-unrelated sectors. For instance, the steelmaker Corus developed its Living Solutions modular accommodation system by transferring its manufacturing expertise, including computer-controlled equipment and assembly production, from its traditional use in metals production.

23. For example, a recent survey suggests that 45 per cent of customers are unhappy about the low interest rates they receive on their savings, but 80 per cent of them have never switched banks, see Which? (2007), Bank Customers Annoyed by Low Interest Rates, But Most Have Never Switched Their Business, press release, 4th April.

24. The concept of 'interactive innovation' is derived from Rothwell's historical classification of five generations of models of innovation, see Rothwell, R. (1994), 'Towards the Fifth-Generation Innovation Process', International Marketing Review, 11 (1), pp.7-31. Rothwell noted that the growing complexity and pace of industrial technological change is forcing firms to forge new alliances and to respond more efficiently to market changes. This process is leading some companies towards more strategically directed integration within external agencies, hence 'interactive innovation'.

25. For example Lundvall, B.-Å. (1988), 'Innovation as an Interactive Process: From User-Producer Interaction to the National Innovation System', pp. 349-369 in Dosi, G., Freeman, C., Nelson, R. R., Silverberg, G., and Soete, L. (eds.), Technology and Economic Theory, (Pinter, London).

This approach to off-site manufacture in construction can reduce costs by more than 30 per cent compared to traditional methods and reduce environmental damage by halving the number of deliveries to building sites. Notably, although Corus developed the system on its own, it needed to partner with the established construction firms Mowlem and KBR in order to gain credibility and penetration in the sector (see Appendix B Section 2.3).

Similarly, in oil production, the application of Nuclear Magnetic Resonance (NMR) to identify oil reserves in the North Sea was helped by the parallel development of the technology by American medical researchers. NMR is now a widely-used technique to optimise production in oil fields across the world; it increases revenues from fields by millions of dollars. As with Corus' Living Solutions, the medical researchers who advanced the technology needed to work closely with partners in the oil sector in order to develop and commercialise their innovation (see Appendix A Section 2.3).

In these cases, suppliers and intermediaries play a major role in developing and diffusing innovations. When they function correctly, this makes for effective sectoral systems of innovation, by which innovations are generated, developed, implemented and diffused rapidly and efficiently. In some sectors like education, there exist formal intermediary organisations such as the SSAT and the Innovation Unit, whereas in others, private consultancies or trade associations perform this function.

### 6.4. Innovation is an increasingly global process

As demonstrated by NMR in oil production, innovation is often a global process. Many sectors are served by globalised service and supplier companies, which are often larger than the companies that they supply products and services to. For example, the US-based oil services company Schlumberger has revenues of $19 billion and operates all over the world; in financial services, the UK-based technology supplier Misys works with clients in 120 countries (see Appendix A Section 1, and Appendix C Section 2.2).

This creates a problem for national metrics and national innovation policies. The 'unit' of innovation is rarely the nation. Rather, innovation crosses national boundaries by being developed within individual but

**Case study summary: Retail banking**

Retail banking is one part of the UK financial services industry that represents an important source of productivity growth for the UK economy. In 2003, the UK retail banking market alone grew by 7.9 per cent to reach $1.54 trillion.

Innovation in retail banking is primarily process-oriented rather than product-based and most innovations have their basis in technology. In the first instance, technology has increased the efficiency of banks' back-office operations (collectively, European banks invested more than €45.7 billion in new ICT systems in 2005). Much of this technology is not developed in-house but delivered by technology suppliers. These suppliers provide systems that handle processes such as account transactions, mortgage and loan processing, card issuing, and customer relationship management.

However, in addition to improving back-office transactions, these technologies have increasingly been integrated to offer innovative products and services to customers including telephone banking, internet banking and offset accounts. These innovations have earned substantial cost savings for providers, as well as improvements in services to customers. For example, it has been estimated that a typical internet banking transaction costs only ten per cent of the cost of a branch transaction.

Radical innovation in retail banking is relatively rare due to the intangible character of many products and weak consumer demand – with many customers lacking the capability to understand more complex products. Light-touch regulation has been important in ensuring the competitiveness of the UK sector in comparison to other countries.

See Appendix C for further detail.

multinational companies, or between companies and global suppliers.

This also means that national framework conditions, rather than just national policies for innovation, become important. For example, oil companies base their decisions on where to invest in exploration and production on the taxation regimes that apply in various regions, not just on what support they might receive for R&D activity. In combination with the oil price, taxation is likely to have a far larger impact on investment in innovation than subsidies for research (see Figure 1, and explanation in Section 6.9, below).

### 6.5. Innovation relies heavily on 'absorptive capacity'

When innovation processes are distributed geographically and across a 'hinterland' of organisations and sectors, the development of innovation depends not only (or indeed primarily) on the internal resources allocated to R&D but on a far broader set of capabilities that are captured by the concept of 'absorptive capacity'.

This capacity is a business's ability to identify, assimilate, and exploit knowledge from its wider environment, including the quantity and quality of its networks – be it from other research centres, businesses, or customers.[26] Innovative capability, therefore, is largely to do with the ability to identify and exploit systematically the effects produced by new combinations in the existing stock of knowledge.[27] This process has been called 'innovation without research'[28] and echoes the recent emphasis on 'open innovation'; that firms should better utilise ideas from outside sources rather than always seeking to invent for themselves.[29] In the open innovation model, internal R&D remains necessary, but chiefly to exploit value from external ideas.

As seen with NMR, as well as being external to the firm, this knowledge may be generated in other regions or countries entirely. Harnessing this foreign R&D has the potential to produce as much value for the UK economy as domestic R&D so long as there exists sufficient skill and knowledge in UK businesses to develop and apply the resultant knowledge.[30] Lack of appropriate skills, for instance, has been a barrier to the uptake of MMC in the UK construction industry.

Similarly, it might be useful to measure levels of national innovation not only in terms of an ability to create new-to-the-world inventions but also the ability to absorb and exploit knowledge that originates elsewhere.[31] Those factors that contribute to national absorptive capacity include basic infrastructure (for example, transport and telecommunications infrastructure), advanced infrastructure (for example, universities and research institutes) and formal and informal frameworks (for example, intellectual property rights regimes and competition policy).[32]

### 6.6. Organisational innovation is important of itself and to extract maximum benefit from other innovations

Innovation is often about change in organisational forms and processes, either to deliver value directly or to maximise benefit from other innovations such as the implementation of new technologies.

BAA's Heathrow Terminal 5 development forms a critical part of the UK's future transport infrastructure and is being constructed by 60 main suppliers as part of a £4.2 billion project. Traditionally, the high level of risk in large-scale construction projects creates silos which prevent integrated working between different suppliers.[33] Recognising this, BAA made a deal: it took the highly unusual step of taking on all of the risk of the project and used the new, risk-free environment to establish cross-supplier expert teams tasked with identifying problems before designs were finalised. This model has proven so effective that it has been identified as best practice for the whole construction sector (see Appendix B Section 2.4). The National Audit Office has estimated that up to £2.6 billion could be saved annually if the principles developed by BAA were applied across the public sector.[34]

Retail banks' experience of internet banking shows that maximising economic return requires that technological innovation be complemented by organisational innovation. Initially, many internet bank operations were developed as separate, 'green field,' organisations to minimise risk and to circumvent the difficulties of introducing new systems and approaches within an existing organisation. In several cases, the processes and services developed by these new operations have now been fed back into the parent companies. However, realising the full economic benefit from this has been dependent upon simultaneous organisational change that has, for instance, transformed high street bank branches from delivery channels to sales offices for a broader range of new

26. Cohen, W., and Levinthal, D. (1990), 'Absorptive Capacity: A New Perspective on Learning and Innovation', Administrative Science Quarterly, 35, pp.123–33.

27. David, P., and Foray, D. (1995), 'Accessing and Expanding the Science and Technology Knowledge Base', STI Review, 16, pp.13-38.

28. Cowan, R., and van de Paal, G. (2000), Innovation Policy in the Knowledge-Based Economy, (European Commission, Brussels).

29. See Chesbrough, H. (2003), Open Innovation, (Harvard Business School Press, Boston, Massachusetts), and Chesbrough, H. (2006), Open Business Models, (Harvard Business School Press, Boston, Massachusetts). See also National Endowment for Science, Technology and the Arts (2007), Connect, Collaborate, Innovate, (NESTA, London).

30. Jaumotte, F. and Pain, N. (2005), From Ideas to Development: The Determinants of R&D and Patenting, OECD Economics Department Working Paper No. 457, (OECD, Paris).

31. Criscuolo, P., and Narula, R. (2002), 'A Novel Approach to National Technological Accumulation and Absorptive Capacity: Aggregating Cohen and Levinthal', paper presented at the DRUID Summer Conference on Industrial Dynamics of the New and Old Economy, Copenhagen/Elsinore 6-8 June.

32. Narula, R. (2003), Understanding Absorptive Capacities in an "Innovation Systems" Context: Consequences for Economic and Employment Growth, DRUID working paper 04-02, (DRUID, Copenhagen).

33. For example, problems in coordination between suppliers seriously afflicted the Wembley stadium project, particularly as the design developed during the building process.

34. National Audit Office (2005), Improving Public Services Through Better Construction, (NAO, London).

financial products and services (see Appendix C Section 2.4).

**6.7. The use, adoption and exploitation of existing technology is often more important than new-to-the-world invention**

Often, it is the case that successful sectors adopt and adapt, rather than invent, important technologies. Much of the technology investment by retail banks, for example, is into existing technologies; these may not always be radically new but they are necessary for banks to offer innovative products and services to customers. Similarly, most of the materials and processes used in modern methods of construction aren't new-to-the-world; rather, the point is that they are largely new to construction and offer the ability to build more quickly, more cheaply and in a more environmentally sustainable manner (see Appendix B Section 2.3).

In legal services, the Community Legal Service Direct (CLS Direct) helpline and website provide free publicly-funded confidential advice on a range of common problems in areas such as debt, benefits, housing and employment. Clearly inspired by NHS Direct, the idea of a single, publicly-funded gateway to help and support isn't new (and neither is the telephone), but the helpline receives around 450,000 calls per year and resolves many legal problems before they escalate into far more costly procedures (see Appendix D Section 2.4).

**6.8. 'Being innovative' can mean many different things**

These six case studies show that being an 'innovative organisation' can mean playing one or more of four different roles, all of which are important in sectoral systems of innovation:

- An organisation might be a **generator** of new ideas – for example, a global technology supplier in oil or financial services;
- It might be a **developer** of ideas into fully-fledged innovations – for example, a large oil production or construction company;
- It might be adept at being a fast-follower, an **adopter** of innovations developed elsewhere – for example, a retail bank or small oil company;

**Case study summary: Civil legal aid services in England and Wales**

England and Wales spend far more on legal aid per capita than any other countries in the world; £2 billion in 2006 alone. Aside from reducing costs, the Government has stated that improving access to legal advice is an important part of its social inclusion agenda.

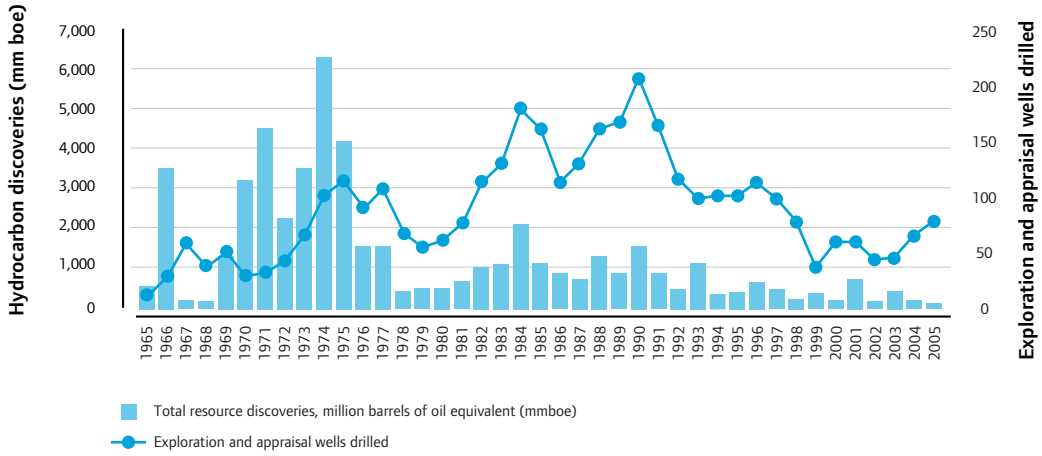
Reform in the sector is being led by UK and devolved Governments; in England and Wales, a more market-based system is being introduced in an attempt to contain costs. At the same time, the UK Government has introduced some innovative ways of delivering legal aid advice, like Community Legal Advice Centres – one-stop-shop services, delivered by a consortium of provider organisations, which meet the needs of individuals experiencing multiple legal problems. Community Legal Service Direct (CLS Direct) is another example: a free, publicly-funded confidential advice service that provides help and advice on a range of common legal problems through a national helpline, website and information leaflets. The helpline currently receives around 450,000 calls per year.

The voluntary sector has also pioneered innovations. Citizens Advice Bureaux currently provide more than 2,000 outreach services in England and Wales, some in partnership with Health Authorities in GP surgeries. This type of provision has been shown to increase access to advice for people who would otherwise be effectively excluded because of age, poor health, poverty or lack of transport.

In general, however, the legal aid sector has been slow to adopt new working practices, and has not yet embraced the opportunities for innovation presented by technology. To date, narrowly-focused government priorities have tended to reinforce a reluctance amongst providers to think more imaginatively. Little funding is allocated to innovation and the sector suffers from the lack of a single body with an explicit mission to promote innovation.

See Appendix D for further detail.

**Figure 1:** Drilling of exploration and appraisal wells relates to discoveries of oil and gas reserves




**Source:** Department of Trade and Industry.[35]

- It might be a **supplier or transmitter** of innovations to others – for example, a trade association in construction or a partnership of schools in education.

### 6.9. Different sectors exhibit different barriers to innovation

Since innovation systems are so different, it is unsurprising that barriers to innovation vary widely between sectors.

In oil and the financial services, the main barriers to innovation tend to be unfavourable framework conditions. In the oil sector, much innovation is driven by the need to explore for new oil reserves. This expenditure on exploration activity is determined by economic calculations based upon the present and projected oil price and local conditions such as taxation and regulation. Changes to the taxation regime in the early 1990s can be seen to have had a significant impact on decisions to invest in exploration in the UK Continental Shelf (UKCS) (see Figure 1: for more detail see Appendix A Section 5.3).

Recently, the DTI has introduced more flexible licences to encourage exploration in hard-to-explore mature and frontier fields. Frontier licences, awarded only in the difficult area West of Shetland, offer companies taking on challenging areas an incentive to do so by discounting normal licensing fees and allowing them to opt-out after initial exploration. Similarly, cheaper and more flexible Promote licences encourage entry into mature fields by 'small cap' oil companies. Taken together, these increase demand for innovation amongst production companies, because they need new technologies and approaches to find and extract oil reserves, particularly in the difficult areas targeted by these new licences.

In construction, as in many sectors, a supply of skilled personnel is crucial to the ability to develop and implement innovations. The skills deficit in working with modern methods of construction has been a significant barrier to the wider adoption of these innovative techniques (see Appendix B Section 3).

In sectors such as legal aid services and the rehabilitation of offenders there are structural and cultural factors that inhibit innovation, despite the obvious need for new approaches and ways of working. The legitimate prioritisation of the delivery of critical services (such as public safety in dealing with offenders) might restrict opportunities for innovation; in turn, the criticality of these services may result in consistent political pressure that creates a fear of failure that precludes experimentation with new approaches. Innovation may be further inhibited by narrow priorities for improvement as determined by government policies, and the cultural conservatism of some practitioners (see Appendix D Section 3, and Appendix F Section 3).

35. Data from Department of Trade and Industry, Drilling Activity, DTI, see www.og.dti.gov.uk, accessed 9th June 2007.

## 7. There are at least four types of hidden innovation

### 7.1. Type I: Hidden innovation based on science and technology but excluded from traditional indicators

Type I hidden innovation comprises research and experimental development with a scientific and technological basis (the *Frascati Manual* definition of R&D), but is excluded from measurement for methodological reasons.

Out of the six case studies, it can be seen most clearly in the oil production sector (see Appendix A for further detail). There, some investments in formal R&D are important, but further development work is often required before such technologies can be successfully applied. Indeed, this field development is frequently more important to the process of drilling and exploration (and therefore revenue generation) than the initial invention itself.

BP's Life-of-Field Seismic system represents a combination of new and existing technologies; it realises its usefulness by providing a platform for the integration of disciplines such as geology, reservoir engineering and petroleum engineering, supported by a very powerful capacity for data processing and analysis. More generally in the oil sector, much of the developmental work to realise innovations in technologies and techniques isn't counted as R&D (and hence innovation) because it is considered 'too close' to everyday business practice. If it was counted, it would almost double the oil sector's measured investment in innovation from £680 million to £1.28 billion.

Such innovation is crucial for the UK; without it, Government would have significantly lower tax revenues from North Sea oil production (currently amounting to more than £10 billion a year), and the UK would have to pay £30 billion each year for oil and gas imports.

### 7.2. Type II: Hidden innovation in non-scientific and technological forms such as new forms of organisation and process

Traditional indicators are blind to innovations in organisational forms or business models. These Type II hidden innovations, such as the innovative working relationships developed to build Heathrow Terminal 5, can create significant value – in this case saving millions of pounds by ensuring that projects don't overspend or overrun. The impact of adopting such approaches is beginning to show in industry-wide key performance indicators for construction, three-quarters of which have seen continuous improvement over the past five years. For example, on one measure, productivity has risen more than 36 per cent (see Appendix B Section 4.3).

### 7.3. Type III: Hidden innovation from the novel combination of existing technologies and processes

Type III hidden innovation can be created from largely non-innovative components when they are combined in new ways to deliver new products, services or processes.[36] Technology often plays a significant role in this type of innovation but because this technology often isn't new-to-the-world it doesn't get counted in traditional indicators.

Banks are major investors in this type of innovation. High levels of investment in ICT help improve 'back office' processes like account transactions, credit authorisation, investment products and customer relationship management. When intelligently integrated, however, improvements in these systems can be used to create completely new solutions such as internet banking or offset accounts.[37] The value to the customer is delivered through the integration of these various software systems into a coherent single service. For banks, the introduction of new delivery channels like internet banking have helped to reduce the costs of transactions by up to 90 per cent.

European banks spent more than €45.7 billion on such systems in 2005.[38] Yet official definitions of 'R&D' only acknowledge software development that represents a 'scientific and technological advance'.[39] The use of existing software systems in novel combinations to provide new services is not measured as innovation.

### 7.4. Type IV: Hidden innovation that takes place 'under the radar' of many surveys

Type IV hidden innovation comprises the locally-developed, small-scale, incremental innovation that often goes unnoticed not only by traditional indicators but often also by many of the organisations and individuals who work in a sector. Examples include the innovation that occurs everyday in classroom practice and in multidisciplinary construction project teams.

36. Previous studies have emphasised the importance of this form of innovation, termed variously the 'recombination and re-use of known practices', 'recombinant innovation' and 'architectural innovation.' See respectively: David, P. and D. Foray (1995), 'Accessing and Expanding the Science and Technology Knowledge Base', STI Review, 16, pp.16-38; Hargadon, A. (2003), How Breakthroughs Happen: The Surprising Truth About How Companies Innovate, (Harvard Business School Press, Watertown MA); and Henderson, R. M., and Clark, K. B. (1990), 'Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms', Administrative Science Quarterly, 35, pp.9-30.

37. Offset accounts come in many varieties but the core principle is that interest on savings is used to reduce mortgage debt.

38. Celent (2005), IT Spending Trends in European Banking, 2005, (Celent, London).

39. See section 2.4 in Organisation for Economic Co-operation and Development (2002), Frascati Manual 2002, Proposed Standard Practice for Surveys on Research and Experimental Development, (OECD, Paris).

## 8. Four layers of policy impact on innovation – only one of which is called 'innovation policy'

### 8.1. Traditional innovation policy

The first layer includes traditional innovation policies, such as R&D tax credits and activities that encourage the transfer of knowledge from universities into industry. However, because science-based innovation that is delivered by formal R&D is only focused in a small number of sectors, this type of policy has limited immediate impact on the majority of the economy.

### 8.2. Policy that indirectly supports hidden innovation

The second layer of 'policies' (more often, actions by government) already supports hidden innovation, frequently by establishing or supporting intermediary organisations or networks. These policies represent a recognition that a particular sectoral system of innovation is weak and requires development. In construction, the UK Nations have supported initiatives such as Constructing Excellence, which brought together major companies, clients, different levels of government and the research community to identify, develop and diffuse innovations such as off-site manufacturing (see Appendix B Section 2.1). In education, the Government has established and supported sectoral innovation units (the Innovation Unit) and other intermediaries (like the Specialist Schools and Academies Trust).

More generally, the DTI's Innovation and Growth Teams and the TSB's Innovation Platforms encourage intelligence-sharing between government and industry.

### 8.3. Innovation by government in sectors where it has a substantial presence

The third layer reflects the way in which government itself can act in more innovative ways. Sectors like legal aid services and the rehabilitation of offenders are witnessing the introduction of new market-based systems of procurement (for example in the National Offender Management Service), and new forms of public provision (such as Community Legal Centres).

### 8.4. Non-innovation policy that impacts on innovation by affecting 'framework conditions'

As seen in Section 6.9, sectoral innovation systems are fundamentally shaped by framework conditions such as taxation, competition, regulation, public procurement, intellectual property regimes, and (in the public sector) performance targets and priorities for improvement set by national policies. As a result, policies that are usually thought to be unrelated to innovation can have a significant impact on incentives to innovate.

The political climate can also play a critical role in determining levels of innovation. In the rehabilitation of offenders, until there is a change in the high-profile and politically-charged debate over crime and punishment, the successful innovative approaches that can be seen elsewhere in the world and are occasionally developed in individual prisons or by voluntary groups are unlikely to make much progress (see Appendix F Section 6). By contrast, in the future, the popular and political pressure surrounding climate change (and the regulation that may result) is likely to be an important driver of innovation – both hidden and traditional.

## 9. Developing new metrics for hidden innovation is possible and valuable

### 9.1. Measuring innovation is fundamental to evidence-based policymaking

Measurement of innovation is not simply a matter of academic interest: it is fundamental to the development of evidence-based policy and for monitoring the impact of those policies.

Traditional metrics are flawed but they are at least consistent, and have been proven to bear some relation to economic measures such as productivity for at least a limited number of sectors. They do, however, rarely measure innovation itself but are proxy indicators for it. Expenditure on R&D measures an input; patent production measures an output. High R&D expenditure may in fact mask great inefficiency in development whereas low levels of patent production may represent success in innovation if those patents are highly valuable.

To date, policymakers who have embraced the principle of wider definitions of innovation have struggled to develop metrics on which to base policy.[40] NESTA's research, however, has found that it is possible to develop meaningful new metrics for innovation – ones that more accurately measure the innovation that matters in sectors where hidden innovation is more important than science-based innovation.

40. The latest edition of the *Oslo Manual* – which provides international guidelines for the collection of data on innovation activities in industry – extends its coverage to 'new' types of innovation including organisational innovation. However, survey approaches are still being piloted. See organisation for Economic Co-operation and Development/ Eurostat (2005), Oslo Manual, Third Edition, (OECD/Eurostat, Paris/Luxembourg).

**9.2. Two examples of metrics for hidden innovation: technology investment in oil production and dissemination of new techniques in construction**

In oil production, the development of technologies used in the exploration and appraisal of potential reserves (which is uncounted in traditional indicators) is a better measure than traditional R&D, because it is much closer to the innovation that matters to oil companies. Instead of characterising the oil sector as being 70 times less innovative than pharmaceuticals (the result of relying on R&D spend), this allows us to recognise the £600 million spent on exploration in the UK alone as a more accurate reflection of oil companies' commitment to innovation (see Appendix A Section 5.1).

In construction, the dissemination and use of modern methods of construction (MMC), for example, would be a better measure of innovative activity than the rate at which construction companies patent new inventions. The adoption and use of MMC is broadly indicative of the extent to which construction firms have a propensity to innovate by moving to new working methods and materials which have been proven to reduce costs and lessen impact on the environment. Instead of characterising the sector according to its low patenting rate (only one per cent of construction firms apply for any patents), these metrics would focus attention on the rate at which the innovative techniques spread through the sector (MMC is currently used in only four per cent of new builds) (see Appendix B Section 5).

**9.3. Developing new metrics means balancing accuracy, longevity, comparability and ease of collection**

A perfect innovation metric would possess the four characteristics of accuracy, longevity,

**Case study summary: Education in England**

In the UK in 2004-05 there were 9.96 million pupils and over half a million teachers in 34,400 schools. Measured performance in UK education has improved and investment has increased in recent years, but there remains a long tail of underachievement. For example, less than half (43.8 per cent) of all pupils in state schools in England and Wales attain five or more GCSEs (including English and maths) at grades A* to C.

