A D&R system for education
Tom Bentley and Sarah Gillinson
Foreword

Mike Gibbons – Chief Executive, The Innovation Unit

This publication is the latest in our series of ‘think pieces’ – the series in which The Innovation Unit provides a platform for leading thinkers to present ideas that provoke discussion among everyone who is connected with education. Through the series The Unit aims to act as a ‘critical friend’ both to policy makers and people who work in schools, and also to champion the role of innovation and professional creativity within an education system. Although the whole series has been written with the English education system in mind, many of the ideas and issues apply to education systems in other countries.

This latest Innovation Unit think piece, written by Tom Bentley and Sarah Gillinson, examines the essential components of a research and development – R&D – system for education and makes recommendations for how this could be developed. It takes into account our knowledge about innovation and research within education and in sectors like healthcare, information technology and pharmaceuticals. It examines what we are learning about the importance of users and collaborative development in generating and spreading innovation in other sectors from manufacturing to social care. In effect, this signals a shift from R&D to D&R – development and research. The idea of D&R has been around the education sector for a few years, but now it is becoming increasingly important.

In a speech last year to The Smith Institute, Gordon Brown1 drew attention to the fact that like other sectors, education is under pressure to find new ways of delivering.

Both research and development are needed to create new knowledge which enhances understanding of learning and teaching. Crucially, this must also translate into the practical ability to conduct learning, teaching and the organisation of education services in ways that are more fit for purpose and better value for money. This publication makes a powerful argument for greater support from government for the crucial activity of D&R to help achieve this.

At the time of going to press, the Department for Education and Skills (DfES) in England is being re-organised into the Department for Children, Schools and Families (DCSF) and the Department for Innovation, Universities and Skills (DIUS).

The recommendations at the end of this publication should be read in this light.
Education is about the creation and transfer of knowledge. This is what education systems aim to do through interactions between students and teachers.

 Everybody knows this, but many of us are confused about how it really happens. We would like the transfer to be straightforward, predictable and to follow what we agree is important. In most cases, though, it is messy, unpredictable, and shaped by what different people think important at different times.

 Like other sectors, education is under growing pressure to find new and better ways to create positive outcomes. Its users and funders demand better performance, ideally at lower cost per user, through more powerful learning experiences for students and a more motivated, capable and faster developing workforce. This pressure will only increase over the next ten or twenty years.

 Education is not just important in itself, but helps to drive how we do other things better. It plays a crucial role in the innovative capacity of whole societies and economies through the supply of skills and expertise to other sectors and in the processes of social and commercial innovation. In the policy frameworks for innovation beginning to appear around the world, aspects of education are central. Skilled workers, research infrastructure, higher order skills and enterprising attitudes are all essential for enhancing national capacity for R&D.²

 Education is integral to the story we now tell of global competitiveness through innovation. But innovation still has an uncertain place within education.

 Recent schools policy in England has emphasised innovation and sought to shift the emphasis of system reform towards the role of users in driving innovation and creating demand for improvement, eg by focusing on the responsiveness of schools to parents and extending personalised learning to more and more students.
Gordon Brown has set out his intention that Britain’s achievement in maths education should match the best in the world. To achieve this kind of goal, we need not just systematic improvement, but also systematic innovation, achieved partly through a disciplined, integrated approach to research and development (R&D).

R&D is needed to create new knowledge which enhances understanding of learning and teaching. Crucially, this must also translate into the practical ability to conduct learning, teaching and the organisation of education services in ways that are more fit for purpose and better value for money.

This pamphlet examines the essential components of an R&D system for education and makes recommendations for how they could be developed. It draws on what we know about innovation and research within education and in sectors like healthcare, information technology and pharmaceuticals. It does not review comprehensively the history of educational research or R&D, but is informed by past policy and recent practice. For example, it examines what we are learning about the importance of users and collaborative development in generating and spreading innovation in other sectors from manufacturing to social care.