For much of the past decade, innovation in education has been in the form of centrally-led reforms to improve standards. Most prominently, in England, the National Curriculum (implemented in 1992) ended decades of localised autonomy over what children learnt at school. This was followed by national testing, national inspections, and the introduction of the National Literacy and Numeracy Strategies in 1998 and 1999. These centrally-led reforms have increased the focus of the sector on improving performance, but have tended to lessen the real and perceived opportunities for teachers and schools to adopt more radical new practices or forms of organisation.

More recently, policy in England in particular has placed emphasis on stimulating and supporting greater innovation in the sector, albeit still largely within centrally-determined structures and systems. Radically different models of curriculum, assessment or school organisation remain rare and most innovation is incremental, in the form of schools and teachers adapting and improving their practice to meet the needs of pupils. There is a large volume of relatively small-scale but valuable innovation in the way schools organise themselves, the curriculum they offer and the way they deliver it.

Partnerships between schools have emerged as a particularly important mechanism for encouraging, and diffusing innovation. These are often supported by intermediary organisations such as the National College for School Leadership (NCSL), the Specialist Schools and Academies Trust (SSAT) and the Innovation Unit.

Despite the increase in collaborations, they remain relatively rare. The sector suffers from few mechanisms for the diffusion of innovations developed at the local level.

See Appendix E for further detail.

comparability and ease of collection. It would precisely measure the innovation that matters; it would be able to do so consistently over a long period of time; it would enable comparisons between sectors and countries; and it would be straightforward to collect.

These four attributes are frequently in tension. Measuring the use of MMC in construction (as one metric of innovation amongst others) would give an accurate impression of innovation in the sector. It would not be timeless but is likely to have some longevity given the current low rate of adoption. Only at very high levels of adoption would such a metric become less meaningful. With reasonable caveats for national conditions such as planning and regulation laws, it could also be used to indicate the level of innovation in UK construction vis-à-vis other countries. These caveats would be no more constraining than those that pertain for traditional indicators such as patents or R&D spend.

Conversely, the adoption of specific techniques in the oil sector (such as horizontal drilling) would be less accurate, because such techniques tend to be adopted only where they are required (for example, according to the structure of an oil field being developed). For the oil sector, general metrics such as levels of investment in new technologies and techniques are likely to be more accurate.

The most important consideration is perhaps relative ease of collection. Counterintuitively, this supports the development of more appropriate metrics. The more a metric reflects the innovation that matters in a sector, the more likely it is that at least some data already exist regarding it, such as with MMC in construction and technology investments and exploration costs in oil. The only reason that data currently exist for R&D is that the concept of 'R&D' has been established for many years, despite its present lack of accuracy for many sectors. However, this does not mean that it is easy to collect. The *Frascati Manual*, which establishes the international definition of R&D used in comparative surveys, is 255 pages long and contains many complex qualifications as to what does and does not constitute R&D.

### 9.4. Building an appropriate 'dashboard' of innovation indicators

Any single metric, however, will not be sufficient to appraise a sector's innovation performance. A healthy innovation system may not necessarily produce a large number of fully-developed innovations: it may be creating, identifying and developing innovations but then discarding them as non-essential to the sector's development. In theory, this would still represent a well-oiled innovation machine.

Equally, innovation is a complex process that takes time to produce outcomes, and so immediate success may not be visible even in a well-functioning system. Together, these factors mean that 'health check' indicators that measure the efficient operation of processes that are important to innovation are critical to a full 'dashboard' of innovation indicators.

### 9.5. Rebalancing in favour of accuracy and 'health check' indicators

To date, innovation policy has privileged the attributes of longevity and comparability over accuracy, and placed insufficient weight on 'health check' process indicators compared to inputs and outputs. The result has been a small set of indicators that are relevant to only a small part of the UK economy. Most obviously, there is an inherent tension in seeking to establish metrics for innovation that never develop – as if the innovation that matters in a particular sector will not change over time. In this respect, the desire for longevity needs to be balanced against a stronger regard for accuracy.

While it would be inefficient to collect data for a vast set of highly accurate indicators that were valid only for one sector or for a very short period of time, NESTA's research demonstrates that it is possible to develop a small but accurate dashboard of indicators that would effectively track innovation performance. The resulting set of indicators would give a far clearer impression of the innovation performance of a particular sector and of the UK as a whole.

## 10. Recommendations: Innovation policy needs to be sensitive to the sectoral systems of innovation already at work

### 10.1. Policy should concentrate on the building of capacity for innovation rather than the creation of specific innovations

Ultimately, there are two possible objectives for innovation policy. The first is to directly stimulate innovation in a sector. In the private sector, this is rarely possible outside of a time of recognised crisis other than through supply-side initiatives such as R&D tax credits.

In public sectors, such an approach is possible and understandable in sectors facing crisis situations, but on its own top-down innovation is unlikely to move the performance of a sector from good to great. To achieve sustained high performance, the practice of innovation needs to become an everyday reality for those who work in a sector at the local level – whether in an individual company, school, prison or legal practice.[41]

The second objective is to improve a sector's capacity for innovation by improving not only its generation of innovation but its internal incentives and processes for developing and diffusing innovations, and its absorptive capacity to identify and draw them in from elsewhere. Doing this in the private sector requires deep industry knowledge and likely a partnership between industry, government and academia. In the public sector, policy can take a far more direct approach by establishing bodies to champion innovation, and setting targets and long-term strategic objectives.

These six case studies demonstrate such a wide range of possible interventions that even discriminating between them (let alone undertaking them) would require considerable effort, particularly since general policymakers would be at a significant informational disadvantage to those active in the sectors themselves. To be most efficient, innovation policy interventions should primarily focus on the second objective – increasing a sector's capacity to innovate and to identify sectoral weaknesses itself.

**10.2. Continue to extend current policies to include sectors other than those traditionally dependent on science and technology**

Despite the detail of innovation being different between sectors, some quick and perhaps significant benefits could be achieved by expanding and extending existing policy instruments. **Initiatives such as Knowledge Transfer Networks, Knowledge Transfer Partnerships and Innovation Platforms should be expanded to include sectors**

41. For example, the importance of moving from 'informed prescription' to 'informed professional judgement' in education has been identified by Barber, M. (2002), The Next Stage for Large Scale Reform in England: From Good to Great, (Technology Colleges Trust, London).

**Case study summary: The rehabilitation of offenders**

In England and Wales, 87 prisons (62 per cent of the total) were overcrowded at the end of October 2006. In 12 prisons, the population was at more than 150 per cent of certified normal accommodation. This overcrowding understandably makes it more difficult for the prison service to focus on reducing re-offending alongside its responsibilities to punish serious crime and protect the public. More than 55 per cent of prisoners who return to the community are reconvicted within two years and it has been estimated that re-offending costs the UK £11 billion each year.

To date, no single organisation has had lead responsibility for reducing offending and the management of offenders has often fallen down in the transition between prisons and probation because prisons and probation were managed separately. To begin to combat this, the Government has introduced an organisational innovation in the form of the National Offender Management Service (NOMS). This is the system through which correctional services and interventions are now commissioned.

Nine Regional Offender Managers (ROMs) in England and a Director of Offender Management in Wales will purchase services from probation areas, prisons and other organisations providing services to offenders.

Individual prisons have introduced some innovations in the operation of rehabilitation programmes, but the prison system as a whole is not innovative. This situation is largely conditioned by the public and political demands upon the prison service, which prioritise punishment and public safety over developing new approaches.

The voluntary sector can be a significant source of innovation. An estimated 900 voluntary and community sector (VCS) personnel work in prisons, many with a focus on rehabilitation, and more than 700 education projects are delivered by 286 organisations in 110 prisons. However, currently the approaches developed by such groups do not tend to be diffused beyond individual prisons in which they operate.

See Appendix F for further detail.

**beyond those that are heavily dependent on science and technology**. To some extent, this is already underway, for instance with the new remit of the Technology Strategy Board.

Reflecting the important influence that developments of technology can have on sectors that primarily exercise hidden innovation, **Foresight-type exercises should be extended to include the UK's most economically significant sectors regardless of their apparent dependence on technology**. Conducted well, these initiatives will use collective industry knowledge and the resources of government to identify 'around the corner' innovations that have the potential to disrupt the current operations of a sector. Examples might include the impact of electronic trading on the City of London in the 1980s, the challenge to traditional music distribution by the rise of the MP3 file format, or the potential offered by developments in mobile technology to revolutionise payment systems and public service delivery.

**10.3. Build an understanding of sectoral systems of innovation and (where appropriate) develop policy as a result**

The innovation that matters even to these six sectors and the policy required to support it (or even whether policy has a role at all) differs greatly. Schools may require improved partnerships between each other and between schools and research establishments; banks may need leaving alone other than an increased focus on financial education; whereas legal aid might benefit from a centrally-led innovation strategy coordinated by a body similar to the Innovation Unit in education. To be effective, future innovation policy needs to appreciate these widely differing dynamics, but government cannot be expected to do this alone.

**Government should call for evidence on how innovation happens in the most critical sectors of the UK economy**. These calls would not necessarily take the form of formal, established commissions that report to government, but of industry-led investigations for the explicit purpose of sector-wide improvement of the innovation system. Their focus should be to uncover the existing innovation dynamics of the sector, to identify how increased innovation might contribute to improved performance and productivity, to specify what meaningful measures of innovation might look like, and to examine what evidence exists for any specific government interventions. Where possible, this process should be conducted through existing industry groups, although government should actively seek out the input of non-industry stakeholders essential to innovation: consumer groups, regulators and representatives of a sector's 'innovation hinterland.' The primary role of government would be to provide initial impetus, and then to facilitate, listen and learn.

These investigations should have tightly defined missions and timeframes and they should draw on best practice from home and abroad. In construction, Constructing Excellence has successfully united government departments, local government, clients and major construction companies behind a programme of sector-wide reform to drive innovation. In the Netherlands, the Government (supported by the OECD) brings together the public and private sectors to lay out 'innovation road maps' in sectors that are critical to the Dutch economy.

Based on the evidence from NESTA's research, the result is not expected to be a raft of new innovation policies. New policy may result, but it is more likely that existing policies will be interpreted differently and deployed in different measures for different sectors. Judging by the experience of Constructing Excellence, many of the resultant recommendations will be for industry itself.

Once they are uncovered, the major challenge for government in supporting sectoral systems of innovation will be to ensure that the four layers of policy that affect innovation work together coherently and effectively. In future, this would strive to avoid situations like the apparent contradiction in tax and regulation policy that has affected oil exploration, or the introduction of lowest-cost procurement in the rehabilitation of offenders at the same time as attempts to encourage new approaches to sector-wide challenges.

**10.4. Develop an annual sector-relevant Innovation Index to better guide policy development**

Evidence-based policymaking demands baselines and measures of improvement over those baselines. In the past, innovation metrics that have privileged science-based innovation have tended to lead policy in that direction. Refocusing policy around an economy-wide view of innovation will require the development of metrics of equivalent robustness.

**The UK should therefore develop its own annual Innovation Index**. By using sector-

specific indicators (like those identified above but further informed by the work of the industry-led sectoral investigations), this would be better able to capture both the traditional and hidden innovation in major sectors than the current generic indicators, and provide a better 'health-check' of the capacity of the UK's innovation system.

In the first instance (and for the sake of ease of collection), the first Innovation Index should be compiled from existing data sources; future iterations may commission new data based upon identified gaps. In ensuring the development of an accurate measure of innovation in the UK, the development of the new Innovation Index should privilege accuracy over comparability and ease of collection. While metrics that have a useful life of only a very few years should be avoided, the goal of longevity should also otherwise be subservient to that of accuracy.

**10.5. Innovation must be a distributed goal but with a high-level champion in the machinery of government**

Innovation is a fundamental economic priority that should be at the heart of government.

- The importance of hidden innovation means that innovation policy needs to extend beyond stimulating scientific invention to include the adoption and exploitation of technologies, organisational innovation and innovation in services (including public services). As a result, **innovation policy should encompass science and technology policy and not the other way around.**

- The influence of framework conditions means that innovation is inherently a cross-departmental issue. This is, of course, a case made for a number of other policy areas, but the criticality of innovation to the future economic and social well-being of the UK gives added weight to it being made a distributed aim. **All government departments should have a brief to be innovative themselves and to act to stimulate or be hospitable to innovation elsewhere in the economy**. Mechanisms that should be considered to achieve this include innovation being included in Ministerial responsibilities, departmental strategic objectives, Public Service Agreements (PSAs) and a consideration of the impact on innovation being added to the Regulatory Impact Assessment.

- Distributed goals have historically not fared well in government and therefore **it is essential that this broader innovation agenda has a senior departmental home**. This should be within (or closely linked to) the department that is primarily responsible for the productivity of the UK economy.

- The development of intelligent innovation policy across the economy requires sustained and informed engagement with industry, a deep understanding of economics and the ability to formulate effective long-term innovation strategy. **The department responsible for innovation must therefore include a highly skilled strategy and policy unit** that can provide the deep theoretical background and evidence required for such a complex and important area of economic policy.

- Finally, the department primarily responsible for innovation must **take responsibility for the development of a small number of innovation-specific policies**. For instance, the running of Foresight programmes or any initiatives that came out of the industry-led sectoral innovation investigations would have no other logical home within government.

**10.6. An effective innovation policy unit needs latitude to experiment and time to evaluate the results**

To function fully effectively, this unit would have two specific requirements: it would need to have latitude to undertake disciplined experimentation and it would require a longer-than-normal time horizon to compensate for the vagaries of managing innovation.

As with innovation itself, stimulating innovation requires risk-taking and proceeding with imperfect information. Such things are traditionally in conflict with governmental pressures around evaluation and may even come into conflict with legitimate concerns surrounding the stewardship of public money. An effective innovation unit **will need the latitude to engage in disciplined and ring-fenced high-risk experimentation** – for instance in considering the potential of 'innovation vouchers' or piloting a nationally-branded 'innovation advisory service.'[42] It is also **likely to require longer-than-normal evaluation cycles** in order to appreciate the full impact of innovation policies that may take 5-10 years to come to fruition and which may yield significant unintended consequences.

42. The Dutch Ministry of Economic Affairs has introduced Innovation Vouchers for SMEs. These are worth €7,500 each and can be used by SMEs to buy knowledge from public knowledge institutes and large R&D-intensive companies. These vouchers are now being trialled in the West Midlands, in a scheme being administered by Aston University. The Innovation Advisory Service (IAS) is designed to help ambitious growth companies in the South East of England to identify how to innovate and to gain access to resources and funding. IAS is funded by the South East England Regional Development Agency (SEEDA) and managed by Oxford Innovation.

This is not a case for wanton experimentation or an absence of accountability, but a recognition of the reality of working on the cutting-edge of economic policy. The unit responsible for innovation policy should be encouraged to take reasonably-sized, well-understood but considerable risks with its programmes, and should be evaluated according to their performance against those known risks rather than against an unattainable (and undesirable) gold standard of 100 per cent success.

**10.7. Innovation policy needs to become more like innovation itself**

This report makes the case that future innovation policy needs to be outward-looking, collaborative, absorptive, sector-sensitive and more developmental and experimental. In short, innovation policy needs to take on more of the characteristics of innovation itself.

# Appendix A: Oil production in mature and frontier fields

## High but largely hidden innovation from close globalised collaborations between production and service firms

### 1. Oil production in the UK Continental Shelf (UKCS) is important to the UK's economy and is driven by large multinational production and service companies

The UK Continental Shelf (UKCS) is mainly a mature area in which the 'easiest' oil fields have already been exploited.[43] As a result, off-shore oil production requires constant innovation to locate and extract new reserves.[44] The UKCS also contains some 'frontier' (deep water or turbulent subsea conditions) areas, notably West of Shetland. Difficult conditions in these areas mean that new techniques and technologies are constantly required for exploration.

Oil production from the UKCS satisfied 96 per cent of the UK's oil demand and 92 per cent of its gas demand in 2006.[45] Her Majesty's Treasury received £10.3 billion in tax revenues from oil companies in 2006, and oil service companies operating in the UK earned £4 billion in export sales.[46] Indigenous oil production made a balance of payments contribution of £34 billion and saved £30 billion in oil and gas imports.[47]

All rights to the UK's petroleum resources are vested in the Crown, with the Department of Trade and Industry (DTI) acting as the principal regulator. The Secretary of State for Trade and Industry grants licences to operators that confer exclusive rights to "search and bore for and get" petroleum over a limited area for a limited period.

Production companies lead exploration activities, normally from offices in Aberdeen, the North Sea's (and Europe's) 'oil capital'. These companies include the 'super-major' oil companies such as ExxonMobil, BP, Shell, ChevronTexaco and TOTAL, which are vertically integrated into distribution, refining and retailing.[48] Below them are a number of smaller (but still large) international oil companies, also vertically integrated, and long-established in the UKCS. These include ConocoPhillips, Marathon and Amerada Hess.[49]

A third group of 'small cap' (smaller-capitalisation) companies are specialists in either mature or frontier areas, and so have particular demands for innovative products and services. Opportunities for these companies have opened up over recent years as the super-majors have scaled-back their activities in the UKCS. For example, Talisman,[50] a Canadian company, was an early exponent of a business model based around the exploitation of mature fields, and acquired fields from Elf beginning in 1988.[51]

Service companies provide the products and services that enable exploration and production such as imaging and drilling technologies and techniques. 'Integrated' service companies such as Schlumberger and Halliburton offer a wide range of products that cover the whole process, from exploration, through drilling and production, to decommissioning.[52] Smaller companies provide niche products and services (see for example Section 2.4).

43. Peak production of North Sea oil occurred in 1997, and fell ten per cent in 2004, and 12.8 per cent in 2005 – the largest decrease of any oil exporting nation in the world.

44. The importance of innovation in the UKCS has been recognised by the UK Government, for example, DTI (2007), Innovation and Energy, speech by Rt Hon Alistair Darling MP, Secretary of State for Trade and Industry, University of Aberdeen, 23rd March.

45. United Kingdom Offshore Operators Association (2007), 2006 Activity Survey, (UKOOA, London).

46. Ibid.

47. Ibid.

48. ExxonMobil had revenues of $365 billion in 2006, while BP had revenues of almost $266 billion; see ExxonMobil (2006), 2006 Financial & Operating Review, (ExxonMobil, Irving, Texas), and BP (2006), Annual Report and Accounts 2006, (BP, London).

49. ConocoPhillips had revenues of $188 billion in 2006, see ConocoPhillips (2006), 2006 Annual Report, (ConocoPhillips, Houston, Texas).

50. Talisman had revenues of $10 billion in 2006, see Talisman Energy (2006), 2006 Annual Report Summary, (Talisman Energy, Calgary, Alberta).

51. According to UKOOA the share of UK production across majors, independents and small oil companies was about 60 per cent, 35 per cent, and five per cent respectively in 1999, but by 2006 this had become 50 percent, 40 per cent and ten per cent, see p.28, United Kingdom Offshore Operators Association (2006), Energy Now and for the Future, UKOOA Economic Report 2006, (UKOOA, London).

52. Schlumberger had revenues of $19 billion in 2006, while Halliburton had revenues of $22 billion, see Schlumberger (2007), 2006 Annual Report, (Schlumberger, Houston, Texas), and Halliburton (2007), 2006 Annual Report, (Halliburton, Houston, Texas).

## 2. Innovation in oil production depends on collaboration between production and service companies to develop and prove new technologies and techniques

### 2.1. Innovation is driven by interaction between production and service companies and is inseparable from the process of exploration

The oil production sector has a well-developed system of innovation. The innovation that matters in oil production results from the interaction between production and service companies, for example collaborative activity that helps a production company develop a well while a service company develops a technique (two examples are provided below). In this way, in oil production, exploration activity is almost inseparable from innovation, especially exploration in mature or frontier fields. Some service companies have large-scale formal R&D programmes, but even these companies are dependent on production companies for field trials and first uses of technology, especially because oil fields are heterogeneous and so technologies need adapting to particular locations.

### 2.2. Innovation would be uneconomic in the UKCS alone and therefore happens globally

Innovation in important new tools and techniques that have proven crucial to production in the UKCS has in many cases been located outside of the UKCS in other deepwater areas such as the Gulf of Mexico (where there are more opportunities for major new finds), but these often feed back into practices in the UKCS (and vice versa). It is rare for a field to pose such unique challenges that innovation must happen there and there alone. As such, oil companies decide to locate innovation activity for other reasons, including framework conditions such as tax regime and skills supply (see below Section 3.3).

### 2.3. Example 1: Nuclear Magnetic Resonance (NMR): demand-led incremental development between production and service companies and those active in other fields

Nuclear Magnetic Resonance (NMR) measurement is an innovative technology that reduces exploration costs and optimises production from wells. NMR equipment is lowered into a borehole that has been drilled into rock and sedimentary strata; NMR analysis of these boreholes is then used to identify the existence of fluids such as water, oil and gas.

The American major production company Chevron undertook early research into the feasibility of making NMR measurements at the start of the 1950s. By 1968 Chevron had licensed the concept to Schlumberger, which built a prototype. Through field testing, the technology was found to have an application in the evaluation of reservoirs with heavy or viscous oil, but it was not fully deployed because such reservoirs were not commercially viable at that time. During the 1970s and 1980s Chevron, Shell and Schlumberger continued research into the technique.

In the mid-1980s a group of physicists founded a company called NUMAR to develop probes that could be inserted into the human body to produce images of tissue from within using NMR imaging technology. When they conducted patent and literature searches they found the oil well probe literature, and subsequently changed the focus of the company from the human body to oil well probes. NUMAR's NMR tool was introduced in 1990 and was an instant success; this prompted Schlumberger to mount a 'crash programme' to leapfrog NUMAR's technology. The two companies aggressively introduced their respective tools while publishing jointly with oil companies in scientific journals. After subsequent development, NMR logging that did not require radioactive sources became a mainstream porosity measurement offered by the major service companies.[53]

Despite its complexity, NMR is now an increasingly mainstream technology. One study of the impact of NMR in a single area in South Texas (Lobo Trend) demonstrated cost savings of $65,000 and increased revenue from optimised production of nearly $900,000.[54]

### 2.4. Example 2: Four-dimensional seismic surveys: developed through partnerships between production and service companies

Life-of-Field Seismic is an innovative system that increases production rates and reduces costs. It uses permanent seismic sensors planted on the seabed to create time-lapse movies of fluid and pressure changes that show how the recovery of oil is proceeding in near real-time (hence 'four-dimensional'). This helps to maximise the production of oil from wells.

Life-of-Field Seismic is a combination of new and existing technologies. It realises its usefulness by providing a platform for the integration of insights from disciplines such as geology, reservoir engineering and petroleum engineering, supported by a very powerful

53. Similarly, the drilling of horizontal wells was pioneered by production companies but almost all of the necessary enabling technology is now owned by the service industry. Horizontal well drilling has revolutionized the viability of economically marginal oil and gas reserves, see Woiceshyn, J., and Daellenbach, U. (2005), 'Integrative Capability and Technology Adoption: Evidence from Oil Firms', Industrial and Corporate Change, 14, pp.307-42.

54. American Association of Petroleum Geologists (2000), 'NMR Does Well in Lobo Trend, A Millidarcy Makes Big Difference', Explorer, December.

capacity for data processing and analysis (BP's in-house super-computing facility in Houston is said to be the largest in the private sector in the US[55]). It was developed by BP in the UK, Norway and the US with GEOSPACE and nine other contractors.[56] BP has around 100 specialists working in advanced seismic imaging and operations teams, and has spent $400 million developing the technology with its partners, including $50 million on formal R&D and field trials.[57]

The system offers the potential to increase recovery from the Valhall field in the North Sea by 60 million barrels.[58] BP estimates that its 'Field of the Future' programme (which includes Life-of-Field Seismic) could increase recovery from its fields worldwide by one billion barrels.

Similarly, Apache, a US independent oil company, has relied on successive three-dimensional seismic surveys to demonstrate the viability of its maturity business model. Apache spent $400 million in redeveloping Forties (a large mature field discovered by BP in 1974), including drilling 18 wells.[59] Apache's surveys have enabled it to add 45 million barrels of oil equivalent as proven reserves, and it estimates that there could be as many as 300 to 400 million more barrels of oil equivalent at Forties field.

## 3. The amount of innovation in oil production is determined by interactions between the extent of exploration, the oil price, taxation and regulation

### 3.1. Oil prices determine profits, which are closely correlated with exploration and innovation

Expenditure on exploration activity is determined by economic calculations by the production companies, which are affected by the present and projected oil price, as well as taxation and regulation.

Historically, the oil industry has exhibited a five to ten-year 'boom and bust' cycle driven by the oil price. High prices determined by exogenous events enable investment to be made in exploration and development work. This increases the availability of oil which then causes a glut which forces prices to fall. The peak of the most recent boom was in 2006 and coincided with an increased drive to re-explore and re-develop previously uneconomic mature assets, thus driving development of new and innovative approaches.

### 3.2. The UK Government has used marketing and regulation to drive exploration, thus stimulating innovation

In recognition of the maturity of the field, the regulator of the UKCS, the DTI, has become noticeably more proactive in its promotion and stewardship. Recently, it has been successful in marketing the UKCS to Canadian oil companies such as Nexen and Petro-Canada. In seeking to exploit the mature or frontier assets in the UKCS, these new entrants depend heavily on the deployment of advanced techniques and technologies for their commercial viability and have thus helped to drive innovation.

Frontier Licences (awarded only in the difficult area West of Shetland) allow companies to apply for relatively large amounts of acreage and then relinquish three-quarters of it after an initial screening phase during which the normal rental fees are discounted by 90 per cent.[60] These licences offer companies taking on challenging areas an incentive to do so, and since such fields demand advanced techniques for exploration, innovation is stimulated as a result.

Since 2002, the UK has encouraged entry by small cap oil companies by offering Promote licences at one-tenth of the cost of a traditional 'drill or drop' licence for the first two years. The DTI, in collaboration with other industry organizations, also introduced the 'Stewardship' initiative in 2004. This aims to reallocate fallow fields and unexplored acreage being held in a dormant state by established companies.[61] Together, both initiatives encourage smaller companies with good ideas to apply for acreage and work up prospects to either sell on or develop themselves (normally by bringing in other investors).

### 3.3. General fiscal policy can have a direct impact on investment in exploration and the associated innovation

Due to the close relationship between oil company profits and expenditure on exploration and innovation, fiscal policy can have an indirect, but important, effect by determining how attractive the UKCS is as a location for production activity. For example, changes to the tax regime for oil production in 1993 can be seen to be related to a decline in levels of exploration in the UKCS.[62] Similarly, in April 2002, a ten per cent supplementary charge to corporation tax was introduced

55. Hayward, T. (2006), Meeting the Increasing Global Demand through Innovation, speech to ADIPEC conference, Abu Dhabi, 5th November, (BP, London).

56. The full list of partners to BP and their contributions to the technology is: Bolt (new seismic sources); Concept Systems (technology and services for navigation, communication, quality assurance and data management); Facilium (project engineering, procurement and management services); Fugro (vessel and source positioning); I/O (digital source control system); OYO Geospace (LoFS seismic array design and manufacture); Rovde (vessel provider and marine operator); Subsea7 (marine installation); Westland Geoprojects (innovative source handling and vessel engineering); Petroleum Geo Services (seismic processing).

57. Ibid.

58. BP (2005), Technology Where it Really Counts, (BP, London). Valhall is located in the Norwegian sector of the North Sea.

59. Apache Corporation (2006), 2005 Summary Annual Report, (Apache Corporation, Houston).

60. The Exploration and Development periods are also extended by two years over and above those stipulated for the traditional licence. The licence is solely for the acreage west of the Shetland Islands and the outer Irish Sea.

61. PILOT (2005), Maximizing Economic Recovery of the UK's Oil and Gas Reserves: Context for the Brownfields Challenge, (PILOT, Aberdeen). PILOT is a joint programme involving the Government and the UK oil and gas industry operators, contractors, suppliers, trade unions and SMEs, aiming to secure the long-term future of the industry in the UK.

62. The previous taxation regime, Petroleum Revenue Tax (PRT), allowed for losses on UKCS exploration to be carried forward to set against assessable profits from the same field in later periods without a time limit. If a field reached the end of its productive life, any losses still unused could be set against profits from another field owned by the same company (or an associate). The 1993 change ended the PRT for any fields receiving development consent from the Secretary of State for Trade and Industry on or after 16th March 1993.

(raised to 20 per cent in January 2006).[63] This came at the same time as many small cap and independent oil companies were considering the further development of mature fields through the maturity business model. These fields tend to be comparatively low margin, and so the tax changes may have had a significant effect in discouraging activity.

## 4. Innovation is hidden because it is distributed and because exploration activity is excluded from surveys

### 4.1. Traditional metrics suggest oil is a low innovation sector

The UK oil production industry is ranked ninth in its spend on R&D (with only 3.5 per cent of all UK R&D spend), behind sectors such as food producers and banks. The sector spent £675.77 million on R&D in 2005-06, representing an R&D intensity (expenditure on R&D as a proportion of sales) of only 0.2 per cent.[64] (In comparison, the UK pharmaceuticals sector has an R&D intensity of more than 14 per cent – more than 70 times higher). The figure for R&D includes expenditure on midstream and downstream activities as well (storing, processing, refining, and so on). The specific figure for upstream activity (the location and production of crude oil and natural gas) is likely to be substantially lower still (perhaps just one-third of total R&D[65]). R&D is also heavily concentrated (94 per cent) in just two companies (BP and Royal Dutch Shell).[66]

### 4.2. This neglects some of the R&D that takes place globally but which is deployed in the UKCS

The major service companies such as Schlumberger and Halliburton have formal R&D programmes that develop tools and techniques that are deployed in the UKCS. However, because the R&D spend takes place in many locations and because these are global companies with headquarters in other countries, this expenditure is not counted in UK figures. For example, Schlumberger reported global R&D expenditure of $506 million in 2005, with Halliburton reporting about half this ($256 million) in 2006.[67] The five largest service companies have increased R&D spending globally from about $400 million in 1990 to about $1 billion in 2004.[68] European small and medium-sized enterprises invest an additional $500 million per year.[69]

### 4.3. This also neglects non-formal R&D expenditure in the UKCS

Formal R&D is only one aspect of production companies' investment and activity in innovation. As demonstrated above, the tools and techniques initially developed 'in the lab' need to be developed, tested and proven before they can be properly deployed and commercialised. For example, BP spent $395 million on R&D in 2006, but $890 million on investments in developing innovative technologies.[70]

Service companies in particular require access to wells owned by production companies to develop their innovations. The cost of rig time (and the risk of damaging the well) form part of oil companies' operating costs rather than R&D. Even in service companies, such field tests are not considered as formal R&D costs, although they have many of the same characteristics as the processes that go on in the R&D processes of pharmaceutical firms, for example.

Smaller, independent companies do not tend to report formal global R&D, because they do not have the formal R&D programmes that the majors do. Instead, R&D programmes are ad hoc, focused on particular projects or in funding projects in universities.[71]

### 4.4. Innovation in exploration is excluded from some surveys

Much innovation in exploration is not counted as R&D in traditional indicators because it is classified as 'directly applied research'. The *Frascati Manual* definition of R&D (which determines not only the definition used in surveys but also that for company accounts and R&D tax credits) explicitly excludes what it calls "surveying and prospecting activities" even though such activities are crucial to innovation; only surveying undertaken for "primarily scientific purposes" is counted as R&D.[72]

## 5. Innovation could be better measured by recognising that exploration is a major driver and so a reasonable proxy for investment in innovative activity

### 5.1. Exploration is a reasonable proxy for investment in innovative activity

Drilling wells for exploration and appraisal (as opposed to drilling for development) has only one purpose: to generate data for the construction and interpretation of geological models. These models then form the basis of decisions as to whether or not to explore.[73] Exploration is particularly important in the

63. As a counter to this, the 2002 Budget also introduced 100 per cent first year allowance for capital expenditure such that most costs are tax deductible when incurred.

64. All figures from Department of Trade and Industry (2006), The R&D Scoreboard 2006, Commentary and Analysis, Volume 1, (DTI, London). The definition of 'R&D' reported in the DTI Scoreboard comes from company accounts prepared in line with generally accepted accounting principles (GAAP), which are in turn based on the *Frascati Manual*.

65. Based on an analysis of US-based production companies, see Acha, V. L. (2002), Framing the Past and the Future, DPhil thesis, University of Sussex.

66. Even then, these companies' individual R&D intensity is small at only 0.2 per cent.

67. Schlumberger (2005), 2005 Annual Report, (Schlumberger, New York); Halliburton (2006), 2006 Annual Report, (Halliburton, Houston, Texas). Service companies tend to locate their R&D activity with respect to fiscal regimes, labour costs and areas of research excellence. They then apportion their R&D expenditures to each country proportional to revenue, where agreed with fiscal authorities.

68. p.33-36, International Energy Authority (2005), International Energy Agency 2005 Resources to Reserves, Oil and Gas Technologies for the Energy Markets of the Future, (OECD/IEA, Paris).

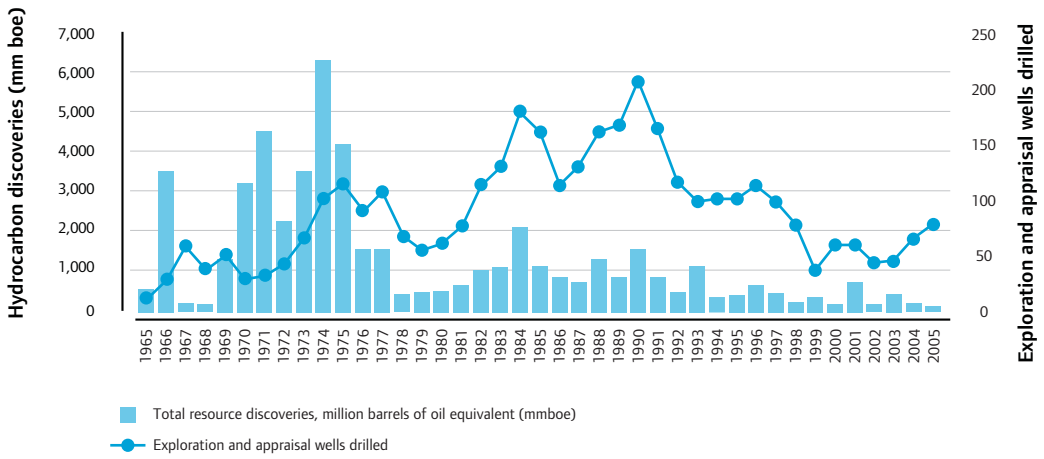
69. p.34, ibid.

70. BP (2006), Annual Report and Accounts 2006, (BP, London). BP's specific definition of technology investments comprises four elements: technology development for incremental improvement of its base businesses; technology leadership areas to create and sustain material, advantaged business positions; long-term technology investments to secure the company's future; and application and propagation of technology through formalized technology networks and knowledge management processes.

71. For example, Apache doesn't have a formal R&D programme.

72. p.41, Organisation for Economic Co-operation and Development (2002), Frascati Manual 2002, (OECD, Paris). For the same reason, it is unlikely that such activities qualify for the R&D tax credit. UK Government has suggested that claims for the R&D tax credit should be factored into oil companies' contracts with service companies, given that service companies conduct much formal R&D on behalf of oil companies, see para. 4.26, HM Treasury (2007), The North Sea Fiscal Regime: A Discussion Paper, (HM Treasury, London). However, this does not resolve the issue for those types of innovative activity, such as collaborative developmental activity, that may be ineligible for the tax credit.

**Figure 2:** Drilling of exploration and appraisal wells relates to discoveries of oil and gas reserves




**Source:** Department of Trade and Industry.[75]

73. Finch, J. H., Macmillan, F. E., and Simpson, G. S. (2002), 'On the Diffusion of Probabilistic Investment Appraisal and Decision-Making Procedures in the UK's Upstream Oil and Gas Industry', Research Policy, 31, pp.696-988.

74. However, capturing this expenditure has become more difficult as a side-effect of UK Government policy. The Ring Fence Expenditure Supplement introduced in January 2006 allows most exploration and development expenditure to be offset against income, but ring-fenced to specific fields. In effect this encourages companies to 'hide' expenditure relating to innovation in specific fields.

75. Department of Trade and Industry, Drilling Activity, DTI, see www.og.dti.gov.uk, accessed 4th May 2007.

UKCS context of maturity, where new reserves are more difficult to find. This activity also stimulates further innovation in service companies.

The activities associated with exploration resemble the formal R&D conducted in other sectors. The drilling of exploration and appraisal wells is not always innovative in the sense of being based on new techniques, but neither is much of the day-to-day R&D activity in other sectors. Some R&D work in pharmaceutical companies, for example, is comprised of established routines and procedures, such as the screening of new chemical combinations that might one day become marketed drugs. Nonetheless, such expenditure by pharmaceutical companies is regarded as investment in innovation, whereas the development work undertaken as part of exploration activity by oil companies is not.

**5.2. Counting these activities almost doubles the formal R&D reported by the UK industry**

On top of the £676 million already counted as R&D, £600 million was spent on exploration in the UKCS alone in 2006 (compared to the £5.6 billion invested in undertaking new production).[74]

**5.3. This enables the tracking of innovation activity over time**

A further development of this approach is to focus on the exploration and appraisal wells drilled in the UKCS. This metric is meaningful for a broad range of oil companies (in contrast to formal R&D, which as noted tends to be organised globally and hence doesn't provide a UK-specific figure).

Figure 2 charts the extent of the drilling of exploration and appraisal wells in the UKCS against the amount of new reserves proven. As a result, it shows the transition of the UKCS from a largely undeveloped area to a mature region where exploration (and therefore innovation) is essential to its continued economic viability. The sharp decrease in new reserves proven from the mid-1970s onwards was followed by a dramatic increase in the number of wells drilled for the purposes of exploration. Demonstrably, increased exploration leads to increased discovery. The chart illustrates a recent increase in exploration due to higher oil prices and more flexible licensing by UK Government, but that this level is still a long way short of the peak in the early 1990s.

The impact of hidden innovation can also be identified though greater efficiency. Given the increased prominence of the maturity business model, we might expect unit costs of fields to have increased, reflecting the additional costs of working in mature fields. Instead, as shown in Table 1, despite the average size of discoveries declining over time in the UKCS, the unit cost of fields is lower for the smaller post-1996 fields than it is for the much larger pre-1980 fields. It is reasonable to extrapolate that much of this increased benefit is due to innovations in drilling and imaging technologies.

**Table 1:** Unit costs of fields at 2000 prices

| | Oil fields, £/barrel | Gas fields, pence/therm |
|---|---|---|
| **Starting production before 1980** | £11.00 | 9 pence |
| **Starting production 1980-1985** | £16.00 | 23 pence |
| **Starting production 1986-1990** | £14.00 | 21 pence |
| **Starting production 1991-1995** | £9.00 | 14 pence |
| **Starting production 1996-2000** | £9.00 | 14 pence |

**Source:** Department of Trade and Industry.[76]

### 5.4. A future framework for measuring innovation in oil production should incorporate surveys of activity

Since exploration activity is closely linked to innovation, process metrics such as field trials and first uses may be a valid method for 'health checking' the innovation system within oil production. At the moment, such data are often hidden because of commercial sensitivity, and tends to be very widely distributed, perhaps down to the level of business unit managers or oil field production managers. A formal 'Financial Reporting System' for the North Sea would help to capture and analyse these data.

One model for gathering these data is the US Energy Information Administration's (EIA) *Performance Profiles of Major Energy Producers*. This is a comprehensive annual financial review and analysis of the domestic and worldwide activities and operations of the major US-based energy-producing companies. *Performance Profiles* examines companies' operations by individual lines of business, by major functions within each line of business, and by geographic region. Most significantly for this analysis, it also explores changes in the majors' exploration and development expenditures and their success in finding and developing oil and gas reserves. The report is based on detailed financial and operating data and information submitted each year to the EIA through its Financial Reporting System (FRS). EIA supplements the FRS data with additional information from company annual reports and press releases, disclosures to the US Securities and Exchange Commission, news reports and articles, and various complementary energy industry data sets. Altogether, this provides a way of tracking investments in and outcomes from innovative activity at the company level.

## 6. Innovation could be improved and enhanced through continued support for exploration, collaboration and careful consideration of changes to framework conditions such as the fiscal regime

As a mature area, UKCS production will inevitably decline. However, the United Kingdom Offshore Operators Association (UKOOA) has estimated that if investment levels in the UKCS are sufficient, the rate of decline could be slowed to perhaps four per cent a year. This would be equivalent to an extra one million barrels of oil equivalent (boe) a day in 2020, and a total of nearly seven billion boe produced by 2030.[77]

As noted, interventions such as Promote and Frontier licences can help to stimulate innovation indirectly, despite not being thought of as 'innovation policy'. The UK Government also sometimes seeks to resolve coordination problems by promoting shared ownership of new infrastructure. For example, it launched the West of Shetland Taskforce in November 2006. This includes BP, Chevron, DONG Energy, ExxonMobil and TOTAL.[78] Its aim is to identify technically and economically viable projects that could act as a West of Shetland gas hub – an area that is particularly important since West of Shetland represents a potential 17 per cent of the UK's remaining oil and gas reserves.[79]

Projects such as this have emerged from an approach in which the regulator, industry organisations (such as UKOOA) and oil companies build consensus through contributing to task forces and secondments. Yet in contrast to the Norwegian Continental Shelf, the UK regulator remains less active in releasing exploration blocks in a centrally

76. p.21, Department of Trade and Industry (2001), Development of UK Oil and Gas Resources, (DTI, London).

77. United Kingdom Offshore Operators Association (2006), Energy Now and for the Future, UKOOA Economic Report 2006, (UKOOA, London).

78. Department of Trade and Industry, Drilling Activity, DTI, see www.og.dti.gov.uk, accessed 4th May 2007.

79. Department of Trade and Industry (2006), West of Shetland Task Force Forge Ahead into New Year, press release, 19th December, (DTI, London).

coordinated and planned way. It is also less active in supporting links between higher education, training and research in connection with the industry. The new Energy Technologies Institute is aimed at strengthening the 'middle ground' between pure research and the deployment of proven technologies, and could prove useful in developing a more co-ordinated approach to exploration in the UKCS.

All of these initiatives, however, are likely to have only limited impact on levels of innovation in oil production in the UKCS if framework conditions such as fiscal policy are uncompetitive compared to other regions. Figure 2 shows a decline in levels of exploration that followed changes in the North Sea tax regime in the early 1990s.[80] Government should continue to evaluate whether the current fiscal regime maximises investment in exploration and innovation in the UKCS, perhaps through a more sophisticated reporting system like that in the US.[81]

80. Which allowed the offset of all UKCS exploration against profits on producing assets.

81. HM Treasury has recently rejected the suggestion that the current fiscal regime has any negative impact on the level of exploration undertaken in the UKCS, see para. 416, HM Treasury (2007), The North Sea Fiscal Regime: A Discussion Paper, (HM Treasury, London).

# Appendix B: Construction

## Innovation through sector-wide partnerships and project-level interactions with clients

### 1. Construction is a crucial sector for economic and social development but its performance has historically been poor

Using a narrow definition, the construction sector generates around ten per cent of GDP (or about £90 billion)[82] from more than 182,000 firms employing 1.17 million people. This makes it the UK's largest industry.[83] In Scotland, construction employs around 200,000 people and represents about ten per cent of GDP.[84] Across the UK, £33.5 billion was spent by the public sector on construction in 2003, more than one third of the sector's total revenue.[85]

However, a broader conceptualisation of the sector – going beyond on-site production to include 'hinterland' activities such as architectural and technical consultancy, as well as building service and management – is required to understand how and where innovation happens in construction.[86] For example, engineering consultancies frequently play a highly innovative role in major construction projects but fall outside traditional sectoral boundaries (these consultancies earned nearly £2 billion in overseas fees for the UK in 2004).[87]

Previous studies have portrayed the construction sector as highly conservative,[88] with its innovation performance undermined by its project-based nature[89] and the short-termism and opportunism engendered by procurement arrangements.[90]

### 2. Innovation in construction is highly non-linear: it derives from evolving working practices, project collaborations and problem-solving

#### 2.1. There has been a strong focus on improvement and innovation in the sector over the past ten years

The UK Governments, industry associations and major businesses have worked in partnership over recent years to improve performance and innovation in the sector. These efforts stemmed from critical reports such as the *Construction Task Force Report* (the Egan Report) that pointed to client dissatisfaction and the poor view of the industry, poor training and low R&D investment. Similarly, the Scottish Executive's Modernising Construction Strategic Group, resulted in the establishment of a Construction and Innovation Excellence Forum.[91]

Based on these reports, a number of cross-sector bodies were formed to drive improvement,[92] organised from 2003 onwards under the umbrella group Constructing Excellence.[93] Improving innovation performance has represented a significant strand of these efforts, especially developing and diffusing new working practices and innovative materials and processes. For example, the Partners in Innovation programme (one part of the Construction Research Programme that is supported by the DTI) has funded more than 100 projects. This includes the AVANTI cluster, which aims to promote ICT-enabled collaborative working (and which was implemented by such major companies as Taylor Woodrow and Costain), and Buildoffsite, which aims to promote the uptake of offsite 'manufactured' building techniques (see below). DTI-funded Knowledge Transfer Partnerships between industry and universities,

82. nCRISP (2003), The Pearce Report, The Social and Economic Value of Construction, The Construction Industry's Contribution to Sustainable Development, (nCRISP, London). The £90 billion figure is based on data for 2001.

83. Department of Trade and Industry (2006), Construction Statistics Annual Report 2006, (DTI, London).

84. Scottish Enterprise (2007), Construction Sectors Plans Unveiled, press release, 30th March.

85. This represents the annual expenditure by central and local government on construction, see Department of Trade and Industry (2004), Annual Construction Statistics, (DTI, London). The figure excludes expenditure on the construction elements of Private Finance Deals.

86. Such a broader conceptualisation – 'the construction sector framework approach' - has been developed by an international group of economists working in a project group as part of the International Council for Research and Innovation in Building and Construction (CIB), see Carassus, J. (ed.) (2004), The Construction Sector System Approach: An International Framework, Report by CIB W55-W65 Construction Industry Comparative Analysis Project Group, (CIB Rotterdam).

87. National Endowment for Science, Technology and the Arts (2006), The Innovation Gap, (NESTA, London). Export figures from New Civil Engineer NCE Consultants File annual survey for 2005, see www.nceplus.co.uk.

88. For example, Rosenberg, N. (1982), Inside the Black Box: Technology and Economics, (Cambridge University Press, Cambridge); Reichstein, T., Salter, A., and Gann, D. (2005), 'Last Among Equals: A Comparison of Innovation in Construction, Services and Manufacturing in the UK', Construction Management and Economics, 21 (6), pp.603-612.

89. p.435, Gann, D. M., and Salter, A. J. (1998), 'Learning and Innovation Management', International Journal of Innovation Management, 2 (4), pp.431-454.

90. Gil, N., Tommelein, I. D., Kirkendall, R. L., and Ballard, G. (2001), 'Leveraging Speciality-Contractor Knowledge in Design-Build Organisations', Engineering, Construction and Architectural Management, 8 (5/6), pp.355-367.

91. Department of Trade and Industry (1998), Rethinking Construction - The Report of the Construction Task Force, (DTI, London). For Scotland, see Modernising Construction Strategic Group (2003), Achieving Construction Innovation and Excellence in Scotland, (Modernising Construction Strategic Group).

especially major construction research centres such as those at Loughborough, Reading and Salford universities, have also helped to develop innovative materials and processes. The Scottish Construction Forum was established in 2004 as a similar industry-led initiative to drive improvements in Scotland's construction sector.[94]

### 2.2. Two types of innovation that matter: new materials and techniques and improved business processes

There are two main types of business-level innovation that matter in construction. First, traditional R&D-type activity (of degrees of formality) that concentrates on producing new or improved materials, products or subsystems. Second, organisational innovation that generates new or improved supply chain arrangements, human resource management strategies, business processes or working practices.

### 2.3. Example 1: Off-site manufacture: developed using non-construction expertise

The story of Corus' development of its Living Solutions fully-fitted steel-framed accommodation modules combines both types of innovation. The modules are manufactured at its Shotton works in Flintshire, North Wales, and delivered to site as 'building blocks' ready for assembly. Once assembled on-site, the modules can be clad in more traditional materials such as brick or wood. The modules are suitable for repeatable building programmes, such as defence estates, student halls of residence, key worker and specialist accommodation (for example, for the elderly), and hotels and hostels. For instance, Living Solutions is currently being used for the £1 billion Allen/Connaught Private Finance Initiative development of accommodation for military and civilian personnel near Salisbury Plain and Aldershot.[95] The project will provide living and working accommodation for 18,000 personnel, including 10,700 single living accommodation units.

Off-site manufacture is one form of what are called 'modern methods of construction' (MMC).[96] Off-site manufacture is generally cheaper, faster, results in fewer faults, and reduces waste and transport costs. For example, Corus estimates that for the Allen/Connaught project, construction costs were reduced by more than 30 per cent compared to traditional methods. In addition, construction was not delayed due to weather conditions, 50 per cent fewer deliveries to site were needed and on-site waste was significantly reduced.[97]

Despite their importance to construction, however, the technologies and processes on which contemporary modular building techniques are based were developed most rapidly by companies from sectors other than construction. Corus is a metals company, formed in 1999 by the merger of British Steel and Koninklijke Hoogovens. It developed Living Solutions in 2003 by transferring its manufacturing expertise, including computer-controlled equipment and assembly production, from traditional steel operations to the production of volumetric building systems.