In particular, we focus on recent thinking about open systems and ‘open innovation’, given the impact they are having on other sectors around the world and their importance for harnessing the innovative potential of educational practitioners, ‘users’ and entrepreneurs, as well as researchers and policy makers.

“R&D is needed to create new knowledge which enhances understanding of learning and teaching.”

We argue that successful innovation systems combine five essential features:

- identifying opportunities
- creating and distributing knowledge and capabilities
- supporting and financing new organisations
- managing risk and uncertainty
- creating and managing essential infrastructures.

In education, these five functions are reflected in our priorities for building an effective R&D system, and for the way in which the elements of that system need to interact with each other. These elements are:

- future proofing – exploring needs, risks and opportunities
- basic research – exploring new frontiers of knowledge
- validation, evaluation and feedback
- hubs and clusters – harnessing the benefits of multiple contributors
- collaborative product development
- next practices and lead users – making the most of user-driven innovation.

Together, they provide the basis of a systemic strategy for pursuing innovation across the education system, and an opportunity to deepen and accelerate the benefits of education reform.
What is R&D?

The internationally accepted definition of R&D states that “research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge … and the use of this stock of knowledge to devise new applications”.\(^4\)

Investment in R&D is based on the belief that investing in continued discovery of knowledge, and developing its practical uses, creates value for the whole of society. Often this value is assumed to be determined by the commercial competitiveness of the applications – especially in fields dominated by corporations. For the UK Department of Trade and Industry, this is increasingly important, “with sustained R&D and other related investment at the right levels, businesses are in a better position to achieve and maintain competitive advantage in the increasingly global market place”.\(^5\) This should be in everyone’s interest, resulting in “high quality jobs, successful businesses, better goods and services and more efficient processes. That is why R&D matters.”

Of course, the types of value created by sustained investment in new ideas and their applications vary hugely according to the field of endeavour: greater confidence in the health service and doctors’ ability to safeguard our health cannot be compared to the joy we might get from an improved steering mechanism on a new car. But what does not vary is the pivotal importance of R&D to the performance and evolution of large systems, from education and healthcare to aeronautics and manufacturing.

“… what does not vary is the pivotal importance of R&D to the performance and evolution of large systems, from education and healthcare to aeronautics and manufacturing.”

Creating and retaining high quality jobs, improving services for users and developing more efficient means of delivery just as easily apply to the mission of the NHS as to product development at BMW.

Our societies are becoming more knowledge intensive: more jobs involve high levels of specialist knowledge, analysis and interpretation. Information is more pervasive and more accessible. More and more knowledge is integrated into what people and organisations do through ICT, organisational design, regulation, training and so on. As societies and organisations become more complex, we need to invest in developing new knowledge, whether its applications are commercial or not. A more effective education system needs a constant supply of new insight and applications, enabling it to compete through the evolution of teaching, learning and organisational methods.
How does it work?

Commercial R&D has a long history of efforts to stimulate, control and own innovation. Sometimes this has meant huge leaps forward, like the first personal computers, or small bounds, like broadband access being made faster and cheaper for households.

R&D is often seen as a race to market – a competition to generate the best ideas and test their usability before anyone else so that a new product or service can be patented and commercialised, maximising profit. Keeping ahead of the curve is often the best way of staying there, as a proportion of profit can be ploughed straight back into the R&D process to generate the next new idea and application.

It is no coincidence that accepted measures of R&D are about the financial inputs to the process – the capital invested, the intellectual property captured as a result and the number of patents a company achieves. As innovation becomes a higher policy priority, national targets for R&D investment are set and comparative tables in patents and other indicators are widely circulated. But these measures reflect the traditional emphasis of R&D and its market-oriented outcomes. They are not the sole definition, either of value arising from R&D activity or of the inputs and capabilities that make it successful.