Similarly, in Japan one of the leading producers is Toyota Home, an off-shoot of the car manufacturer. Prefabrication is more widespread in Japan; more than 150,000 homes a year are produced this way (40 per cent of new housing).[98] Toyota used its expertise of volume (but increasingly customised) production lines to offer a premium house building 'manufacturing service'.

In commercialising its technology, however, partnership was crucial to Corus. At first, Living Solutions failed to gain market share, because Corus struggled to understand the nuances of the construction market, particularly the lack of consistent design and production processes compared to the manufacturing sector. Corus then formed a joint venture with construction contractors Mowlem and KBR to access their tacit knowledge and networks, and to present a more credible proposition in the market place.

### 2.4. Example 2: Heathrow Terminal 5: Increasing innovation through fully-integrated teams enabled by a new approach to risk management

The construction of Heathrow Terminal 5 represents a £4.2 billion investment by BAA and will result in the UK's largest free-standing structure. Currently, it is on time and on budget to open on 27th March 2008.[99]

A fundamental principle of the T5 Agreement between BAA and its 60 key suppliers was to establish fully-integrated expert teams to increase efficiency, productivity and transparency. As a result, many of the suppliers were involved at the earliest stages of the planning process. The integrated expert teams were then able to work together to identify potential problems and issues before designs were finalised and fabrication and construction began. To enable this, BAA took the highly unusual step of taking on all of the risk on the project. This ensured that the various

92. These included the Reading Construction Forum, the Design Build Foundation, the Construction Best Practice Programme, the Movement for Innovation, The Housing Forum, the Local Government Task Force, Rethinking Construction, Be, and the Construction Clients' Group.

93. Constructing Excellence in the Built Environment is a not-for-profit organisation and is the successor to Rethinking Construction and The Construction Best Practice Programme.

94. Scottish Enterprise has recently announced further plans for a Scottish Construction Innovation and Excellence Centre. The Centre, funded by Scottish Enterprise Glasgow, will help modernise the industry and act as a platform for sharing information and best practice. It is planned to be up and running in 2008 and be in a self-sustaining position by 2011.

95. Cutmore, A. (2005), 'New Modular Army', Contract, 9th February, pp.24-25.

96. Modern methods of construction (MMC) are those methods which provide an efficient product management process to provide more products of better quality in less time.

97. Corus (2006), Corus Living Solutions, Start Building with Finished Rooms, (Corus, Deeside).

98. Corus (2005), MetalWorks, Housing, (Corus, London).

99. Such is the scale of Terminal 5 that it actually comprises 16 major projects and 147 sub-projects. The 16 major projects include developing the airfield, the main terminal building, a new air traffic control tower, an energy centre, railways and tunnels (such as the extension to the Heathrow Express and the Piccadilly Line), and the baggage handling system.

contractors could focus tightly on working together effectively, and were able to share more information than they might be willing to under traditional arrangements.

The innovative working practices demonstrated in the T5 project have been influential in informing the Egan Report and the subsequent improvement agenda for the sector. For example, the Construction Project Information Committee – which is responsible for providing best practice guidance – has incorporated the processes and protocols developed for T5 into its codes of practice.[100] The National Audit Office has estimated that by 2005, £800 million had been saved in public sector procurement across central Government through the application of best practice principles such as these, and that potentially up to £2.6 billion could be saved annually if the principles were applied across the public sector.[101]

**2.5. Innovation often takes place at a micro-level in the context of individual projects**

The inherent problem-solving nature of construction and the specific challenges of individual projects means that there are frequently high levels of innovation within project teams. Since this happens on a local scale, it normally goes unmeasured by traditional indicators. The co-production of novel design solutions between different parts of a design team (architect, structural engineer, mechanical engineer, and so on) builds on their respective knowledge and experience. Similarly, the day-to-day problem-solving on site during the production phase is very much grounded in participants' tacit knowledge and 'learning by doing.'

The accumulated impact of incremental innovation over time may be significant, both at firm and aggregated sector level. Yet these innovations are far more difficult to capture because the projects in which they occur are typically much smaller, more specific and far less visible than well-known flagship projects such as Terminal 5.

## 3. Innovation is driven by regulations, client demand and skills supply, and conditioned by the structure of the construction industry

Regulations and standards that prescribe new sector-wide product or material attributes (for example, structural integrity) or new behaviours (for example, health and safety regulation) can encourage innovation.[102] A current example of this is the new *Code for Sustainable Homes* which is a phased regulatory framework to 'force' the industry to build 'zero carbon' homes by 2016.

Since construction companies are highly unlikely to develop or adopt innovations without demand from clients, clients may act as a driver of, or barrier to, innovation. One survey of construction firms in five countries emphasised client conservatism and levels of awareness as the major barrier to adoption of new construction practices, as shown in Figure 3.[103]

100. Construction Project Information Committee (2003), Production Information: A Code of Procedure for the Construction Industry, (CPIC, London).

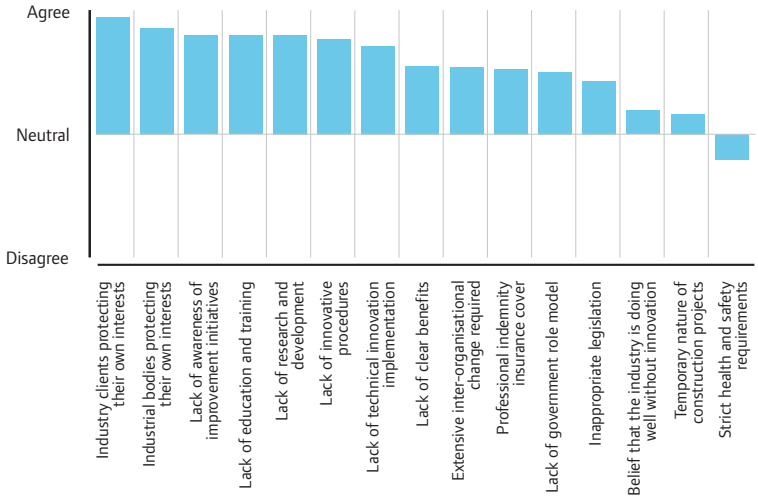
101. National Audit Office (2005), Improving Public Services Through Better Construction, (NAO, London).

102. See Sexton, M., and Barrett, P. (2005), 'Performance-Based Building and Innovation: Balancing Client and Industry Needs', Building Research and Information, 33 (2), pp.142-148. For a general discussion of the role of regulation in innovation, see Georghiou, L. (2007), Demanding Innovation: Lead Markets, Public Procurement and Innovation, (NESTA, London).

103. Based on a survey and workshops in five countries held as part of the Revaluing Construction initiative within the International Council for Research and Innovation in Building and Construction (CIB); see Barrett, P. (2005), Revaluing Construction – A Global CIB Agenda, (International Council for Research and Innovation in Building and Construction, Rotterdam).

104. Barrett, P. S., and Lee, A. (2004), Revaluing Construction: International Survey Questionnaire Results, (CIB, The Netherlands).

**Figure 3:** Factors inhibiting the widespread adoption of new construction practices




**Source:** Barrett and Lee.[104]

However, aside from these exogenous conditions, major construction companies can simply be slow to adopt innovations. For example, despite its significant advantages, the current level of usage of offsite-MMC in housebuilding is low, at less than four per cent of all new build.[105] While nearly two-thirds (64 per cent) of major housebuilders indicate that the industry needs to increase the take-up of offsite MMC applications, a higher proportion (72 per cent) say that they are generally satisfied with their own, in-house, traditional construction methods.[106] Skills deficits, especially with regards to new materials and approaches such as MMC, also hold back innovation; 61 per cent of major housebuilders cite skills shortages as a barrier to using offsite MMC in the industry.[107]

The structure of the industry can also inhibit innovation. The UK industry is predominantly made up of firms with fewer than five people, who have limited capacity to innovate due to their management capacity, limited resources and reduced opportunities for supply chain-driven innovation because of their inability to form long-term relationships with other firms.[108]

Lastly, there are the micro-level factors that collect around projects. Clear communication of needs and perspectives, shared common goals across teams, and early contractor involvement may support micro-level innovation. Lowest bidding procurement, restrictive budgets and a lack of stakeholder participation in projects can inhibit innovation.

## 4. Innovation is hidden because it takes place between construction companies, consultants and clients, not primarily in the R&D lab

### 4.1. Traditional metrics characterise construction as poor at innovation

R&D intensity in the construction sector is low at 0.5 per cent, from a total spend of £89.66 million.[109] (Even for a broader definition of the sector, R&D spend has been estimated at only £236 million).[110] Unsurprisingly, construction fails to rank in the top 15 sectors in R&D spend in the UK.[111] Only 12 per cent of firms report introducing "new or significantly improved" products on a regular basis – the lowest innovative propensity of all sectors.[112]

Unsurprisingly, patenting activity is also low; only one per cent of all construction firms, and only five per cent of large construction firms, report applying for any patents.[113]

### 4.2. Traditional innovation metrics cannot capture much of the business and project-level innovation that is occurring

Much of the innovation occurring in construction is not captured in traditional metrics because it is developmental, incremental, organisational and interactive.

First, most innovation is not based on cutting-edge research (and so not counted as formal R&D); often, improved performance comes from new-to-the-firm practices rather than new-to-the-world technologies. These include the practices that are being promoted by sector-wide initiatives such as Constructing Excellence.

Second, innovation can take the form of processes, materials and expertise developed in other sectors but then applied in new areas, such as Corus' Living Solutions in housing accommodation. Again, this would involve less formal R&D than a wholly new-to-the-world product or process.

Third, organisational innovations such as partnership and collaborations, including the T5 Agreement, are not based on scientific and technological R&D at all (although they may be based on social science research, which is not included in traditional surveys).

Finally, micro-level project innovation is not based on R&D, but on interactions between construction companies, consultants and clients.

### 4.3. The sector has continually improved its performance over the past five years, revealing (at least partially) the impact of hidden innovation

As shown by Table 2, 30 out of 40 sector key performance indicators (KPIs) have improved or stayed constant over the past five years.[114] These include increased client satisfaction, employee satisfaction, profitability and productivity; while defects, impact on the environment, energy use and waste have declined.

105. Goodier, C., and Gibb, A. (2005), The Value of the UK Market for Offsite, (Buildoffsite, London).

106. Pan, W., Gibb, A., and Dainty, A. (2005), Offsite, Modern Methods of Construction in Housebuilding, (Loughborough University, Loughborough).

107. Ibid.

108. Sexton. M., and Barrett, P. (2003), 'Appropriate Innovation in Small Construction Firms', Construction Management and Economics, 21 (6), pp.623-633; also Miozzo, M., and Ivory, C. (1998), Innovation in Construction: A Case Study of Small and Medium-sized Construction Firms in the North West of England, (Manchester School of Management, UMIST, Manchester).

109. Department of Trade and Industry (2006), The R&D Scoreboard 2006, Commentary and Analysis, Volume 1, (DTI, London).

110. Clark, J., and Simmonds, P. (2001), The Funding and Provision of Research and Development in the UK Construction Sector, (Technopolis, Brighton).

111. Department of Trade and Industry (2006), The R&D Scoreboard 2006, Commentary and Analysis, Volume 1, (DTI, London).

112. Department of Trade and Industry (2006), Innovation in the UK: Indicators and Insights, (DTI, London).

113. Department of Trade and Industry (2004), Detailed Results from the Third UK Community Innovation Survey (CIS3), (DTI, London).

114. The Construction Industry Key Performance Indicators are produced by a partnership of the DTI and Constructing Excellence using data from the DTI, the Building Cost Information Service, the Health and Safety Executive, Dun & Bradstreet and other third-party financial analysts. See www.constructingexcellence.org.uk.

**Table 2:** Selected key performance indicators for construction, 2002-2006

| KPI | Measure | Performance | | | | |
|---|---|---|---|---|---|---|
| | | 2002 | 2003 | 2004 | 2005 | 2006 |
| **Economic:** | | | | | | |
| **Client Satisfaction – Product** | Scoring 8/10 or better (per cent) | 73 | 78 | 80 | 83 | 84 |
| **Client Satisfaction – Service** | Scoring 8/10 or better (per cent) | 65 | 71 | 74 | 77 | 79 |
| **Defects** | Scoring 8/10 or better (per cent) | 58 | 68 | 68 | 72 | 77 |
| **Profitability** | Median profit before interest and tax (per cent) | 5.6 | 5.8 | 7.5 | 8.7 | - |
| **Productivity** | Median value added/employee (£000) | 28.0 | 31.1 | 32.6 | 34.2 | 38.2 |
| **Respect for People:** | | | | | | |
| **Employee Satisfaction** | Scoring 8/10 or better (per cent) | - | 41 | 41 | 51 | 55 |
| **Environment:** | | | | | | |
| **Impact on the Environment – Product** | Scoring 8/10 or better (per cent) | - | 28 | 32 | 53 | 54 |
| **Impact on the Environment – Construction Process** | Scoring 8/10 or better (per cent) | - | 51 | 56 | 44 | 45 |
| **Energy Use (Designed) – Product** | Median Energy Use Kg $CO2/100m^2$ gross floor area | - | 4414 | 4295 | 4291 | 3729 |
| **Energy Use – Construction Process** | Median Energy Use Kg CO2/£100k project value | - | 288 | 322 | 293 | 293 |
| **Waste – Construction Process** | Median Waste Removed from site $m^3$/£100k project value | - | 43.5 | 47.1 | 41.6 | 37.0 |
| **Whole Life Performance – Product** | Scoring 8/10 or better (per cent) | - | 29 | 35 | 41 | 41 |

**Source:** Department of Trade and Industry.[115]

115. Department of Trade and Industry (2006), Construction Statistics Annual Report 2006, (DTI, London).

General improvement (not based on innovation) is probably the primary factor contributing to these trends. However, hidden innovation may also be making a contribution. For example, innovation at the level of individual projects is reflected in the measures of client satisfaction and a reduction in defects; these reflect the incremental innovations that occur on-site to improve day-to-day activities. Business level innovation is also represented in the figures for profitability, productivity and employee satisfaction, as businesses actively seek better practices. Sector level innovation can be seen in the environmental effects, which have for the main part improved.

### 4.4. Improvements in productivity also indicate increasing innovation

The sector's improving performance can also be seen in its improving 'total factor productivity' (TFP). Growth in TFP represents that part of growth in output that cannot be accounted for by growth in primary factors of production (capital and labour). TFP also provides some measure of technological advances (although it can be a function of other factors, such as regulation or significant changes in the political environment).

The results from one international comparison of TFP for the construction industry are shown in Table 3. On this basis, the UK construction sector appears to be better positioned than the

**Table 3:** Total factor productivity in four selected countries, 1999 (UK = 100)

| | UK | US | France | Germany |
|---|---|---|---|---|
| **Economy** | 100 | 115 | 102 | 100 |
| **Manufacturing** | 100 | 143 | 110 | 121 |
| **Construction** | 100 | 102 | 98 | 85 |

**Source:** O'Mahoney and de Boer. [116]

UK economy as a whole (and manufacturing in particular) and is competitive with construction sectors in other countries.

This at least partially reflects that the construction sector is a major user of products and services from sectors that have some of the highest R&D expenditures in the economy, for example, machinery and equipment, and telecommunications.[117] However, despite construction being the end-user (and construction clients being the beneficiaries), such innovation does not show up in innovation statistics for the construction sector.

## 5. New metrics need to track the adoption of innovative technologies and approaches, and align with sector performance indicators

New innovation metrics that are relevant to construction might record the take-up of innovations such as MMC or tools or techniques that reduce environmental impact or energy consumption. For example, these metrics could include the proportion of projects that employ the manufacture and adoption of MMC, or investments in training in MMC methods.[118] Similarly, metrics could cover aspects such as the extent of adoption of environmentally friendly manufacturing technologies and materials.[119] Reports to the New Construction Research and Innovation Strategy Panel (nCRISP) have recommended the introduction of periodic surveys on the sector's innovation performance, including measures such as the rate of uptake of recent and emerging technologies and practices and their impact, the use of ICTs, and firms' attitudes to innovation.[120]

To build a full picture of innovation within construction, an innovation survey would also have to incorporate the demand for innovation from clients. Over time, this would reveal, for example, whether recurrent clients are more innovation prone, and whether public clients are more beneficial for firm innovation than private clients.[121]

## 6. Innovation could be improved by continuing the progress already made and implementing targeted regulation

Government has already played a major role in leading and supporting improvement and innovation initiatives in the construction sector.[122] This should continue, particularly in areas such as the development of standards, innovation processes within and between firms, dissemination processes, training and skills, government procurement and sustainability.[123] The latter is particularly important, and regulation provides government with a direct lever to drive innovation in response to environmental challenges.[124]

Ultimately, however, the locus of innovation will remain the construction company and its skilled and experienced engineers and managers, who need to grasp the opportunities afforded by local projects. Government's role in this is limited to ensuring an adequate long-term supply of skilled labour to the industry, and to encouraging client demand (directly when the public sector is itself the client). Some action is underway on this agenda and there is currently a range of initiatives driven from within the sector aimed at enhancing the capacity and confidence of clients, firms and project teams to innovate.[125]

116. O'Mahoney, M., and de Boer, W. (2002) Britain's Relative Productivity Performance: Updates to 1999, Final Report to DTI/Treasury/ONS, (NIESR, London). Similarly, Department of Trade and Industry (2004), Measuring the Competitiveness of the UK Construction Industry, Volume 2, (DTI, London).

117. Office for National Statistics (2006), UK Business Enterprise Research and Development, 2005, news release, 24th November, (HMSO, London).

118. Constructing Excellence has commissioned a survey on the impact of MMC on resource efficiency. The Pearce Report similarly suggested that the 'understanding of technological change' in the sector needs to be better understood and measured.

119. In 2006, the National Platform for the Built Environment undertook a poll of members and colleagues and identified their rankings of broad topic areas from the European Strategic Research Agenda (SRA). This poll identified three key areas as high priority for the UK: reduced resource consumption; a client-driven, knowledge-based construction process; and ICT and automation. Accordingly these three topics became the basis of the most recent UK SRA questionnaire with each topic being broken down into sub-topics.

120. See Rigby, J., Dewick, P., and Bleda, M. (2005), An Enquiry into the Economics of Research, Development and Innovation Funding in the UK Construction Industry, Report for the New Construction Innovation and Strategy Panel (nCRISP), (PREST, University of Manchester, Manchester).

121. See the survey of Swedish construction firms in Bröchner, J. (2006), Manufacturing or Services Innovation? A Survey of Swedish Construction Contractors, working paper, (Chalmers University of Technology, Göteborg, Sweden).

122. The UK Parliament Trade and Industry Committee has recently announced a new inquiry into the UK construction industry, to include construction R&D, the industry's performance against other countries, and environmental sustainability.

123. Rigby, J., Dewick, P., and Bleda, M. (2005), An Enquiry into the Economics of Research, Development and Innovation Funding in the UK Construction Industry, Report for the New Construction Innovation and Strategy Panel (nCRISP), (PREST, University of Manchester, Manchester).

124. Ibid.

125. See the systemic model of continuous improvement developed by the Revaluing Construction project, Barrett, P. S. (2007), 'Revaluing Construction: An Holistic Model', Building Research and Information, 35 (3), pp.268-286.

# Appendix C: Retail banking

## Innovation through the integration of technology and organisational change

### 1. Innovation matters in financial services because it helps to improve productivity in a major wealth-generating part of the UK economy

Retail banking is one part of the UK financial services industry[126] that as a whole represents an important source of productivity growth for the UK economy.[127] In 2003, the UK retail banking market alone grew by 7.9 per cent to reach $1.54 trillion, with a compound annual growth of nine per cent during 1999-2003.[128] That same year, UK retail banking accounted for nearly one-third of the European retail banking market.

London is the world's largest centre for international financial services including banking, but other parts of the UK are also strong. Edinburgh and Glasgow are among the ten largest European centres for banking, life insurance, pensions and investment management. Financial and related services employ 9.3 per cent of Scotland's workforce, with more than 108,000 directly employed and a further 90,000 in related industries.[129] Four banks have their headquarters or major regional offices in Scotland, including the Royal Bank of Scotland (RBS), the fifth largest banking group in the world. Scotland is also one of the world's major fund management centres, with more than £300 billion under management. Leeds is home to more than 30 national and international banks; financial and business services now represent 24 per cent of the city's employment (or nearly 100,000 employees).[130]

### 2. Innovation in retail banking is primarily incremental and process-oriented

#### 2.1. Innovation in retail banking is primarily process-oriented rather than product-based

Few of the new products offered by retail banks are truly innovative; most represent incremental modifications of existing products launched by competitors, sometimes marketed as 'new'.[131] The senior management of UK financial services organisations associate the concept of innovation with 'how things are done' rather than with the development of new products.[132] These products derive from banking groups' strategic focus on how they can extend their reach or increase their distribution of products to consumers rather than on new product development per se.[133] In this way, innovation is 'demand-led' (with the bank, particularly its sales and marketing departments, as the consumer) rather than supply-led through the development of new-to-the-world products.

#### 2.2. Innovations in technology increase the efficiency of 'back office' processes

Most of the process innovations introduced by financial services providers have their basis in technology. In the first instance, technology has increased the efficiency of banks' back-office operations. Over time (and through the agency of sector-spanning consultancy companies such as Accenture), banks have adopted broadly similar process innovations to improve core activities such as account transactions, credit authorisation, investment products and customer relationship management. In turn, this has been supported by sector-wide investments in technology platforms, for example Voca's (formerly BACS')

126. Financial services include banks, building societies, credit unions, friendly societies, investment businesses and insurers. As a whole, this sector accounted for 5.5 per cent of UK GVA in 2005, employed more than one million people, and generated £20 billion in exports (7.2 per cent of total UK goods and services exports combined). GVA and employment figures from HM Treasury (2006), Financial Services in London: Global Opportunities and Challenges, (HM Treasury, London). Export figure from HM Treasury (2005), The UK Financial Services Sector: Rising to the Challenges and Opportunities of Globalisation, (HM Stationery Office, London).

127. Greenhalgh, C. and Gregory, M. (2000) 'Labour Productivity and Product Quality: Their Growth and Inter-Industry Transmission in the UK 1979-90', in Barrell, R., Mason, G., and O'Mahony, M. (eds.), Productivity, Innovation and Economic Performance, (Cambridge University Press/ NIESR, Cambridge/London); Greenhalgh, C., and Gregory, M. (2001), 'Structural Change and the Emergence of the New Service Economy', Oxford Bulletin of Economics and Statistics, 63 (s1), pp.629–646.

128. Datamonitor (2004), Retail Banking in the United Kingdom. Industry Profile, (Datamonitor, London).

129. Scottish Executive (2005) A Strategy for the Financial Services Industry in Scotland, (Scottish Executive, Edinburgh).

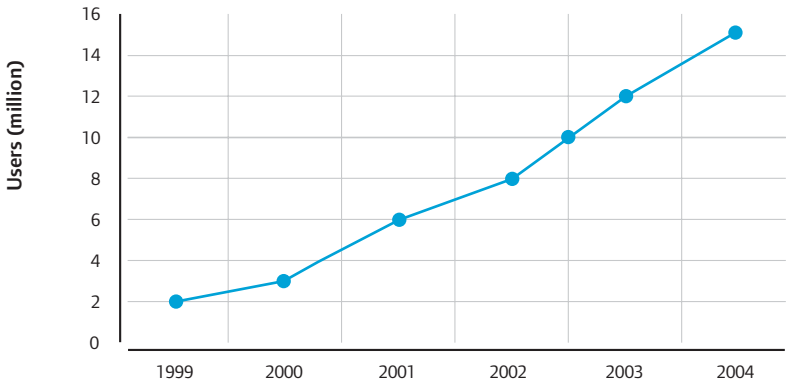
130. HM Treasury (2006), Financial Services in London: Global Opportunities and Challenges, (HM Treasury, London).

131. Akamavi, R. K. (2005), 'A Research Agenda for Investigation of Product Innovation in the Financial Services Sector', Journal of Services Marketing, 19 (6), pp.359-378; Blazzard, N. N., and Haesenaur, A. N. (1997), 'Beware of Marketing Creep in New Product Development', National Underwriter, 101 (3), pp.3-20.

132. Costanzo, L. A., and Ashton, J. (2006), 'Product Innovation and Consumer Choice in the UK Financial Services Industry', Journal of Financial Regulation and Compliance, 14 (3), pp.285-303.

133. Ibid. Examples include 'All-in-one' accounts, offset accounts, and relationship pricing.

**Figure 4:** Users of internet banking in the UK, 1999-2004




**Source:** APACS.[138]

134. Voca is owned by the UK's largest banks and building societies. It processes six billion transactions a year, including 90 per cent of UK salaries, 70 per cent of household bills and most state benefit and pension payments. It is estimated to save the UK banking industry €300m per year.

135. The largest UK-based supplier by revenue is Reuters, but it focuses more on information to the financial services sector as opposed to systems for retail banking; see American Banker/Financial Insights (2006), FinTech 100, (American Banker/Financial Insights, New York, NY/ Framington, MA).

136. Offset accounts come in many varieties but the core principle is that interest on savings is used to reduce mortgage debt.

137. Barbesino, P., Camerani, R., and Gaudino, A. (2005), 'Digital Finance in Europe: Competitive Dynamics and Online Behaviour', Journal of Financial Services Marketing, 9 (4), pp.329-343.

138. APACS Yearbook of Payment Statistics 2004, Table 8.13/Key Note, (APACS, London).

139. Booz, Allen and Hamilton (2002), Banking, International Financial Services, (Booz, Allen and Hamilton, London).

140. Computing (2006), 'HSBC Cost Cuts Allow Focus on Innovation', 5th October, website accessed 11th May 2007. In the case of HSBC, IT operating costs now represent less than half (48 per cent) of IT spend.

141. International Institute of Banking and Financial Services (2005) 'Turning Tellers into Sellers – Re-empowering and Rewarding Branches', Focus on Financial Services, July, (IIBFS, Leeds).

142. Howcroft, B., and Durkin, M. (2003), 'Editorial: Effective Marketing Management in Financial Services Context', Journal of Marketing Management, 19, pp.911-914.

new payment system which cost £100 million and took five years to develop.[134]

Much of this technology is developed and delivered by technology suppliers to the financial services. These suppliers provide systems that handle core processes such as transaction and mortgage loan processing, card issuing, customer relationship management, and also support new delivery channels (see below). Leading suppliers include Fiserv, Fidelity and SunGard. Most of the major suppliers are based in the US, but have clients across the globe. After Reuters, Misys is the largest supplier based in the UK, with a global client base in 120 countries.[135]

### 2.3. Technology then allows for innovations in 'front-office' operations and new delivery channels and customer services beyond the bank

The increasing (and increasingly complex) integration of various back office systems can be used to create new services such as internet banking or offset accounts, which are intended to offer a more coherent single service to customers.[136] This technology integration has enabled most providers to adopt a multi-channel delivery strategy, including telephone, PC, internet, interactive digital TV (iDTV), and mobile phones. By the early 2000s, all the major financial services providers had added online banking facilities to their traditional delivery channels.

Figure 4 illustrates the substantial increase of internet banking users in the UK since the late 1990s. In this respect the UK is one of the leading countries in Europe, second only to Germany in the total number of online banking users.[137]

These innovations have earned substantial cost savings for providers. For example, it has been estimated that a typical internet banking transaction costs only ten per cent of the cost of a branch transaction, while a telephone transaction costs only 40 per cent.[139] Reductions in operating costs can then allow for increased investments in innovative products and services.[140]

### 2.4. These innovations have led to fundamental change in the role of bank branches

Improvements in back-office operations and new delivery channels have enabled bank branch staff to move from teller and clerical tasks to sales roles. Banking groups increasingly view themselves as retailers,[141] managing a mix of alternative delivery channels, only one of which is the branch network.[142] Deposit-taking, lending and money transmission remain at the core of retail banking, but many banks now undertake a wider range of activities, including personal investment advice, fund management and insurance. 'Bancassurance' – commonly defined as the selling of banking and insurance and products through the same channel – has become a key growth area for many groups such as HBOS.

The new sales (as opposed to service delivery) role of branches is reflected in new, more open layouts.[143] It is expected that the decline in the number of branches over the past few years will level off as banks redesign them to become more attractive sales offices for financial

products. To this end, banks are expected to continue to adopt the technologies to enable them to deliver innovative services. These may include using wireless networks and RFID tags to identify particularly valuable customers as soon as they enter a branch, so that staff can target them for new products.[144]

**2.5. New entrants can bring innovative business models into the sector, which are often quickly imitated by existing providers**

Some business segments (for example, personal finance lending) – which were thought to be the exclusive territory of banks – have seen new entrants, not only from related sectors (insurance) but also from previously unrelated sectors (such as retailing and utilities).

For example, the stand-alone internet bank Egg was launched by the insurer Prudential in 1998 in response to the parent company's ageing customer base and the declining growth of its core business. This was followed swiftly by The Co-operative Bank, Abbey National and Halifax with the launch of internet stand-alone banks smile, cahoot and IF (Intelligent Finance) respectively (alongside providers based in other sectors, such as Tesco).[145]

## 3. Innovation is driven by regulation and competition, but suffers from weak expression of consumer demand

**3.1. Deregulation has increased competition, and spurred some innovation**

UK financial services markets have appeared increasingly competitive since the 1980s following a process of deregulation and re-regulation of the sector through the Financial Services Act 1986. Most obviously to the consumer, building societies and banks started to cross into each other's market space. In the late 1980s and 1990s, competition further increased due to the entry of non-traditional providers, as noted above.[146]

The European Markets in Financial Instruments Directive (MiFID) is intended to promote a single market for wholesale and retail transactions in financial instruments. It is likely to encourage UK financial institutions to be more innovative in response to increased competition. Retail banks and building societies will be subject to MiFID for some parts of their business, for example, selling securities, or investment products that contain securities.

**3.2. Technological innovation and organisational innovation are inextricably intertwined but an emphasis on efficiency has driven some innovations and marginalised others**

As noted earlier, the adoption of ICT has enabled innovation. However, beginning with the desire to maintain bank profitability in the economic recession of the early-mid-1980s, the development of new technology-based processes has been primarily about ensuring profitability and remaining competitive in the market rather than being led by consumer demand for specific products and services.

During the 1990s, many banks embarked on organisational change programmes aimed at cutting levels of hierarchy and overheads, and ensuring a speedy response to market changes. In turn, these organisational changes have been essential enablers for the adoption and successful implementation of a new generation of technologies, and have been crucial to realising the maximum benefits from them.[147] (These new technologies have also encouraged such organisational changes). Where this is not achieved, it is frequently due to organisational rather than technical barriers.[148] These include difficulties in coordination and communication between people drawn from different functional departments,[149] a lack of champions to promote innovative initiatives, and a lack of support from the top management.[150]

However, these change programmes, with their emphasis on cost-cutting, may have sidelined other forms of innovation.[151] For example, initial investments in new technology-based delivery channels resulted in higher costs and lower quality customer service, due to a lack of ICT knowledge and suitably skilled staff, and a lack of communication between functional divisions (such as IT and marketing).[152]

**3.3. Radical innovation is relatively rare due to weak consumer demand**

Weak consumer demand for unique products and services is a major reason why imitative incremental innovation is more common than radical innovation in retail banking.[153]

This weak demand is due in large part to consumer ignorance and inertia. For example, a recent survey suggests that 45 per cent of customers are unhappy about the low interest rates they receive on their savings, but 80 per cent of them have never switched banks.[154] The Cruickshank Report in 2000 pointed out that many consumers are unaware of even basic details of financial services,[155] and it has

143. Scarbrough, H., and Lannon, R. (1989), 'The Management of Innovation in the Financial Services Sector: A Case Study', Journal of Management Marketing, 5 (1), pp.51-62.

144. Accenture (2005), Perspectives, Mastering Technology Innovation in the Retail Banking Industry, (Accenture, London).

145. Supermarkets such as Tesco and Sainsbury's have offered basic financial products since the late 1980s, initially through their call centres, then adding internet-based services.

146. Following the adoption of electronic banking throughout the 1980s and 1990s, however, regulation has increased in areas such as network security and disaster recovery procedures.

147. Scott Morton, M. S. (1992), 'The Effects of Information Technology on Management and Organizations', pp. 261-278, in Kochan, T., and Useem, M. (eds.), Transforming Organizations, (Oxford University Press, New York); Zuboff, S. (1988), In the Age of the Smart Machine, (Basic Books, New York).

148. Morris, T., and Westbrook, R. (1996), 'Technical Innovation and Competitive Advantage in Retail Financial Services: A Case Study of Change and Industry Response', British Journal of Management, 7, pp.45-61.

149. Brown, S. L., and Eisenhardt, K. M. (1995), 'Product Development: Past Research, Present Findings, and Future Directions', Academy of Management Review, 20 (2), pp.343–378; Dougherty, D. (1992), 'Interpretive Barriers to Successful Product Innovation in Large Firms', Organization Science, 3 (2), pp.179–202.

150. Vermeulen, P. A. M. (2004), 'Managing Product Innovations in Financial Services Firms', European Management Journal, 22 (1), pp.43-50; Vermeulen, P. A. M. (2005), 'Uncovering Barriers to Complex Incremental Product Innovation in Small and Medium-Sized Financial Services Firms', Journal of Small Business Management, 43 (4), pp.432-452.

151. Costanzo, L. A., and Ashton, J. (2006), 'Product Innovation and Consumer Choice in the UK Financial Services Industry', Journal of Financial Regulation and Compliance, 14 (3), pp.285-303.

152. Devlin, J. F. (1995), 'Technology and Innovation in Retail Banking Distribution', International Journal of Bank Marketing, 13 (4), pp.19-25; Costanzo, L. A., Keasey, K., and Short, H. (2003), 'A Strategic Approach to the Study of Innovation in the Financial Services Industry: The Case of Telephone Banking', Journal of Marketing Management, 19, pp.259-281; McCabe, D. (2000), 'The Swings and Roundabouts of Innovating for Quality in UK Financial Services', The Service Industries Journal, 20 (4), pp.1-20.

been estimated that consumers are oblivious to around 30-40 per cent of the new product development which occurs in the financial services industry.[156] Despite the proliferation of alternative channels, many customers prefer to undertake their business through the traditional branch channel.[157]

The complexity of some products and the high but somewhat superficial proliferation of product 'innovations' contribute to this consumer inertia. Further, many products and services are sold off the back of current accounts, the provision of which is dominated by a few large providers, and so customers may not be aware of the full range of choices open to them.

### 3.4. Incentives for radical innovation are also weakened by the intangible character of many financial services products

As in any sector, the development of a highly innovative product is a risky business activity: it can take a long time and absorb a considerable amount of resources.[158] The intangible nature of most financial services products makes them relatively easy to imitate by competitors.[159] This lack of effective protection systems encourages an emphasis on imitative rather than novel innovation (such as the investments in back office operations followed by new delivery channels noted above).[160]

### 3.5. Radical innovation is triggered by major strategic challenges in markets and tends to be established at arm's length in 'green field' operations

Radical innovations tend to be introduced only when a provider faces a declining market that it has previously relied on. For example, the launch of the stand-alone telephone bank, first direct, by Midland Bank in 1989 came in response to declining profits at the parent company and attempts to improve the bank's cost/income ratio.[161]

Similarly, in the late 1990s, the former UK insurer Scottish Provident developed a successful (radical) life insurance product, the Protection Plan, to counter-balance the poor performance that the company was experiencing in other business areas. This product led eventually to a re-focusing of the entire company's business.

It is noticeable that most radical innovations such as these have tended to take place outside of the organisational context of the originating company, as 'green field' operations. This suggests that, despite the emphasis within providers on the need for flatter organisational structures to enable quicker decision-making, these structures can still inhibit the development of innovations. Additionally, these new operations do not have to struggle with integrating existing software systems; they are able to start from scratch in designing new services with bespoke systems and processes.

## 4. Innovation is hidden because it is enabled by technology adoption and organisational development, not formal R&D

### 4.1. Traditional metrics suggest that banking and financial services are not very innovative

Large-scale investments in formal R&D activities are relatively rare.[162] R&D spend in banks was £705 million in the UK in 2005-06 – an R&D intensity of 0.9 per cent – but with a high concentration in just two companies.[163] The Royal Bank of Scotland and HSBC spent £329 million and £245 million on R&D in 2005-06, making them the eleventh and thirteenth highest-spending UK firms respectively (but even then, with R&D intensities of only 1.3 per cent for RBS and 0.7 per cent for HSBC).[164] This spending mainly comprises banks' in-house software development (see below).

The financial services as a whole are poorly reflected in traditional innovation indicators. For example, financial services scored the lowest of all sectors in the UK in applications for patents in the third Community Innovation Survey.[165] In one (highly aggregated) exploratory survey of the relative performance of Europe's service sectors (including 'financial intermediation'), the UK ranked well below Latvia and Romania.[166]

### 4.2. Traditional metrics neglect the broader role of ICT in supporting innovation

Traditional metrics represent a narrow understanding of the role of ICT in innovation in sectors such as retail banking. The *Frascati Manual* only acknowledges software development that represents a "scientific and technological advance" as R&D and hence as innovation. The use of existing software for a new application or purpose, however, is not considered to be an investment in innovation – despite the central role that this software might play in providing an innovative new service such as internet banking.[167]

153. Knights, D., Sturdy, A., and Morgan, G. (1994), 'The Consumer Rules? An Examination of the Rhetoric and Reality of Marketing in Financial Services', European Journal of Marketing, 28 (3), pp.42-54.

154. Which? (2007), Bank Customers Annoyed by Low Interest Rates, But Most Have Never Switched Their Business, press release, 4th April.

155. HM Treasury (2000), Competition in UK Banking, (HM Treasury, London). UK banks have been gaining exceptional returns since the 1990s – returns on equity have often been in excess of 20 per cent. This is higher than might be expected in a genuinely competitive market. The UK banking sector reported pre-tax profits of £38 billion for 2006. Cruickshank suggested that customers could well pay £3-5 billion less for banking services if there were full competition in the sector.

156. Malhotra, M.K., Grover, V., and Desilvo, M. (1997), 'Re-engineering the New Product Development Process: A Framework for Innovation and Flexibility in High Technology Firms', Omega: International Journal Management Sciences, 24 (4), pp.425-441; Quinn, B. J. (1992), Intelligence Enterprise: A Knowledge and Service Based Paradigm for Industry, (The Free Press, New York).

157. International Institute of Banking and Financial Services (2003), Getting the Right Mix, (IIBFS, Leeds); International Institute of Banking and Financial Services (2005), 'Turning Tellers into Sellers – Re-empowering and Rewarding Branches', Focus on Financial Services, July, (IIBFS, Leeds).

158. Alam, I. (2003), 'Innovation Strategy, Process and Performance in the Commercial Banking Industry', Journal of Marketing Management, 19, pp.973-999.

159. Davidson, H., Watkins, T., and Wright, M. (1989), 'Developing New Personal Financial Products – Some Evidence of Role of Market Research', International Journal of Bank Marketing, 7 (1), pp.8-15; Easingwood, C. J. (1986), 'New Product Development for Service Companies', Journal of Product Innovation Management, 3 (12), pp.264-275; de Brentani, U. (2001), 'Innovative Versus Incremental New Business Services: Different Keys for Achieving Success', Journal of Product Innovation Management, 18 (3), pp.169-187.

160. Avlonitis, G. J., Papastathopoulou, P. G., and Gounaris, S. P. (2001), 'An Empirically Based Typology of Product Innovativeness for New Services: Success and Failure Scenarios', Journal of Product Innovation Management, 18, pp.324-342.

### 4.3. Traditional metrics also neglect organisational innovation

As noted, innovation in retail banking tends to be process-oriented, with new technologies being applied to develop processes that then enable later innovations. Investments in technology often need to be complemented by additional innovations in organisational forms – such as process and business model innovation – to realise their full impact (for example, in the initial development of internet banking). Equally, the quick adoption of innovations developed by competitors is often dependent on organisational forms that are conducive to receiving and rapidly developing innovations. These forms of organisational innovation, and the factors that contribute to them, are not captured in traditional metrics such as R&D.

## 5. New metrics need to capture broader investments in ICT and organisational innovation

### 5.1. A more representative innovation metric needs to be based on a broader understanding of the role that ICT plays in innovation

New metrics for technology-based innovation could be developed that capture a second type of investment in technology-based innovation (the first type being cutting-edge software development). These investments would include the more incremental (but nonetheless crucial) development of technologies that are currently excluded from measurement. For example, investment in a delivery channel for mobile phone banking may not be new-to-the-world (it might have already been developed by a supplier for another bank), but it is innovative in the sense that it offers a new service to customers and delivers value to them.

Not all of banks' investments in new technologies support innovation directly, of course. Some expenditure merely consists of replacing legacy systems without any noticeable advances. Nonetheless, nearly two-thirds of all investments in ICT support new delivery channels to customers – and so enable the development and provision of innovative services.[168]

These investments are considerable. Across Europe, HSBC is the highest spending bank on IT, with a budget of over €3 billion; four banks spent more than €2 billion each on IT in 2005 (UBS, Deutsche Bank, ABN AMRO and HSBC).[169] Collectively, European banks increased spending by 2.5 per cent in 2005 to more than €45.7 billion; 2006 was expected to see a further five per cent increase.

New metrics based on this expenditure (but which excluded investments that were merely replacing legacy systems) would also have to recognise the global nature of the development of such technologies; that is, national comparisons could be problematic. As in the oil industry, the innovative technologies and processes provided by these global suppliers may be initially developed in one country but adopted (and adopted rapidly) in many others, perhaps by competitors. Technology development and implementation for financial services is big business: the world's 100 largest technology suppliers to the financial services had revenues of more than $46 billion in 2005; the largest supplier, Fiserv, had revenues of more than $3 billion.[170]

### 5.2. Intellectual property other than patents better captures new products in the financial services

Patents are largely irrelevant to the financial services, including retail banking, but other forms of intellectual protection could be more indicative of innovation activity.[171] While common in the US, 'business method' patents are rare in Europe because they tend to be granted only where it can be shown that a specific 'technical' (usually defined as non-financial or non-economic) problem has been resolved.[172] However, one study has demonstrated that the strong growth and development of the financial services sector in the UK has been accompanied by a rise in intellectual property rights (IPR) protected through trademarks, and that higher trademark intensity is associated with higher market values.[173] It also suggested that the market's valuation of trademarking in financial sector firms increased in the late 1990s.

## 6. More accessible financial information and better education could help to stimulate substantive rather than superficial innovation in the longer-term

Retail banks have a comparatively highly developed system of innovation – for example, their ability to introduce new organisational forms (such as green field operations) and to make large-scale investments in technology to provide new services by drawing on global suppliers. However, large-scale innovation in

161. Devlin, J. F. (1995), 'Technology and Innovation in Retail Banking Distribution', International Journal of Bank Marketing, 13 (4), pp.19-25; Costanzo, L. A., Keasey, K., and Short, H. (2003), 'A Strategic Approach to the Study of Innovation in the Financial Services Industry: The Case of Telephone Banking', Journal of Marketing Management, 19, pp.259-281.

162. Cridland, J. (2006), 'Don't Let Us Ignore Invisible Innovation', The Edge, 21, p.23; Hipp, C., and Grupp, H. (2005), 'Innovation in the Service Sector: The Demand for Service Specific Innovation Measurement Concepts and Typologies', Research Policy, 34, pp.517–535; Hughes, D. (2006), 'The Government's Value-Added Agenda', The Edge, 21, p.2.

163. Department of Trade and Industry (2006), The R&D Scoreboard 2006, Volume 1, (DTI, London). That this investment in R&D has been picked up at all in recent surveys is due to the European adoption of new International Financial Reporting Standards that require the more extensive disclosure of R&D activities in annual accounts – not because traditional metrics based on the *Frascati Manual* have become more appropriate for recording investments in software development.

164. Ibid.

165. According to this survey, only one per cent of enterprises that were involved in innovation activity in the 'Financial intermediation' sector had applied for at least one patent. Table UK. 14A, European Commission (2004), Innovation in Europe, Results for the EU, Iceland and Norway, (European Commission, Brussels). These data relate to 1998-2000.

166. Kanerva, M., Hollanders, H., and Arundel, A. (2006), 2006 TrendChart Report: Can We Measure and Compare Innovation in Services?, (European Commission, Brussels). The authors of this study note that these exploratory results could be misleading, because 'innovation' is likely to be much higher in countries that are catching-up to leading countries.

167. The OECD acknowledges the weakness of traditional indicators in capturing R&D in software development, see section 2.4 in Organisation for Economic Co-operation and Development (2002), Frascati Manual 2002, Proposed Standard Practice for Surveys on Research and Experimental Development, (OECD, Paris).

168. According to one survey of European banks, efficiency (cost reduction) is the most cited reason for investment in ICT (in 90 per cent of cases), followed by replacing legacy systems (75 per cent) and improving customer service through multi-channel strategies (65 per cent); see Celent (2006), IT Spending Trends: A Global Financial Services Review (Celent, London).

the sector tends to be driven by framework conditions: namely competition (often by new entrants) and effective (and effectively-expressed) demand from the marketplace. Policy has a role to play in both areas. Regulation can encourage entry by new suppliers – frequently existing players in other areas of the financial services sectors, but occasionally from entirely new entrants.

Government has a more indirect role in stimulating innovation by acting to improve the fundamental problem of the relatively low 'financial capability' of UK consumers.[174] The UK still has a low propensity towards savings and financial social exclusion remains considerable. It has been estimated that around three million households (12 per cent of all UK households) do not have a current account,[175] and 70 per cent of people have made no personal provision to cover an unexpected drop in income.[176] Consumers are often unfamiliar with financial services products and lack confidence when buying them.[177]

The innovation system in retail banking is currently isolated from many of these demands: consumer demand for new products is low and where it does exist it is poorly expressed. As noted, the retail banking sector is responsible for a relatively high but somewhat superficial proliferation of product 'innovations'. This can in fact contribute to low financial capability. For example, the Sandler Review of savings noted that the complexity of the retail savings market confuses many consumers, with its vast array of subtly differentiated products and complex charging structures.[178]

Financial capability (and therefore demand and the effective expression of that demand) could be improved by ensuring that consumers are provided with more comparable and accessible product information and that adequate product regulation is in place.[179] The Financial Services Authority (FSA) has already intervened to provide more information on products,[180] but this may not be effective if people do not possess adequate initial levels of finance knowledge.[181]

To have a substantial effect on consumer demand, financial capability needs to receive greater emphasis at an earlier stage in the educational process. Personal finance continues to have a relatively low profile in school curricula, despite recent efforts to increase its prominence.[182] School-based financial education is critical in helping young people to avoid mistakes, especially given the long lead-time between financial decisions and the outcomes of those decisions.

The Government has recently stated that it intends to review the policies and programmes that have the potential to raise financial capability, and to set long-term goals for the contribution each can make.[183] This review will include the school curricula, services such as the Social Fund, Jobcentre Plus and Sure Start Children's Centres. It will also promote the Child Trust Fund as a learning tool to bring personal finance to life in the classroom (linked to the first payments for seven-year-olds in 2009).

169. Celent (2005), IT Spending Trends in European Banking, 2005, (Celent, London).

170. American Banker/Financial Insights (2006), FinTech 100, (American Banker/Financial Insights, New York, NY/ Framington, MA).

171. However, there is an increasing number of patent systems in the US financial services industry, see Hunt, R. M. (2002), 'Innovation in Financial Services and Payments', Federal Reserve Bank of Philadelphia, 17 May 2002. A 1998 ruling in a case involving State Street Bank made clear that business processes could be patented, see Scholtes, S., and Tett, G. (2007), 'Banks Lay Traps for Copycats', Financial Times, 8th January. This could motivate providers to place innovation at the core of their business strategies and to adopt customer-centric business models, see Jones, T. (2002), 'Innovation Now', Argent, 2 (6), pp.28-31.

172. A business method patent is protection for a method of operating an aspect of a business. There is no exclusion for methods of doing business under US patent law, but the European Patent Convention does not recognise methods of doing business as patentable. A particular area of focus in the US has been the patenting of data processing methods, see United States Patent and Trademark Office (undated), Automated Financial or Management Data Processing Methods, USPTO white paper, (USPTO, Washington DC).

173. Greenhalgh, C., and Rogers, M. (2005), 'Market Value of UK Intellectual Property: Manufacturing, Utility and Financial Services Firms', in Bosworth, D., and Webster E. (eds.), (2006), The Management of Intellectual Property, (Edward Elgar, Cheltenham).

174. 'Financial capability' means "…being able to manage money, keep track of your finances, plan ahead, choose financial products and stay informed about financial matters", according to the Financial Services Authority, website, accessed 12th May 2007.

175. HM Treasury (2004), Promoting Financial Inclusion, (HM Treasury, London).

176. Financial Services Authority (2006), Levels of Financial Capability in the UK: Results of a Baseline Survey, (FSA, London).

177. Costanzo, L. A., and Ashton, J. (2006), 'Product Innovation and Consumer Choice in the UK Financial Services Industry', Journal of Financial Regulation and Compliance, 14 (3), pp.285-303.

178. HM Treasury (2002), Medium and Long-term Retail Savings in the UK: A Review, (HM Treasury, London).

179. Cook, M., Earley, F., Ketteringham, J., and Smith, S. (2002), Losing Interest: How Much Can Consumers Save by Shopping Around for Financial Products?, Occasional Paper 19, (Financial Services Authority, London).

# Appendix D: Civil legal aid services in England and Wales[184]

## Centralised efforts at innovation to reduce costs and improve access in a conservative sector, with alternative suppliers emerging

### 1. Innovation matters in legal aid services because it is a socially vital but hugely costly sector

The cost of the legal aid system has risen dramatically in recent years, from £1.5 billion in 1997 to £2 billion in 2006 in England and Wales (equivalent to £100 per annum for every tax payer).[185] This represents around ten per cent of the total legal services market.[186] The UK now spends far more on legal aid per capita than any other country in the world, as shown in Table 4.