R&D has historically been seen as a linear process. So increasing inputs (often financial investment) should result in increased outputs (patents). In this ‘pipeline’ model, basic scientific research is picked up by companies thinking it might have some commercial value; from there, product developers match their understanding of the market with possible applications and develop commercial prototypes, and these are tested and taken to market.

This is what many writers call the ‘first generation’ R&D model and it is easy to imagine examples in education. Developments in ICT are often in this category, eg interactive whiteboards have been developed out of longer term technology innovations such as LCD screens and touch-screen technology, prototyped and then marketed to schools and education departments.

In science and technology, R&D policies are founded in a model of basic scientific research which is solely focused on discovery. New discoveries – penicillin, the semiconductor, DNA, neural networks – do not have an automatic benefit or application; rather, they provide part of the foundation of knowledge from which new uses can arise.

There is a long history of support for this way of thinking about R&D. Proponents say that keeping the development of science and its applications separate fosters the greatest possible progress in the long run. To maximise the stock of human knowledge, discovery should be driven by curiosity, not by the world view or the performance targets of governing institutions. This view is exemplified by the approach of Vannevar Bush, America’s Director of the World War II Office of Scientific Research. The Office was
founded on the back of his determination and personal suggestion to President Roosevelt that civilian scientists and the military should be better co-ordinated, and was seen by many as instrumental to the Allies winning the Second World War. Alfred Loomis, another well respected war-time scientist, said: “Of the men whose death in the summer of 1940 would have been the greatest calamity for America, the President is first, and Dr. Bush would be second or third.”

Yet, for all his commitment to joining up scientific and military progress, Bush believed that “basic research is performed without thought of practical ends … (because) applied research invariably drives out the pure”. Or as Stokes, a modern day economist puts it: basic research is the “pacemaker of technological progress – a remote but powerful dynamo”.

So in this traditional model, better R&D is achieved by investing more in basic research and then improving the efficiency of the pipeline through which research passes to reach the market. Focusing more on applied research, or making the direction of basic research more instrumental, is often viewed with suspicion.

Would education benefit from a similar approach to R&D? That depends on how we understand the types of knowledge and applications that might be relevant. Education is itself an applied process – the organisation of teaching and learning in order to transfer knowledge and develop

---

**The adoption of ‘synthetic phonics’ as policy**

Synthetic phonics is a particular method of teaching and learning about reading, based on the sounds of letters and learning how to blend them into words. The technique itself has been in use for many years, but came to prominence as a policy issue in 2005 when the results of a seven year joint study by the Universities of Hull and St Andrews were published. Nineteen primary schools in Clackmannanshire adopted the synthesised phonic style of teaching and were compared to other schools in Scotland. The report says: “It is evident that the children in this study have achieved well above what would be expected for their chronological age”.

The publication of the study coincided with renewed pressure on government to meet its own literacy targets. So during 2005 and early 2006, Jim Rose, former Ofsted Deputy Chief Inspector, was commissioned to investigate the evidence base supporting this approach. His final report, published in March 2006, has resulted in the practice of synthetic phonics becoming a policy requirement – the educational equivalent of a basic commercial requirement or regulation as the result of new knowledge and applications. The legal requirement to install a catalytic converter in new cars is a good example from the commercial world. As with the education study outlined here, research and development undertaken at a University (Trinity College at Hartford, Connecticut), led to the discovery of the converter, during a basic research programme, fundamentally changing the market.
understanding. It is conditioned by social norms and public responsibilities, as well as by the core knowledge being taught and learned through the curriculum. At the same time, basic research from other fields is relevant to the way education is conducted. Brain science has generated great interest, though relatively few proven applications, in the education sector over the last decade. Mobile technology is another field of basic research now leading to myriad educational applications, many taken up through the commercialisation and marketing process. Education is itself an applied process – the organisation of teaching and learning in order to transfer knowledge and develop understanding. It is conditioned by social norms and public responsibilities, as well as by the core knowledge being taught and learned through the curriculum.