The explanations for this enormous differential include the increasing number of cases coming to trial as a result of changes in the criminal justice system, and the slowness of the UK to exploit ICT solutions such as electronic case management systems to reduce overheads.[188]

Costs tend to be lower in countries with public defender services (using salaried lawyers) rather than those using lawyers in private practice, as in the UK. The legal aid system is unique as a public service in that it is provided almost entirely by thousands of contracted private and third sector practitioners. These include for-profit providers (solicitors, lawyers, barristers working in private practice)[189] and not-for-profit providers (voluntary organisations and charitable bodies, such as Citizens Advice Bureaux and Law Centres).[190]

Since legal aid funding is administered through one budget, covering criminal, civil and family legal aid, rising costs of criminal legal aid have put particular strain on civil legal aid (advice and representation for people with family law, welfare benefits, debt, housing and domestic violence problems). These increases in criminal legal aid have reduced the available budget for civil and family legal advice services from £378 million in 1995-96 to £210 million in 2004-05.

At the same time, the UK Government wants the legal aid sector to be better able to respond to cross-cutting agendas around social exclusion, young people and social regeneration, in particular, ensuring that there is greater equality of access to advice and representation.[191]

**Table 4:** Expenditure on legal aid, selected countries

| | Criminal legal aid (£ millions) | Non-criminal legal aid (£ millions) | Legal aid budget per head (£) |
|---|---|---|---|
| **UK** | 1,096.48 | 822.33 | 36.86 |
| **Netherlands** | 64.07 | 74.78 | 8.62 |
| **Germany** | 60.34 | 256.38 | 3.83 |
| **France** | 55.51 | 135.69 | 3.18 |

**Source:** Flood, White, and Bacquet.[187]

180. Financial Services Authority (2000), Informing Consumers: A Review of Product Information at the Point of Sale, (FSA, London).

181. The FSA established the Financial Capability Innovation Fund in 2005 to provide grants to encourage innovative projects run by voluntary organisations to help people become more financially capable. This supports a small number of projects – but not enough to induce a systemic change in financial capability. For the range of initiatives, see Financial Services Authority (2006), Financial Capability in the UK: Delivering Change, (FSA, London).

182. National Centre for Social Research (2006), Personal Finance Education in Schools: A UK Benchmark Study, (Financial Services Authority, London); also England, J., and Chatterjee, P. (2005), Financial Education: A Review of Existing Provision in the UK, (Department of Work and Pensions, London).

183. HM Treasury (2007), Financial Capability: The Government's Long-Term Approach, (HM Treasury, London).

184. Scotland has a separate legal system to the rest of the UK. It has occasionally been included in this case study for comparison purposes or for examples of innovation that have potential to be adopted elsewhere.

185. Legal Services Commission (2006), Annual Report 2005/06, (Legal Services Commission, London). The system assisted more than two million people to afford legal representation in England and Wales in 2005-06.

186. Mayson, S. (2007), Legal Services Reforms: Catalyst, Cataclysm or Catastrophe?, (Legal Services Policy Institute, London).

187. Flood, J., White, A., and Bacquet, S. (2005), Report on International Approaches to the Defence of Indigent Persons in Criminal Cases, for Lord Carter's Review of Legal Aid Procurement, (2006), A Market-based Approach to Reform, (Lord Carter of Coles, London).

188. This said, Scotland introduced a new civil legal aid applications computer system in 2005. This system allows the Scottish Legal Aid Board to deal with casework electronically, so dealing with applications more quickly, easier tracking of the progress of applications and better case management. See Scottish Legal Aid Board (2006), Review, Scottish Legal Aid Board Annual Review 2005-2006, (SLAB, Edinburgh).

189. In March 2005 the number of solicitors' offices with LSC general civil contracts stood at 3,989. It has been estimated that up to 8,250 solicitors' offices are engaged in the advice sector, there are up to 5,000 points of contact through national agencies (such as Citizens Advice Bureaux), and 17,500 other organisations (such as local support and resource groups) also offer advice services; see Matrix Research and Consultancy (2006), Estimating the Size and Nature of the Civil Legal Advice Sector in England and Wales, (Department for Constitutional Affairs, London).

190. Law Centres employ specialists in areas of social welfare law to provide independent legal advice and representation to help individuals and local groups solve everyday problems, such as getting decent housing, dealing with discrimination, or obtaining the correct benefits. Core funders include the Big Lottery Fund, the Legal Services Commission and London Councils. The Law Centres Federation supports and promotes Law Centres in England, Wales and Northern Ireland; the equivalent body in Scotland is the Scottish Association of Law Centres.

191. The Citizens Advice Service has warned of 'advice deserts' in the Community Legal Service (CLS) – a loose structure for the co-ordination of sectors, services and funding – as a result of providers such as solicitors focusing on the most profitable markets and areas, see The Citizens Advice Service (2004), Geography of Advice, An Overview of the Challenges Facing the Community Legal Service, (Citizens Advice Service, London).

192. The Department for Constitutional Affairs (DCA) in England and Wales, the Scottish Executive's Justice Department and the Northern Ireland Court Service are responsible for policy and strategy development in the sector. In May 2007 the DCA was renamed the Ministry of Justice. The Legal Services Commission (LSC), the Scottish Legal Aid Board and the Northern Ireland Legal Services Commission manage procurement and contracts.

193. Sir David Clementi (2004), Report of the Review of the Regulatory Framework for Legal Services in England and Wales, (Sir David Clementi, London).

194. Lord Carter's Review of Legal Aid Procurement, (2006), A Market-based Approach to Reform, (Lord Carter of Coles, London).

195. See Department for Constitutional Affairs/Legal Services Commission, (2006), Legal Aid: A Sustainable Future, (HMSO, London); Legal Services Commission/Department for Constitutional Affairs (2006), Legal Aid Reform: The Way Ahead, (HMSO, London). Scotland introduced fixed fees for criminal legal aid in 1999.

## 2. Innovation is generally top-down and limited, with some organisational innovations

### 2.1. The legal aid sector is largely un-innovative

In general, the legal aid sector has been slow to adopt new working practices, and has not yet embraced the opportunities for innovation and modernisation presented by technology. The sector has been relatively unaffected by the modernisation agendas which have impacted on the rest of the public sector. These have included the development of markets and competition, more robust commissioning systems, performance management, the redistribution of tasks and the development of new roles. In general, there has been a lack of cross-sectoral learning from reform in other public sector areas.

### 2.2. Reform is being led by UK and devolved governments[192]

Successive reviews have recommended improvements to procurement and regulation. The Clementi Review in 2004 considered what regulatory framework would best promote competition, innovation and the public and consumer interest in an efficient, effective and independent legal aid sector.[193] The Carter Review of legal aid procurement in 2006 recommended that the legal aid services market should be restructured and driven by competition on quality, capacity and price to make the market more efficient, effective and sustainable.[194] To achieve this, it proposed a system of fixed and graduated fees (rather than the hours worked by the practitioner) to manage the transitional period to full market competition.

In response, the then Department for Constitutional Affairs (DCA) and the Legal Services Commission (LSC) outlined a programme of reforms to the procurement of legal aid in England and Wales.[195] These include changes to fee structures (remuneration by job or task rather than by hour), a 'unified contract' for civil legal services to bring law firms and not-for-profit agencies under the same contract conditions,[196] and ultimately a system of 'best value' competitive tendering for criminal legal aid services. The UK Government has stated explicitly that these reforms are intended to encourage efficiency and innovation in the sector.[197] At the time of writing, the Legal Services Bill, which essentially implements the main recommendations from the Clementi Review, is proceeding through the UK Parliament but may not come into force before the next general election.

These proposals are being met with considerable resistance in the sector. The first set of concerns relates to the new fee structures that are being introduced, and in particular whether these might threaten the existence of smaller practices and encourage lower quality service for clients (or even lead to clients with more difficult cases being unrepresented). The second set of concerns relates to the main provisions of the Legal Services Bill, in particular whether it might weaken the independence of the legal profession, increase the regulatory burden and costs, and make practices vulnerable to unfounded complaints.[198]

### 2.3. Example 1: Community Legal Aid Centre: Government-led innovation in one-stop-shop service provision

The LSC is piloting Community Legal Advice Centres as one-stop-shop services, delivered by a consortium of provider organisations to improve access and local responses to individuals experiencing multiple legal problems.[199] These Centres are models for the delivery of combined social and welfare legal services, including community care, debt, housing, employment and welfare benefits (early resolution can prevent the further escalation of legal and personal problems and so save downstream costs across the public sector). The Centres combine funding streams to provide a service from initial diagnosis and information provision to advice, support and legal representation in court. Contracts for the Centres are awarded to a single provider or to a group of providers that come together to form a single legal entity. For the first time, these contracts for official, government-provided services can be awarded to private sector organisations.

### 2.4. Government has also introduced some innovations using ICT in the wider legal services sector

Some ICT-based innovations have been introduced in the wider legal services sector (that is, not limited to legal aid) including:

- Community Legal Service Direct (CLS Direct), a free, publicly-funded confidential advice service that provides help and advice on a range of common legal problems through a national helpline, website and information leaflets. The helpline receives around 450,000 calls per year;

- Criminal Defence Service Direct (CDS Direct), a pilot telephone helpline that provides non-means tested legal advice direct to members of the public suspected of criminal offences and detained by the police. The LSC is currently implementing a wider roll-out of this service;

- The National Mediation Helpline and website, which provides information about mediation services in England and Wales;

- Money Claim Online (MCOL), an internet-based service of Her Majesty's Courts Service for claimants and defendants to settle small claims disputes;

- Video link services where there is a lack of accessible advice services, such as within rural communities;

- Virtual Plea and Directions Hearings pilots for Crown Court cases, allowing barristers, solicitors and other professions to submit information electronically to the court rather than attending for oral presentations (saving up to £12,000 a day).[200]

Generally, however, the legal sector has been slow to adopt ICT, for example, in the form of electronic case management systems to support court procedures, which are considerably more widespread in other countries.

### 2.5. There has been some innovation by the third sector to improve access

Outreach services are being developed as an alternative method of delivering legal advice and support to hard-to-reach and vulnerable populations that may not ordinarily be able to access mainstream advice services. Such services are delivered within hospitals, courts, colleges and community centres.

Citizens Advice Bureaux currently provide more than 2,000 outreach services in England and Wales, some in partnership with Health Authorities in GP surgeries. This has been shown to increase access to advice for people who would otherwise be effectively excluded because of age, poor health, poverty or lack of transport.[201]

The LSC is also currently conducting pilot studies for money advice outreach services, targeting areas of high financial exclusion. Services are being provided in prisons, Sure Start centres, credit unions and employment projects.

### 2.6. Alternative Dispute Resolution (ADR) is an innovative approach in the early stages of development

ADR is a collective term for a range of methods for resolving civil disputes through an independent third party, without the need for a formal court hearing. The savings in legal aid from the increased use of ADR could be significant.[202]

The DCA piloted a Small Claims Mediation Service scheme at Manchester County Court (in July 2006 this was extended to ten courts in the region). The scheme involved a trained in-house mediator providing a free service for court users, giving parties the option of a mediation session, either by phone or face-to-face appointment, before the court hearing. If the mediation was not successful, the case progressed to the hearing as normal.[203] During the June 2005 to January 2006 evaluation period, the settlement rate of face-to-face mediation was 82 per cent, while the settlement rate for all face-to-face mediations and telephone-based facilitation was 86 per cent.

In the private sector, eBay now offers an online dispute resolution service through Square Trade.[204] This is a free web-based forum on which users can attempt to resolve differences on their own, or with the help of a professional mediator.

## 3. Innovation has generally been centrally driven by concerns over costs and efforts to improve access, but is inhibited by conservatism and a lack of incentives

There have been two main drivers of innovation in the civil legal aid sector: the desire to reduce costs and improve access by government; and the desire to improve access and service levels by government and third sector organisations.

However, for many providers, the incentives for innovation are relatively weak. Providers do not (yet) compete on price, but they do need to gain new clients or retain existing ones, meaning that some compete on service provision – for instance, by ensuring that their services are more accessible through greater flexibility in opening hours, appointment times and drop-in services.

To date, narrowly-focused government priorities have tended to reinforce a reluctance

196. The new Unified Contract takes effect on 1st April 2007 for civil providers – both solicitor and not-for-profit – and from 1st April 2008 for crime providers.

197. See the foreword by Lord Falconer, Secretary of State for Constitutional Affairs and Lord Chancellor, to Legal Services Commission/Department for Constitutional Affairs (2006), Legal Aid Reform: The Way Ahead, (HMSO, London).

198. For example, The Bar Council (2007), Bar Council Steps Up Pressure for Key Changes to Legal Services Bill, press release, 16th April; The Law Society (2007), Reform of Legal Services: Law Society Concerns, The Law Society website, accessed 23rd April 2007.

199. Department for Constitutional Affairs (2006), Getting Earlier, Better Advice to Vulnerable People, (DCA, London). Research suggests that 40-50 per cent of clients of solicitors, Citizens Advice Bureaux, Law Centres and local authorities present clusters of problems that cut across specialist boundaries, see Moorhead, R., Robinson, M., and Matrix Research and Consultancy (2006), A Trouble Shared – Legal Problems Clusters in Solicitors' and Advice Agencies, (Department for Constitutional Affairs, London).

200. The current saving at the pilot court equates to four full court days per week at a cost between £10,000 and £12,000 per day.

201. Galvin, K., Sharples, A., and Jackson, D. (2000), 'Citizens Advice Bureaux in General Practice: An Illuminative Evaluation', Health and Social Care in the Community, 8 (4), pp.277-282.

202. The UK Government has estimated the cost of unresolved disputes and serious legal problems to the economy to be £3.5 billion each year; £1.5 billion in costs to public services and £2 billion in lost income through loss of employment, although the true figure is likely to be significantly higher. See Department for Constitutional Affairs (2006), Getting Earlier, Better Advice to Vulnerable People, (DCA, London).

203. See www.dca.gov.uk/civil/adr/small-claims-manchester.pdf.

204. See http://pages.ebay.co.uk/services/buyandsell/disputeres.html.

to think more imaginatively. The LSC (and previously, the Legal Aid Board) have not previously allocated funding on the basis of quality of provision.[205] Policymakers view many providers as being primarily concerned with ensuring their profitability within imposed funding constraints, yet providers often perceive a lack of support and encouragement to innovate because of the constraints of existing funding and procurement mechanisms.

Currently, law practices can only be owned by lawyers, which may restrict the adoption of innovative new working practices.[206] Professionally-trained managers might be more willing to consider innovative forms of provision or business reorganisation than those without a background in management.

Little funding is allocated to innovation outside of government priorities. One exception has been the Partnership Initiative Budget (incorporating the Partnership Innovation Budget), a short-term funding stream enabling organisations at a local level to develop projects that improve access to advice and information in civil law, in particular for vulnerable groups.[207] This was launched in 2000 by the then Lord Chancellor's Department (later the Department for Constitutional Affairs, now the Ministry of Justice). Core funding was administered by the LSC, but each project was also required to attract match funding. The second (and final) round, announced in 2001, focused on promoting 'community legal education' (educating people about their legal rights and entitlements) and on strengthening the relationships between advice providers and community groups in order to develop better services for clients.

Similarly, in Scotland, the Scottish Legal Aid Board and the Scottish Executive have funded and developed (so-called 'Part V') projects to test out different ways to improve access and deliver legal advice in local communities. For example, the Argyll and Bute Advice Network Project has trialled various innovative methods of legal advice training and delivery including video and telephone conferencing.[208] However, although these pockets of innovative practice exist, policymakers have tended to be slow in capturing innovation at the grass-roots level and disseminating new approaches more widely.

205. Some recent steps have been taken to review the quality of service delivery purchased with funding, for example, the Quality Mark and case file reviews, however these do not include a focus on the efficiency of delivery.

206. The draft Legal Services Bill proposes the development of external investment and ownership of legal firms by non-lawyers (following the Clementi Review).

207. See Legal Services Commission (2005), Innovation in the Community Legal Service, (LSC, London).

208. See Scottish Legal Aid Board (2006), Review, Scottish Legal Aid Board Annual Review 2005-2006, (SLAB, Edinburgh).

209. The Scottish Executive's Civil Law Research Team has an annual budget of approximately £300,000, which covers a broad range of topics including Family Law, Human Rights, Community Legal Services, Legal Aid, civil courts and civil procedure.

### 4. Innovation is hidden because traditional metrics neglect organisational innovation and new applications of old technologies

Day-to-day business practice or improvement in the legal aid sector isn't dependent on cutting-edge science and technology. As a result, the sector simply does not register in surveys based on traditional metrics.

A sector-relevant analogue for R&D does exist in the social science research that focuses on the sector (for example a number of systematic reviews commissioned by the DCA Research Unit to support the transfer of existing knowledge from other sectors and other countries). Aside from the DCA, there are a number of organisations that invest in and manage this research. These include departments within policy-focused bodies such as the Legal Services Research Centre and the Scottish Executive Legal Studies Research Team (now the Civil Law Research Team), as well as the various umbrella bodies representing providers, such as Citizens Advice, the Advice Services Alliance and Youth Access.[209]

### 5. Innovation could be better measured through tracking investments in developing innovation and outcome performance metrics

First, new metrics could be developed around levels of investment in research and development to support innovation, and the extent to which research evidence is used to inform change. Despite a lack of research capacity within the sector, recent years have seen an emerging evidence base relating to client needs, as well as evaluations of innovative mechanisms for delivery.

However, research alone will not drive innovation unless it translates into improved services. Therefore, metrics should include not only the investment in innovative projects, but also the funding used to disseminate and evaluate them. The tracking of the adoption of new approaches, for example, the adoption of a particular access channel such as telephone or internet services, would also provide a measure of the innovative capacity of the sector.

Second, output and outcome performance metrics should be used to assess the value of innovations. For example, it has been

suggested that outcomes measures should reflect the ability of the different components of the CLS, or the CLS as a whole, measuring:

- the extent to which services are delivered to different client groups, particularly hard-to-reach, socially excluded groups;
- the ability of the CLS to address issues that contribute to social exclusion;
- the benefits accrued by other parts of the public sector from early interventions by the CLS (for example, the cost of housing repossessions defrayed by early advice on housing debt); and
- the ability to retain people with problems within the system during the referral process.[210]

Data for these metrics could be drawn from the Legal Services Research Centre's English and Welsh Civil and Social Justice Survey (formerly the National Periodic Survey of Justiciable Problems). This is a large-scale representative household survey which explores people's experience of civil justice problems, the strategies employed to deal with them, barriers to advice, sources of financial support for advice and representation, the impact of problems and the impact of advice.[211]

### 6. Innovation could be improved by a coherent sector-wide approach and greater exploitation of ICT

Due to the publicly-funded but privately-delivered nature of the sector, any Government-led reforms will need to be complemented by innovative approaches and practices by service providers. There are three main respects in which such innovative practices might be better encouraged and supported.

First, the strengthening of incentives for innovation within the sector. As noted, there are mixed views regarding whether the current reforms being introduced will improve performance in the sector. Whatever the future impact of the reforms, at the moment they can be regarded as being focused primarily on reducing costs rather than promoting new practices and approaches. It should, however, be possible to incorporate some rewards for effective delivery via new approaches into contracts for providers.

Second, allowing non-lawyers to own businesses and non-traditional businesses to compete for contracts may also stimulate innovation. Areas of law not covered by legal aid, such as domestic conveyancing and personal injury work, are now being offered through 'virtual' alternative business structures by companies such as Halifax and the Co-operative Group. There are already some non-legal commercial organisations providing 'gateway' and legal information services to support access to the legal aid sector. Allowing non-lawyer ownership of practices might encourage existing legal aid providers to become more innovative in order to remain competitive in the market. Furthermore, encouraging new types of providers into the legal aid market, particularly those established within other commercial markets, might drive innovation through competition and the transfer of ideas from other sectors.

Third, greater scanning for innovative practice (domestically and overseas) and the championing of specific innovations. For example, one enabler of innovation is the adoption of ICT. There are potentially radical ICT-based innovations such as ICT-based dispute resolution (let alone a greater emphasis on dispute resolution generally) that could be developed and adopted more widely. Currently, there are insufficient incentives within the sector to support the development and adoption of innovations.[212]

More generally, the sector suffers from the lack of a single body with an explicit mission to promote innovation, in contrast to many other sectors.[213] This means that there is no cross-sectoral strategy for investment and support for innovation.

210. Matrix Research & Consultancy (2004), The Independent Review of the Community Legal Service, (DCA, London).

211. The survey has been conducted in 2001, 2004 and, since January 2006, on a continuous basis. Previous survey findings are presented in Pleasence, P. (2006), Causes of Action: Civil Law and Social Justice, (Legal Service Commission, London).

212. It has been estimated that a greater focus on dispute resolution could reduce the legal aid bill by many millions, £10 million in family disputes alone, see National Audit Office (2007), Legal Services Commission, Legal Aid and Mediation for People Involved in Family Breakdown, (NAO, London).

213. Such as local government (the Improvement and Development Agency) or health (the NHS Institute for Innovation and Improvement, previously the NHS Modernisation Agency).

# Appendix E: Education in England

## Centrally-led improvement initiatives, but with increasing local innovation and developing intermediary institutions

### 1. Provision of education is a significant part of UK public expenditure and has major economic and social consequences – including for innovation

In the UK in 2004-05 there were 9.96 million school pupils in 34,400 schools. There were over half a million (560,700) teachers in public sector schools in 2002-03, 82 per cent of whom (457,200) taught in England.[214]

Aside from its own process of innovation (innovation in education), the education system has been recognised as a 'framework condition' for innovation. It represents the largest single public investment in the skills, knowledge and creativity of the future workforce, and hence the UK's future capacity to innovate (education for innovation).

Increased innovation is required to improve educational achievement and foster the desire for continued learning irrespective of class, race or gender. Measured performance in UK education has improved and investment has increased in recent years, but there remains a long tail of underachievement. For example, it remains the case that less than half (43.8 per cent) of all pupils in state schools in England and Wales attain five or more GCSEs (including English and maths) at grades A* to C.[215]

### 2. Over the past decade, most sector-wide change has been centrally-driven, with few locally-developed innovations being diffused more widely

#### 2.1. Innovation has been framed by centrally-led reforms to improve standards

Reforms introduced by UK national Governments have been the dominant driver of change in the education sector over the past 20 years. In England, the National Curriculum (implemented in 1992) ended decades of localised autonomy over what children learnt at school.[216] This was followed by national testing, national inspections, and the introduction of the National Literacy and Numeracy Strategies in 1998 and 1999. These strategies used a combination of targets, performance measurement, funding streams, provision of specific teaching resources, and training to influence what teachers actually do in the classroom.

In the parlance of innovation studies, these changes were both radical and incremental: radical in the sense that they were major changes from previous structures, but incremental in the sense that they drew on existing knowledge and evidence as to effective practice in curriculum and assessment.

The increasing divergence in education policy between the UK nations in recent years may provide valuable evidence regarding the relationship between policy and innovation in the future; for example whether the current programme of curriculum reform in Scotland[217] or Northern Ireland,[218] or changes to testing in Wales,[219] allow for greater innovation by schools and teachers. Conversely, it could be the case that education policy in England, which has been characterised as more 'market-based' than the other UK nations,[220] provides a greater spur to innovation. However, at the moment, the impact of this divergence is not clear. Given other factors, comparisons between the UK nations do not always produce clear conclusions about the educational impact of different policies.[221] The full effects of different policies may take many years to emerge.[222]

214. Office for National Statistics (2007), Social Trends, No. 37, (Palgrave Macmillan, New York).

215. Department for Education and Skills (2007), DfES School and College Achievement and Attainment Tables (formerly Performance Tables), 2006, DfES website, accessed 8th May 2007.

216. Wales and Northern Ireland largely follow the National Curriculum requirements, with the exception that Welsh is also a core subject in Wales and that in Northern Ireland schools can develop additional curriculum elements to meet the needs of pupils. Control over the education system was devolved to Wales when the Welsh Assembly came into being in 1999. Scotland has its own distinctive and flexible qualification framework that is separate from the National Curriculum-based framework used in England, Wales and Northern Ireland. The curriculum in Scotland is not set by law, placing responsibility on local authorities and schools. What and how students are taught is based on guidelines prepared by Learning and Teaching Scotland on behalf of the Scottish Executive.

217. Scotland is currently pursuing its biggest education reform programme for a generation under the Scottish Executive's 'Ambitious, Excellent Schools' agenda. The Curriculum for Excellence is central to this agenda; it is the programme of work that is reviewing the current curriculum and aims to provide more freedom for teachers, greater choice and opportunity for pupils, and a single coherent curriculum for all young people aged 3-18.

218. A review of the curriculum in Northern Ireland began in 1999. The Council for Curriculum Examinations and Assessment (CCEA) launched a series of radical proposals for a new Northern Ireland curriculum focused on developing skills and competencies, and the capacity for self-learning. The changes to the curriculum are being implemented from 2007-08 onwards.

219. Wales has scrapped compulsory tests for seven year-olds (teachers can decide when and how to administer them), and tests for 11 and 14 year-olds will be phased out by 2007-2008. All testing will be replaced by teacher assessments and a new skills test for ten year-olds focusing on numeracy, literacy and problem-solving. Secondary school league tables were abolished in Wales in 2001.

### 2.2. The UK Government has recently encouraged innovation to further improve standards

More recently, policy in England in particular has placed emphasis on stimulating and supporting greater innovation in the sector, albeit still largely within centrally-determined structures and systems. A new system of innovation in education is now emerging, described as 'disciplined innovation'.[223] This combines local and national elements with some local innovation that can be taken-up by collaborative networks or federations of schools (discussed further below).

In England, the Innovation Unit has been an increasingly important component of this system. The Innovation Unit was set up within the Department for Education and Skills (DfES) in 2002 to support schools in developing innovative projects and putting their emerging ideas into practice, and to disseminate good practice across the school system.[224] Most notably, the Unit has championed 'personalised learning'[225] and school-to-school networking and collaboration.[226] It has supported schools and local authorities in working together more effectively, promoted models of innovative practice and provided resources for schools to develop this agenda. One example is its current 'Next Practice' (radical) series of development projects (17 field trial sites for radical rather than incremental innovations in practice).

Innovative teaching practice and forms of organisation have also been encouraged and supported as part of other centrally-led initiatives. These include personalised learning, investments in ICT in teaching, learning and school management (including the National Grid for Learning, the e-Learning Strategy and Curriculum Online), the school building investment programme Building Schools for the Future (BSF), and the teaching practices promoted via Teachers TV (a television channel and website dedicated to teachers' continuing professional development).

### 2.3. Innovation often remains localised, incremental, and focused on processes and organisation

Radically different models of curriculum, assessment or school organisation are rare. Most innovation is incremental, in the form of schools and teachers adapting and improving their practice to meet the needs of pupils.

There is a large volume of relatively small-scale but valuable innovation in the way schools organise themselves, the curriculum they offer and the way they deliver it. This has sometimes been facilitated by the increasing devolution of resources and the flexibility schools have over their deployment; in the hands of effective and imaginative headteachers, this flexibility offers some latitude to introduce innovations.

For example, Fulwood High School and Arts College near Preston has established a 'Learning Laboratory' to provide workshops on the application of the arts for gifted and talented pupils from all local schools in Years 5 to 11.[227] These courses are delivered by local businesses, lecturers and creative industries professionals in and out of school time. The Laboratory also provides arts-related training for teachers, trainee teachers, and supply teachers.

Descriptions of these locally-developed innovations are often available on websites such as the DfES Standards site, TeacherNet, the Innovation Unit and the Curriculum for Excellence in Scotland. However, such innovations are rarely actively diffused through the system. In many cases they do not even spread throughout an organisation; teachers commonly report that they haven't shared their own innovations (for example, a novel way of teaching a particular topic) with colleagues in the same school.

### 2.4. Intermediary organisations are supporting partnerships and collaborations for innovation: D and R Networks and Networked Learning Communities

The emerging system of innovation is increasingly relying on partnerships and collaborations between schools. These are often supported by intermediary organisations such as the National College for School Leadership (NCSL) and the Specialist Schools and Academies Trust (SSAT).[228] Practitioners consistently cite these opportunities for collaborative development and learning from their peers as being more effective than any other form of continuing professional development (CPD).[229]

For example, in October 2005 the SSAT launched Development and Research (D and R) Networks to support schools in developing 'next practice' in personalising learning.[230] In each of the Trust's 11 regions, five hub schools were chosen to create and lead D and R networks, each taking responsibility for one of five so-called 'gateways' to personalising learning: student voice; assessment for learning; learning to learn; new technologies; and curriculum. Greenford High School, in

220. Given its greater emphasis on performance data, competition between schools, and a more politicised public debate over standards, see Reynolds, D. (2002), 'Developing Differently: Education Policy in England, Wales, Scotland and Northern Ireland', chapter six, in Adams, J., and Robinson, P. (eds.) (2002), Devolution in Practice: Public Policy Differences within the UK, (IPPR/ ESRC Devolution Programme, London/ Edinburgh).

221. Raffe, D., and Byrne, D. (2005), Policy Learning From 'Home International' Comparisons, (Centre for Educational Sociology, University of Edinburgh, Edinburgh).

222. As noted in section four, Mulgan, G. (2007), Ready or Not? Taking Innovation in the Public Sector Seriously, (NESTA, London).

223. Barber, M. (2006), 'Innovation Depends on Disciplined Thinking', Guardian Unlimited website, accessed 1st May 2007. This can be seen as a third phase in innovation in the contemporary education system. The first phase was the localised experimentation and developments in educational theory of the 1960s and 1970s. The second phase was the centrally-driven changes in the 1980s and 1990s aimed at improving attainment with a large data and monitoring aspect, such as the National Curriculum and national testing.

224. Morris, E. (2002), Diversity and Innovation in Education, (Department for Education and Skills, London). The Unit is funded by the Department for Education and Skills but is now a not-for-profit company.

225. Officially defined as: "…the drive to tailor education to individual need, interest and aptitude so as to fulfil every young person's potential", see Department for Education and Skills (2004), A National Conversation about Personalised Learning, (DfES, London). This could, for example, mean agreed individual learning targets to tackle underperformance, or specialist subject enquiry projects for those pupils who are performing better than their peers.

226. The Innovation Unit has focused on four main areas of activity: practitioner support; policy and practice in partnership; strategic networking and collaboration (at school and system level); and knowledge management and communication.

227. See 'The Learning Laboratory', The Innovation Unit website, accessed 8th May 2007.

228. Evaluation studies have suggested that specialist schools have enabled more innovation in teaching and learning, see Department for Education and Skills (2005), Excellence in Cities, The National Evaluation of a Policy to Raise Standards in Urban Schools 2000-2003, (DfES, London). However, a recent National Audit Office report suggested that so far academies (independent state-funded schools with outside sponsors such as businesses or churches) have conducted little collaboration with neighbouring schools, see National Audit Office (2007), The Academies Programme, (NAO, London).

229. Fielding, M., Bragg, S., Craig J., Cunningham I., Eraut, M., Gillinson S., Horne, M., Robinson, C., and Thorp J. (2005), Factors Influencing the Transfer of Good Practice, DfES Research Report No. 615, (Department for Education and Skills, London).

230. The SSAT, in partnership with the DfES, also manages the Leading Edge Partnership Programme (LEPP), which provides incentives for schools to work together on specific issues. This replaced the previous Beacon Schools programme.

231. Specialist Schools and Academies Trust (2006), Annual Report 2005/06, (SSAT, London).

232. See Jackson, D. (2007), 'Networked Learning Communities, Collaboration by Design', chapter six in Parker, S., and Gallagher, N. (eds.), The Collaborative State, (Demos, London).

233. McGrane, J. and McGregor, J. (2005), Southampton Leading for Learning NLC, Annual Enquiry 2005 Case Study, (NCSL, Nottingham).

234. Earle, L., Watson, N., Levin, B., Leithwood, K., Fullan, M. and Torrance, N. (2003), Watching and Learning 3, OISE/UT Evaluation of England's National Literacy and Numeracy Strategies, Third and Final Report, (Ontario Institute for Studies in Education, University of Toronto, Ontario).

235. Hill, R. (2006), The Matter of How: Change and Reform in 21st Century Public Services, (Solace, London).

236. For instance, the head of the qualifications authority for England has suggested the need for a radical scaling-back of the assessment framework, see The Times (2007), 'It's Time to Abandon School Test Regime, Says Exam Watchdog', 21st March. An opportunity for greater flexibility for schools in assessment may be emerging in the piloting of the Making Good Progress initiative in England, see Department for Education and Skills (2007), Making Good Progress: 10 Local Authorities Selected for Groundbreaking Pilot, press release (DfES, London).

Ealing, London, became the London regional hub for student voice, and developed new ways of working with students.[231] A cohort of student observers went through a training process, designing their own documents and protocols, and became a significant part of the school's programme of monitoring and developing teaching and learning. The students also took part in consultation on the school's new curriculum, which offers new ways of working and greater choice and flexibility. Students played an active role in the school's assessment for learning, and teaching and learning action research groups, both evaluating work and proposing new ways forward.

Similarly, between 2002 and 2006, the NCSL established 137 networked learning communities (NLCs) of peer-to-peer learning for school leaders.[232] NLCs are local collaborations between schools and other partners such as universities to develop and research improvements in teaching and learning in response to local challenges (the outcomes of which might also be useful to other areas). For example, one NLC in Southampton brought together pupils, teachers, headteachers and local education authority (LEA) staff to examine how teaching and learning in maths and English could be improved.[233] Attainment data showed that schools in the network improved their results in Key Stage 2 tests scores in English and maths well above the average for non-NLC schools. New approaches developed through the NLC included focusing on the development of thinking skills in maths rather than just working through traditional maths exercises.

## 3. The predominance of centrally-led initiatives has had a mixed impact on real and perceived opportunities for innovation in education

Centrally-led reforms have increased focus on improving performance. As a result, reforms such as the National Strategies have helped to develop teachers' expertise and experience in evidence-based practice (the regular use of data to inform planning, evaluate the impact of practice and so on).[234] The volume and quality of pupil level data expressing the needs, achievements and progress of students has grown dramatically. This in turn has enabled the more effective targeting of efforts at innovation and the evaluation of their outcomes.[235]

However, a preference for centrally-led initiatives has lessened the real and perceived opportunities for teachers and schools to experiment with, and adopt, more radical new practices or forms of organisation.[236] The Gilbert Review (which was charged with establishing a vision of what personalised teaching and learning might look like in schools in 2020) stated that many primary and secondary schools perceived the National Curriculum as too prescriptive, with insufficient scope for local flexibility.[237]

However, the Review also noted that many schools do not use (and perhaps are not aware of) the considerable flexibilities that do exist within the current system.[238] For instance, since the introduction of Power to Innovate (PtI) licences (which allow schools to 'disapply' (not adhere to) specific legislation to facilitate innovation),[239] 15,000 information packs have been downloaded but only a very small number of orders have been granted (18 in the period 2002-2006, affecting just 186 schools).[240] The reason may lie in the fact that, on learning more about the licences, many schools realised that it was not necessary to have a licence in order to innovate in the way they had intended.

Despite the relative increase in collaborations, there remains a lack of mechanisms for the diffusion of innovations developed at the local level, and relatively few schools have been involved in organised collaborations (see Section 5).

## 4. Innovation is hidden in education because it is not normally driven by abstract research but centrally-led reforms and local development

### 4.1. Traditional metrics are not applied to education but there are parallels to R&D in educational research

Traditional innovation metrics focus on primarily private sectors. Education, as a primarily publicly-funded and provided sector, is not included in surveys that are based on traditional indicators. Moreover, the education system does not have an explicitly earmarked R&D budget or a coherent R&D strategy. However, it does have a research capacity, in the research conducted or funded by governments, national agencies, intermediary organisations, and the research conducted in universities.

This research expenditure totals well over £80 million per year in England alone, encompassing the monies spent by this range of organisations on research and evaluation (£53 million),[241] and academic research programmes with a significant R&D dimension such as the Economic and Social Research Council's Teaching and Learning Research Programme (£30 million in the period 2000-2009).[242] This is equivalent to an R&D intensity of 0.0003 per cent (in comparison to the HM Treasury target for private sector organisations of 2.5 per cent by 2014).[243]

**4.2. However, much innovation in educational practice is driven by centrally-led initiatives and local developmental work rather than research and evaluation**

Only a small proportion of educational research has a direct impact on everyday classroom practice and school management. In particular, there is a generally acknowledged and long-standing gap between university-based academic research and classroom application.[244] This is institutionalised by the separation of academic research in universities from professional practice in schools. Academia still tends to value formal research knowledge published in academic journals, while schools value informal knowledge embodied in practice.

## 5. New innovation metrics could be based on outputs of intellectual property and the factors that help to develop new practices

Although pupil attainment (and related metrics such as attendance, behaviour and participation) are useful (if imperfect) proxies for effectiveness, agreed metrics for innovation in education do not yet exist.

Collaborations between schools, often supported by intermediary organisations, could be measured as a proxy for innovation. These collaborations are often a necessary (if not sufficient) condition for effective innovation, and both help to develop and diffuse innovations.[245] The SSAT and DfES Leading Edge Partnership Programme (LEPP) involves more than 1,000 schools (200 lead schools and 800 partner schools); this represents nearly one-third of all secondary schools in England.[246] The NCSL's Networking Learning Communities included 1,564 schools in 93 LEAs across England (around six per cent of all schools in England).[247]

Another way of measuring the capacity of the system to diffuse innovation would be to calculate the number of school practitioners in leadership and partnership roles beyond their own schools, because these interactions are crucial for developing and absorbing innovations. Formal examples could include School Improvement Partners, Consultant Leaders, Advanced Skills Teachers, National Leaders of Education, Executive Headteachers, and members of subject associations. More informal ones would include those teachers leading rigorous and challenging joint working groups within and across networks of schools, as well as other robust collaborative arrangements.[248]

Such metrics would not, of course, account for all interactions that encourage innovation. Most interactions between schools will be informal and largely unrecorded, and, as noted, it is these that practitioners cite as being more effective than other forms of CPD.[249]

Intellectual property (IP) production may form a useful proxy for an output from innovative activity. There are few patents in the state school system but there is considerable IP at all levels, some of which is protected, usually by copyright. Increasingly, organisations and individuals are seeking to exploit the IP derived from localised innovation in the form of marketable products and consultancy services. There are two areas where this could be directly measured: proprietorial software licences for teaching and learning materials; and trademarked and protected professional development, training and school improvement services. Of the former, there are more than 14,700 software resources available that have been officially authorised for use in schools in England alone.[250] Monitoring the increase or decrease in annual production of similar materials would form one reasonable metric for innovation output.

One possibility for achieving an overview of emerging intellectual property would be the revival and extension of the (now discontinued) National Educational Research Forum's (NERF) proposal for an 'evidence centre'. This would collect, evaluate and synthesise the products of both education research and practice-led innovation. It would act as a resource base for the profession and make the best research available in accessible formats.[251]

Such metrics would not, of course, account for all innovation within education. Nevertheless, in combination, they would usefully contribute

237. Teaching and Learning in 2020 Review Group (2006), 2020 Vision, Report of the Teaching and Learning in 2020 Review Group (DfES, London).

238. For example, the time required for each subject is not statutory and there is no requirement that curriculum content should be taught in subject blocks. Schools are able to open up curriculum choice to pupils through project work, out-of-classroom activities and offering clubs within and beyond the school day. The Innovation Unit's dialogue with schools has revealed that schools are not aware of the opportunities to innovate that are open to them without the need for a licence.

239. Innovation Unit (2006), Power to Innovate: Guidance for Applicants (updated), (DfES, London).

240. Innovation Unit (2003, 2004, 2005, 2006), Powers to Facilitate Innovation Annual Reports, (DfES, London).

241. All figures for 2005-06, from National Educational Research Forum (2005), Sharing Research Agendas, Compiled Information from Key Organisations, working paper 6.4, (NERF, London); in addition there is the Innovation Unit's budget of £8.8 million and the SSAT's budget of £9.5 million. There have been similar initiatives in the other UK nations, such as the £2 million five year Applied Educational Research Scheme (AERS) in Scotland in 2004-06 funded by the Scottish Executive Education Department and the Scottish Higher Education Funding Council. Welsh Assembly Government's Education and Skills Department research budget is administered through the Educational Research Services Budget (ERS) and is £1.6 million annually. In Northern Ireland, the Department of Education's educational research budget for 2007-08 is £332,000.

242. TLRP website www.tlrp.org.uk, accessed 28th February 2007. For comparison, up to £500 million has been spent on the national strategies, including £100 million on 'what works'-based resources for teachers and schools (books, worksheets, lesson plans and so on), as calculated by Earle, L., Watson, N., Levin, B., Leithwood, K., Fullan, M. and Torrance, N. (2003), Watching and Learning 3, OISE/UT Evaluation of England's National Literacy and Numeracy Strategies, Third and Final Report, (Ontario Institute for Studies in Education, University of Toronto, Ontario).

243. Based on a UK-wide expenditure on schools of £36.5 billion in 2004-05, see National Statistics (2006), Education and Training Statistics for the United Kingdom, (National Statistics, London). HM Treasury, (2004) Science & Innovation Investment Framework 2004 – 2014, (HM Treasury, London).

to an understanding of the innovativeness of the sector and provide clearer indications as to returns on investment in innovation.

## 6. Innovation could be increased by supporting more developmental work led by teachers and schools

The education sector is notable for the extent of school-level innovation that does not reach a larger scale. Combating this will require more 'D&R', that is, more development-led experimentation by teachers that might lead to formal research work, rather than the other way around. For this to occur, such work needs to be better funded and supported, and schools and teachers need to be given incentives to engage in it.

Strengthening of the intermediary 'market' in innovation would improve the generation and diffusion of new ideas. The Gilbert Review noted that the responsibility for innovation in learning and teaching is distributed widely among bodies with different terms of reference and remits; it is not clear who is ultimately responsible for co-ordinating, capturing and evaluating innovative practices.[252] Organisations like the Innovation Unit and SSAT may be increasingly effective at bringing together schools that seek to experiment and provide support and encouragement for innovation. However, even together, they have relatively little funding and influence compared to the scale of the sector and the challenge it represents. Offering more of the available budget for educational research to consortia of schools engaged in D&R with other partners could have a significant effect. Similarly, making a proportion of capital investment available to groups of schools that work with other partners and intermediaries, to spend on innovative projects and the subsequent scale-up of their outcomes, could enhance levels of adoption and diffusion across the system.

Encouraging more innovation will require system-wide change that will only be achieved if reflected in adjustments to existing accountability and inspection systems. These would need to develop to reflect the collaborative nature of innovation and the importance of locally-generated innovations as well as the implementation of top-down initiatives.

Finally, current initiatives, such as Building Schools for the Future (BSF), 14-19 reform, extended schools and investments in ICT, need to be exploited for their potential to stimulate innovation. For example, the BSF programme of school redesign and refurbishment could be better connected to innovative approaches to the curriculum, teaching and learning, and assessment.

244. Hargreaves, D. (2003), Education Epidemic, Transforming Secondary Schools Through Innovation Networks, (Demos, London). See also Hillage, J., Pearson, R., Anderson, A., and Tamkin, P. (1998), Excellence in Research on Schools, DfEE Report No. 74, (Department for Education and Employment, London), and Tooley, J., and Darby, D. (1998), Educational Research - A Critique, (Ofsted, London).

245. See Rudd, P., Lines, A., Schagen, S., Smith, R., and Reakes, R. (2004), Partnership Approaches to Sharing Best Practice, LGA research report 54, (National Foundation for Educational Research, Slough).

246. Specialist Schools and Academies Trust/Department for Education and Skills (2007), Leading Edge Partnership Programme, Programme Guide, (SSAT/DfES, York/London).

247. National College for School Leadership (2004), Networked Learning Communities, Programme Review of Data and Evidence, (NCSL, Nottingham).

248. Earle, L., Katz, S., Elgie, S., Jafaar, B., Foster, L., with Sammons, P. and Mujtaba, T., (2006), How Networked Learning Communities Work: Volume 1 – The Report, (Aporia Consulting, Toronto).

249. Fielding, M., Bragg, S., Craig J., Cunningham I., Eraut, M., Gillinson S., Horne, M., Robinson, C., and Thorp J. (2005), Factors Influencing the Transfer of Good Practice, DfES Research Report No. 615, (Department for Education and Skills, London).

250. This figure is for 2004 and relates to the number of resources that are eligible for eLearning Credits (eLCs) – money given to schools by the Government to purchase resources – registered on the Curriculum Online website. See Content Advisory Board (2005), Report to the Secretary of State, Report No. 3, (Becta, Coventry).

251. Peckham, M., and Morris, A. (2003), NERF Working Paper Number 3.1, NERF Strategic Proposals, NERF November 2003, (NERF, London); Andrews, R., and Morris, A. (2005) NERF Working Paper 4.1, Report of the Working Group on A National Evidence Centre for Education, On Behalf of the NECE Working Group, NERF December 2005, (NERF, London). NERF was formed in 1999 to develop a national strategy for educational research to improve its quality and impact. It came to an end in 2006.

252. Teaching and Learning in 2020 Review Group (2006), 2020 Vision, Report of the Teaching and Learning in 2020 Review Group (DfES, London). The Gilbert Review included the recommendation that the Secretary of State commission a group to report on what action needs to be taken to establish a better system of innovation in learning and teaching.

# Appendix F: The rehabilitation of offenders

## Overwhelming demand and criticality of delivery as barriers to innovation

### 1. The UK's system of rehabilitation is struggling to reduce re-offending

#### 1.1. Re-offending rates are high and lead to massive economic and social costs

More than 55 per cent of prisoners who return to the community are reconvicted within two years.[253] Three out of every four new criminal convictions are reconvictions of previously convicted offenders. It has been estimated that offending by convicted offenders costs the UK £11 billion each year.[254]

#### 1.2. The prison service – a potential site for the reduction in re-offending – is increasingly overstretched

The prison service costs £1.8 billion and employs approximately 48,500 staff in England and Wales. In Scotland, the budget is £280 million with 4,000 staff, and the Northern Ireland Prison Service costs £136 million with 2,100 staff.

The use of prison has risen sharply since 1992, not in response to rising crime or numbers in court but due to increased penalties for offences.[255] During 2005, a total of 101,236 people received prison sentences[256] and 85,000 were released from prison.[257] The prison population in England and Wales (at 79,996) is the highest in Western Europe apart from Luxembourg (for comparison, the prison population in 1991 was 40,000).[258] In Scotland the prison population is 7,206 and in Northern Ireland it is 1,442.[259]

In England and Wales, 87 prisons (62 per cent of the total) were overcrowded at the end of October 2006. In 12 prisons, the population was at more than 150 per cent of certified normal accommodation.[260] Early 2007 saw prisoners being housed in police and court cells due to a lack of prison places. In his annual report for 2005-06, the Chief Inspector of Prisons argued that the increase in numbers, particularly of those serving indeterminate sentences,[261] is producing "…an alarming and potentially extremely damaging combination".[262]

#### 1.3. This reliance on prisons does not appear to reduce re-offending

First, overcrowding in prisons makes it more difficult for the prison service to focus on reducing re-offending alongside its responsibilities to punish serious crime and protect the public.[263] In addition to the strain on resources, over-crowding causes more transfers of prisoners between facilities, which disrupts rehabilitation work. Second, prison sentences can make the factors associated with re-offending worse; imprisonment can mean losing a home, work, financial stability and family contacts, and gaining access to drugs and other offenders.[264] Third, concentrating resources overwhelmingly on prisons effectively diverts them away from being spent on the development of other (potentially more effective) ways of addressing re-offending.[265] For instance, out of the entire prison population of England and Wales, only 7,445 prisoners completed programmes in prison that are accredited as effective in reducing re-offending (Figure 5).

#### 1.4. There has been major recent reform in this area, but its impact is as yet unclear

The Criminal Justice Act 2003 was described as the most significant overhaul of the criminal justice system in a generation. It was designed to provide longer prison terms for violent and dangerous offenders and alternatives to imprisonment for less serious offenders (for example, a new generic community

253. Home Office (2007), Re-offending of Adults: Results from the 2004 Cohort, (Home Office, London).

254. Social Exclusion Unit (2002), Reducing Re-Offending by Ex-Prisoners, (Social Exclusion Unit, London).

255. Prison Service Pay Review Body (2007), Sixth Report on England and Wales March 2007, (The Stationery Office, London).

256. Home Office Statistical Bulletin (2007), Sentencing Statistics 2005, England and Wales, RDS NOMS, (Office of National Statistics, London).

257. National Offender Management Service (2005), Offender Management Caseload Statistics, Quarterly Brief October to December 2005, England and Wales, (Home Office, London).

258. National Offender Management Service (2007), Prison Population & Accommodation Briefing For 13th April 2007, (NOMS, London). The most recent projections suggest a prison population of up to 106,550 by June 2013, see de Silva, N., Cowell, P., Chow, T. and Worthington, P. (2006), Prison Population Projections 2006–2013, England and Wales, Home Office Statistical Bulletin 11/06, (Home Office, London).

259. National prison service websites, accessed 9th February 2007.

260. Prison Reform Trust (2006), Bromley Briefings Prison Factfile, November 2006, (Prison Reform Trust, London).

261. In an indeterminate sentence, a minimum tariff for incarceration is handed down but the defendant must satisfy the authorities that he or she is fit for release and does not pose any threat to the community. The new power was instituted as part of the measures in the Criminal Justice Act 2003 and has been in use since April 2005.

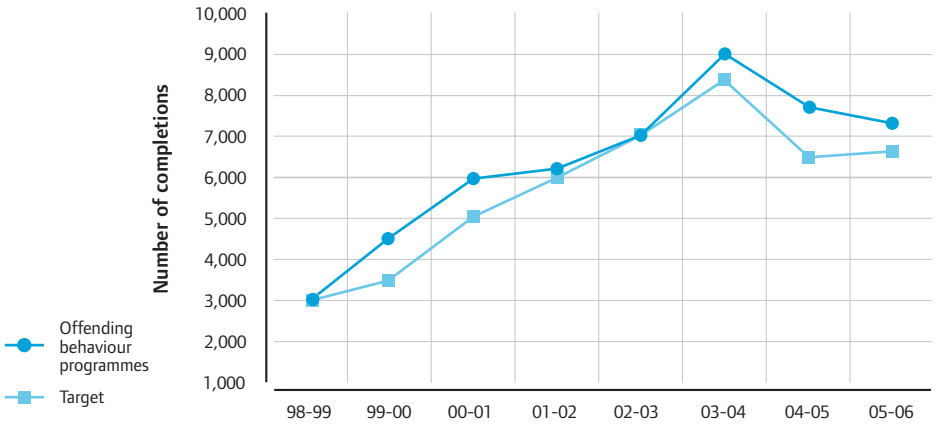
262. p.6, HM Inspectorate of Prisons (2006), HM Chief Inspector of Prisons for England and Wales Annual Report 2005/2006, (The Stationery Office, London).

263. As acknowledged by the Chief Inspector of Prisons, Anne Owers, see Home Affairs Select Committee (2004), Rehabilitation of Prisoners, First Report of the Home Affairs Select Committee, 2004-05, November. Similarly, see the statements by Tony Cameron, former chief executive of the Scottish Prison Service, at http://news.bbc.co.uk/1/hi/scotland/6557971.stm.

264. As noted by the Social Exclusion Unit (2002), Reducing Re-Offending by Ex-Prisoners, (Social Exclusion Unit, London).

265. Ibid.

**Figure 5:** The number of prisoners completing programmes accredited as effective in reducing re-offending in publicly-run prisons in England and Wales, 1998-2006




**Source:** HM Prison Service.[266]

sentence, intermittent or weekend prison and new sentences of 'custody plus' providing for post custody supervision for short prison terms). High profile cases have prompted the Government to undertake a fresh review of sentencing.[267]

## 2. Innovation in rehabilitation is sporadic and does not diffuse through the system

### 2.1. Official reviews have called for a new approach to reducing re-offending

No single organisation has the lead responsibility for reducing offending. This was identified as a major weakness in the system by the Carter Review of correctional services in 2004. This found that the management of offenders often broke down in the transition between prisons and probation because prisons and probation were managed separately.[268]

### 2.2. The sector's poor performance has prompted Government to introduce a significant re-organisation

The UK's national Governments have recognised that the performance of the system needs to improve. The response to the Carter Review was to re-organise the prison and probation services under the National Offender Management Service (NOMS).[269] NOMS is the system through which correctional services and interventions are now commissioned and provided.[270] Nine Regional Offender Managers (ROMs) in England and a Director of Offender Management in Wales will purchase services from probation areas, prisons and other organisations providing services to offenders.[271] In Scotland, NOMS has been accompanied by the establishment of eight new Community Justice Authorities, which bring together local authorities, the Scottish Prison Service and partners in the voluntary sector to produce an integrated approach to reducing re-offending.[272] This represents a more partnership-based (rather than market-based) system than exists in England and Wales.

This system is itself an important organisational innovation.[273] A single offender manager will be responsible for meeting the rehabilitation needs of the offender, irrespective of whether their sentence is in custody or the community. One of the aims of this re-organisation is to promote and harness innovation from the non-statutory sector through the introduction of a market in probation services.[274]

### 2.3. Individual prisons have introduced some innovations but the prison system as a whole is not innovative

Currently, there is relatively little innovation in rehabilitation in prisons. HM Prison Service has driven a number of innovative initiatives in other areas, some of which have ring-fenced funding. For instance, Prisoner Information Point multimedia kiosks have been developed by the Prison Service and BT. The kiosks are intended to help reduce incidences of self-harm and re-offending by providing prisoners with easier access to advice and information.

Specific examples of other innovations developed in individual prisons include peer (prisoner-to-prisoner) housing advice in Kent provided by The Prison Reform Trust and the

266. HM Prison Service (2006), Annual Report and Accounts, April 2005-March 2006, (HM Prison Service, London). These figures do not include privately-run prisons, or sex offender treatment programmes.

267. For example, Home Office (2006), Making Sentencing Clearer – A Consultation and Report of a Review by the Home Secretary, Lord Chancellor and Attorney General, (Home Office, London); also Home Office (2006), Rebalancing the Criminal Justice System in Favour of the Law-abiding Majority - Cutting Crime, Reducing Re-offending and Protecting the Public, (Home Office, London).

268. Carter, P. (2004), Managing Offenders, Reducing Crime, A New Approach, (Prime Minister's Strategy Unit, London).

269. Home Office (2004), Reducing Crime – Changing Lives, The Government's Plans for Transforming the Management of Offenders, (Home Office, London).

270. At this time, the Offender Management Bill is under consideration by Parliament. If passed, it allows for greater commissioning of offender management services from a range of providers, including the private and voluntary sectors. Currently only probation boards can make provision for probation work, either providing services directly or contracting it out (between two and three per cent is contracted out, although the Government is requiring this to increase to five per cent for 2006-07). Under the new legislation, probation boards would be replaced by trusts who, along with others, could be contracted to deliver probation services.

271. This will be supported by an end-to-end offender management IT system, the National Offender Management Information System (C-NOMIS).

272. In Scotland local authorities, often working in conjunction with the voluntary sector, are the main agencies managing community sentences and the rehabilitation of offenders into the community. Community Justice Authorities, which will be made up of locally elected councillors, will be required to produce area plans on how this cooperation will be realised, and funding for the Criminal Justice Social Work will in future be channelled through them.

St Giles Trust; serving prisoners being allowed to open bank accounts towards the end of their sentences at Forest Bank prison in a pilot supported by The Co-operative Group; and the Shannon Trust's Toe by Toe literacy scheme used by the Cheshire Probation Service. Such innovations can be crucial in reducing re-offending; research suggests, for example, that offenders without basic skills education or training may be three times more likely to re-offend than others.[275]

When innovation does occur in individual prisons, it is more often driven by demands on the institution and the needs of its particular population than by central initiatives or research. Examples include a dedicated support worker for elderly prisoners at Frankland, innovative approaches to assessing prisoners from travelling communities for early release at Blakenhurst, and a social worker (in whose appointment young people were actively involved) at Warren Hill Young Offender Institution.

Often, when innovative approaches have been used, they have been motivated more by the need to reduce the prison population on account of the financial cost, rather than by the need to reduce re-offending. Perhaps the most high-profile example in recent years is electronic monitoring. This is currently used both to monitor curfews imposed as a sentence and the home detention curfew early release scheme.[276]

In Scotland, LINKS centres are designed to ensure greater innovation in the local management and support of offenders, based on a strong relationship between prisons and the local community of which they form part. In contrast to England and Wales, where offenders are taken away from the local system of health, education, social services, employment and housing, the LINKS centres try to maintain these connections with a view to successful resettlement on release.

**2.4. The voluntary sector can be a significant source of innovation**

An estimated 900 voluntary and community sector (VCS) personnel work in prisons, many with a focus on rehabilitation.[277] More than 700 education projects are delivered by 286 organisations in 110 prisons.[278] The VCS also contributes specifically to innovation through the Butler Trust.[279] However, the approaches developed by such groups do not tend to be diffused beyond individual prisons or groups of prisons in which these groups operate.

This is despite the fact that historically many aspects of the current system of offender management derive from innovations developed by the charitable and voluntary sector. These include the Probation Service, half-way houses and hostels, and visitor centres. More recent examples include first night in custody and listener schemes that are designed to reduce the risk of self-harm or suicide.

**2.5. Private provision of prisons has not led to more innovative approaches**

Only a small amount of innovation has been contributed by private sector organisations that run prisons. This has come mainly in the recruitment and deployment of staff and use of technology, but rarely in the daily routines of prisons.[280] By contrast, other parts of the private sector have played an important role in investing in employment training programmes in prisons. The best known examples are the Transco National Grid programme for training gas fitters which started at Reading prison in 2000, and the Toyota car mechanics course at Aylesbury Young Offender Institution.[281]

**2.6. Research has led to the development of some innovative approaches and evaluation is increasingly undertaken but results have been mixed**

Research conducted and commissioned by the Home Office and universities has sometimes played an important role in innovation. Examples include the development of the Offender Assessment System (OASys) – the main instrument for assessing the needs of and risks posed by prisoners – and the development of the 'What Works' agenda through evaluations of rehabilitation programmes in prisons and the community.

Since 1996, the Correctional Services Accreditation panel of experts has been responsible for accrediting programmes aimed at reducing re-offending.[282] The panel has accredited over 30 programmes but evidence of effectiveness has been limited when they have been rolled out. This is often due to the embedded influence of traditional approaches and the continuing necessity for security and control.

**2.7. More innovative approaches have been employed in the past but have been restricted through political pressures**

During the 1980s, sustained practitioner-led innovation produced major falls in the number of juvenile offenders sent to prison in England and Wales. These innovations

273. In addition, in May 2007 responsibility for probation, prisons and preventing re-offending moved from the Home Office to the Department for Constitutional Affairs, renamed the Ministry of Justice. This was intended to provide a stronger focus on the criminal justice system and on reducing re-offending. In Scotland, the Scottish Executive Justice Department is responsible for all matters of the law of Scotland, including civil and criminal law and justice, social work services, police, prisons, courts administration, legal aid, and liaison with the legal profession. The Northern Ireland Prison Service is an executive agency of the Northern Ireland Office.

274. Home Office (2006), Improving Prison and Probation Services: Public Value Partnerships, (Home Office, London). NOMS has a target to reduce re-offending by five per cent by 2007-08, working towards ten per cent by the end of the decade.

275. The Learning and Skills Council (LSC) has also recently become responsible for commissioning skills training provision for prisoners through its regional bodies.

276. The development of the 'electronic bracelet' was inspired by a Spider-Man comic strip in 1977 read by Judge Jack Love, a New Mexico district court judge. (In the comic strip, Spider-Man was being tracked by a transmitter worn on his wrist). Judge Love persuaded Michael Goss, a computer salesman, to develop a similar device.

277. Setkova, L., and Sandford, S. (2005), Inside and Out – People in Prison and Life After Release, (New Philanthropy Capital, London).

278. Department for Education and Skills (2005), Government Response to the House of Commons Education and Skills Committee Report – Prison Education, (The Stationery Office, London).

279. The Butler Trust, founded in 1985, identifies and promotes excellence and innovation amongst staff and volunteers in prison and probation, develops and disseminates best practice and provides professional and personal development opportunities for staff and volunteers through an annual awards scheme.

280. National Audit Office (2003), The Operational Performance of PFI Prisons, (National Audit Office, London). However, the privately-operated Dovegate prison in Staffordshire is the only privately operated facility in the UK that has a performance bonus linked to reducing re-offending rates.

281. The Transco programme is a rare example of an innovation that is being scaled-up. Re-offending rates for those completing the scheme are 6.25 per cent compared to 70 per cent for young offenders on average. The scheme is being expanded to other prisons with the support of additional companies. From 2006, 1,300 offenders will be trained and employed by five industrial sectors.

282. Formerly the Prison Service General and Sex Offender Treatment Programme Accreditation Panel, then the Prison Probation Services Accreditation Panel.

283. Allen, R. (1991), 'Out of Jail: The Reduction in the Use of Penal Custody for Male Juveniles 1981-88', Howard Journal, 30 (1), pp.30-52.

284. Social Exclusion Unit (2002), Reducing Re-Offending by Ex-Prisoners, (Social Exclusion Unit, London).

285. Three bodies are responsible for monitoring prisons; Her Majesty's Inspectorate of Prisons (HM Inspectorate of Prisons for Scotland or Criminal Justice Inspection Northern Ireland); individual prison Independent Monitoring Boards; and the Prisons and Probation Ombudsman. Parliament, especially the Home Affairs Select Committee, periodically undertakes inquiries following incidents or tragedies. Prisons and offender management is also informed by domestic and international jurisprudence.

286. One example of this is the Government's rejection of the recommendation to expand day release made by the Home Affairs Select Committee, who had been impressed by the so-called Tegel model they had visited in Germany.

287. HM Treasury, (2004) Science & Innovation Investment Framework 2004 – 2014, (HM Treasury, London). The Scottish Executive's Criminal Justice Research Team work alongside the Civil Law Research Team and share the same budget of approximately £300,000 per financial year to undertake research into criminal justice issues. For the Northern Ireland Office, an annual budget of around £580,000 each financial year is used for research into criminal justice.

included carefully-targeted community-based alternatives for serious and persistent offenders, and the involvement of the voluntary sector in running programmes and monitoring impact.[283] The politicisation of youth crime in the early 1990s led to a change in approach, and funding for these programmes disappeared.

## 3. The rehabilitation system has few incentives for innovation and the dominant culture and political pressures may restrict the take-up of effective innovations

Prison governors have some discretion to innovate, but there are insufficient rewards in the system for generating new ideas and practice.[284] Indeed, prisons operate within a detailed framework of law and policy laid down by government. They are heavily audited on the basis of processes, inputs and outputs, rather than with reference to their achievement of outcomes such as the reduction of re-offending; innovation is therefore inevitably restricted.[285] This reflects a uniformed, disciplinary organisation that (not without justification) accords significant weight to procedure and security, but it can act as a strong block to innovation and a barrier to the diffusion of innovations across the system. The challenge, therefore, is to rapidly identify which innovations are robust and important enough to develop, bearing in mind a legitimate emphasis on delivery.

Voluntary organisations are often driven to innovate from a different social vision of criminal justice and the rehabilitation of offenders than the one that currently underpins the system. Because such visions are typically in tension with the more dominant ethos of the prison service and government policy as a whole, the innovations born of these values are diffused only with difficulty, and are rarely adopted throughout the system.

More generally, successive Governments have privileged public opinion in favour of increasingly punitive sentences over other considerations, including more innovative and demonstrably effective approaches to reducing re-offending.[286]

## 4. Innovation is hidden in rehabilitation because it does not use formal R&D and is driven by local development, not research

### 4.1. Traditional metrics are not applied to rehabilitation but there are parallels to R&D in criminal justice research

NOMS has access to substantial research capability in the form of the Home Office Research, Development and Statistics (RDS) directorate, whose budget is £24 million. Even this, however, is equivalent to less than 0.2 per cent of the total departmental budget of £14 billion and so would imply an 'R&D intensity' well-below the UK Government's target for private sector R&D of 2.5 per cent by 2014.[287]

### 4.2. However, much innovation in rehabilitation is driven by local developmental work rather than research

There are no official data available on rates of innovation in rehabilitation and no useful proxies are included in the sector's KPIs.[288] Innovation is hidden because local development work is driven more often by individual prison regimes and conditions, along with the efforts of voluntary groups. As noted above, the resulting innovations do not tend to be spread throughout the system, and indeed there is no systemic data collection that would illustrate the diffusion or adoption phase of innovation.

## 5. Innovation metrics should focus on capturing the processes that support the local development of innovations and on using NOMS to support and track innovation

Two areas where data might be collected in order to assess the intensity of processes that can support innovation are levels of involvement of community organisations within prisons and the level of involvement of prisons in the community.

Measurement of community organisations' involvement in prisons could involve a basic head count of non-prison service organisations working in the prison, combined with data about the extent and intensity of involvement. Assessing the role of prisons in the community could include the number of prisoners working outside the prison and the involvement of prison staff in local interagency networks and criminal justice coordination groups.

Through the process of awarding commissions for the management of offenders, NOMS could prioritise the selection of innovative solutions, track the number of contracts awarded to such suppliers and monitor their success. This would yield data regarding both the investment in innovation and the effectiveness of those investments. Correctly analysed, these data could be used to identify the most innovative regions or suppliers.

Where innovative approaches have been proven to reduce re-offending (such as the Toyota car mechanics course at Aylesbury Young Offender Institution), the adoption of the innovation across the system could be monitored and reported. Other prisons could then be asked to report on whether they have instituted identical or similar approaches.

## 6. Innovation in rehabilitation could be improved by a more local organisation of the system

There are three levels from which increased innovation in the rehabilitation of offenders could be driven.

First (and most importantly), driving increased innovation in prisoner rehabilitation will be dependent on changing the 'framework condition' of the public and political debate about crime and punishment. Were this achieved, more innovative approaches – perhaps including 'restorative justice' and 'justice reinvestment' models – could be considered and piloted.[289] Such an approach would be the equivalent of a disruptive innovation; it would shift the focus and objectives of the system, rather than just refining and improving within the given system.

A different tone of political debate would allow consideration of innovations to reduce the use of prisons, for example, an increase in the use of robust community sentences as an alternative to short custodial sentences.

Second, at the level of how the existing system is organised, managed and resourced, the new 'contracting culture' framework of NOMS offers both opportunities and threats to innovation. As the Social Exclusion Unit (SEU) warned in 2002, the move towards delivering much rehabilitation work through accredited programmes should not be at the expense of diverting resources from individuals and organisations who can try out different ways of working.[290]

There are particular concerns about whether small voluntary organisations working in individual prisons will flourish in the new environment. For example, the voluntary sector umbrella group CLINKS has expressed concerns that the new arrangements will fail to recognise the distinctive contribution of the voluntary sector.[291] Many of the most challenging offenders are highly disaffected, suspicious of state agencies and unwilling to engage with them. Groups such as CLINKS suggest therefore that the voluntary sector needs to be careful that it does not come to be seen as an 'agent of the state'.

Third, at the level of the practical ways in which regimes and activities prepare prisoners for release into the community, innovative approaches developed in one prison need to be diffused more effectively through the system.[292] The National Audit Office's report on PFI prisons concluded that systems did exist for the dissemination of good practice between prisons, but noted that good practice was rarely transferred.[293] The NAO suggested various ways by which good practice could be exchanged between prisons. These included meetings organised by area managers, work swaps within and between sectors, good practice bulletins by the standards audit unit and better dissemination of good practice points from the Inspectorate, the Butler Trust, and other intermediaries.

Finally, prisoners and ex-offenders are an under-utilised resource for innovation. The SEU found that too often, prisoners are treated as passive recipients of regimes, rather than as a resource within them, despite proof that prisoners can make extremely valuable contributions.[294] A group is being set up by CLINKS to identify and develop opportunities for offenders, ex-offenders and their families to contribute to the design and delivery of services and policies that affect them, and to make recommendations to policy makers, opinion formers and criminal justice organisations about promoting and implementing these.

288. There are two major sets of official Key Performance Indicators (KPIs) for the sector. The first set is collected for the NOMS system, for example, covering resettlement and accommodation outcomes on release. The second set focuses on the prison service, for example, targets in respect of overcrowding and drug treatment programme completions. However, meaningful metrics are required to cover the seven rehabilitation 'pathways' identified in the Reducing Re-Offending Action Plan.

289. 'Justice Reinvestment' involves reallocating resources spent on prison to education, jobs and healthcare, that is, towards preventive social factors. See http://justicereinvestment.org/. 'Restorative justice' brings victims, offenders and communities together to decide on a response to a particular crime, but so far this has generated only a cautious response from policymakers, despite positive emerging evidence as to its impact in reducing re-offending, see Sherman, L. W., and Strang, H. (2007), Restorative Justice: The Evidence, (Esmée Fairbairn Foundation/The Smith Institute, London).

290. Social Exclusion Unit (2002), Reducing Re-Offending by Ex-Prisoners, (Social Exclusion Unit, London).

291. CLINKS (2005), Response to the Draft NOMS Strategy 'The Role of the Voluntary and Community Sector in The National Offender Management Service', (CLINKS, York).

292. The Department for Education and Skills has recently announced two 'test bed' regions (East of England and the West Midlands) for a new personally-tailored approach to employment-focused training for offenders. See Department for Education and Skills (2007), Reducing Re-offending through Skills and Jobs – Hope, press release, 17 May.

293. National Audit Office (2003), The Operational Performance of PFI Prisons, Report by the Comptroller and Auditor General HC 700 Session 2002-2003: 18 June 2003, (National Audit Office, London).

294. Social Exclusion Unit (2002), Reducing Re-Offending by Ex-Prisoners, (Social Exclusion Unit, London).

# Appendix G: Glossary

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|---|---|
| **ADR** | Alternative Dispute Resolution |
| **AERS** | Applied Educational Research Scheme |
| **BACS** | Bankers Automated Clearing Services |
| **BERD** | Business Expenditure on Research and Development |
| **boe** | Barrels of oil equivalent |
| **BSF** | Building Schools for the Future |
| **CBI** | Confederation of British Industry |
| **CCEA** | Council for Curriculum Examinations and Assessment |
| **CIB** | International Council for Research and Innovation in Building and Construction |
| **CIS** | Community Innovation Survey |
| **CDS Direct** | Criminal Defence Service Direct |
| **CLS** | Community Legal Service |
| **CLS Direct** | Community Legal Service Direct |
| **C-NOMIS** | National Offender Management Information System |
| **CPD** | Continuing Professional Development |
| **D&R** | Development and Research |
| **DCA** | Department of Constitutional Affairs |
| **DfEE** | Department for Education and Employment |
| **DfES** | Department for Education and Skills |
| **DoH** | Department of Health |
| **DTI** | Department of Trade and Industry |

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|---|---|
| **EIS** | European Innovation Scoreboard |
| **eLCs** | eLearning Credits |
| **ERS** | Educational Research Service |
| **ESRC** | Economic and Social Research Council |
| **FSA** | Financial Services Authority |
| **GAAP** | Generally Accepted Accounting Principles |
| **GDP** | Gross Domestic Product |
| **GVA** | Gross Value Added |
| **HERD** | Higher Education Investment in Research and Development |
| **HMSO** | Her Majesty's Stationery Office |
| **HMT** | Her Majesty's Treasury |
| **ICT** | Information and Communication Technology |
| **iDTV** | Interactive Digital TV |
| **IFS** | Institute for Fiscal Studies |
| **IIBFS** | International Institute of Banking and Financial Services |
| **IP** | Intellectual Property |
| **IPR** | Intellectual Property Rights |
| **IPPR** | Institute for Public Policy Research |
| **KPIs** | Key Performance Indicators |
| **LEA** | Local Education Authority |
| **LEPP** | Leading Edge Partnership Programme |
| **LSC** | Legal Services Commission |
| **LSC** | Learning and Skills Council |
| **MCOL** | Money Claim Online |
| **MiFID** | European Markets in Financial Instruments Directive |
| **MMC** | Modern methods of construction |
| **MSTI** | Main Science and Technology Indicators |
| **NAO** | National Audit Office |
| **nCRISP** | New Construction Research and Innovation Strategy Panel |
| **NCSL** | National College for School Leadership |

| | |
|---|---|
| **NECE** | National Evidence Centre for Education |
| **NERF** | National Educational Research Forum |
| **NFER** | National Foundation for Educational Research |
| **NHS** | National Health Service |
| **NIESR** | National Institute of Economic and Social Research |
| **NLC** | Networked Learning Communities |
| **NMR** | Nuclear Magnetic Resonance |
| **NOMS** | National Offender Management Service |
| **OASys** | Offender Assessment System |
| **OECD** | Organisation for Economic Co-operation and Development |
| **OISE/UT** | Ontario Institute for Studies in Education, University of Toronto |
| **ONS** | Office for National Statistics |
| **OSM** | Off-Site Manufacture |
| **PFI Prisons** | Private Finance Initiative Prisons |
| **PREST** | Policy Research in Engineering, Science and Technology, University of Manchester |
| **PRT** | Petroleum Revenue Tax |
| **PSA** | Public Service Agreement |
| **PtI** | Power to Innovate |
| **R&D** | Research and Development |
| **RDS** | Home Office Research, Development and Statistics Directorate |
| **RFID** | Radio Frequency Identification |
| **ROM** | Regional Offender Manager |
| **SET** | Science, Engineering and Technology |
| **SEU** | Social Exclusion Unit |
| **SLAB** | Scottish Legal Aid Board |
| **SRA** | European Strategic Research Agenda |
| **SSAT** | Specialist Schools and Academies Trust |
| **TFP** | Total Factor Productivity |
| **TLRP** | Teaching and Learning Research Programme |
| **TSB** | Technology Strategy Board |

| | |
|---|---|
| **UKCS** | United Kingdom Continental Shelf |
| **UKOOA** | United Kingdom Offshore Operators Association |
| **US EIA** | United States Energy Information Administration |
| **US EIA FRS** | United States Energy Information Administration Financial Reporting System |
| **USPTO** | United States Patent and Trademark Office |
| **VCS** | Voluntary and Community Sector |

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