So, basic research discoveries, in all kinds of fields, have important consequences for education. But the model of application which says that unconstrained research followed by linear application to defined problems and existing processes is not necessarily appropriate.

For instance, not all the knowledge that could be valuable in creating better educational outcomes arises in this traditional form. New theories of intelligence, such as those put forward by Howard Gardner,14 David Perkins15 or Robert Sternberg16 are all rooted partly in experimental science, and imply radical reframing of assumptions about intelligence that govern education practice and testing around the world. But they are not purely theories of natural science; they are rooted in social psychology, pedagogical tradition and norms of child development as well. They help to show that the idea of intelligence itself is framed in part by social and moral assumptions, not something that can be scientifically assessed outside of its context. Their application is complex and contested. The outcomes of such theories are not only objectively verifiable results, but are in part qualitative; their valuation depends on judgement and interpretation.

“Education is itself an applied process – the organisation of teaching and learning in order to transfer knowledge and develop understanding. It is conditioned by social norms and public responsibilities, as well as by the core knowledge being taught and learned through the curriculum.”

Furthermore, the processes through which such theoretical insights are ‘developed’ and translated into practice are often slow-burning and indirect; they might influence curriculum development, assessment formats, teacher training, school building design and organisation. Developing applications, like teaching materials, that really take note of the fundamental insight, may depend heavily on user testing and development, rather than just on
prototyping new educational products and bringing them to market. In fact, as we discuss below, many important educational innovations are generated by users themselves, rather than derived from experimental research.

In any case, as we also see below, much private sector innovation is moving rapidly towards more open and interactive organisational models. The connection between new knowledge, new context and new kinds of use can be forged in many different ways; pipelines look slow, narrow and inefficient.

Given the distinctive needs and features of education, is there an approach to R&D that can bring them together coherently?

**Educational research and development – where we are now**

Looking at the history of practice development and policy transfer in schools, we can see some strong assumptions emerging about how research and development should work in education. The synthetic phonics example represents the tip of the iceberg for a history of educational initiatives that follow a linear pipeline approach.

The diagram opposite (Figure 1) shows basic research and discovery from any field feeding into one or both of new ‘fields’ or ‘instruments’ for teaching and learning.

ICT is an example of technologies arising from basic research that does both – it has created a whole new field or ‘subject’ for the curriculum, as well as changing how young people learn (the ‘instruments’ of learning) across the whole curriculum and beyond.

The exact shape and focus of the applications depends on existing policy priorities and goals, as well as the local context and precise challenges faced by practitioners at a given time. The subsequent ‘validation’ stage is particularly pertinent in today’s policy climate. ‘Practice-based policy making’ and the development of a rigorous evidence base prior to adoption in policy is increasingly important of the process.

The final part of the pipeline – pushing refined and tested ideas and applications out of the pipe and into the market – is much like its commercial equivalent. Product development involves applications being packaged, targeted, branded and finally disseminated through all possible channels. Options include written, online and audio visual materials that can be distributed in person, over the internet or more traditionally through the post.

In education, the final stages of the pipeline may be through competitive markets or through the ‘delivery chain’. Many educational products and services are marketed by competing suppliers and then chosen by schools, teachers, families and students. Many others, for example
the provision of best practice guidance on literacy, will come through government. Obligation through legislation is a tool that government has at its disposal that commercial R&D does not.

There have been many recent attempts to create stronger connections between educational research, innovative development processes and practice – to improve the quality and the relevance of research and development within education.

Some major examples include: the Teaching and Learning Research Programme (TLRP)\textsuperscript{17} funded by the Economic and Social Research Council (ESRC),\textsuperscript{18} pilots and pathfinders in Department for Education and Skills’ (DfES) policy, the National Education Research Forum (NERF),\textsuperscript{19} the Institute of Education (IoE),\textsuperscript{20} the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI),\textsuperscript{21} The Research Informed Practice Site (TRIPS), the National Teacher Research Panel (NTRP) and The Innovation Unit.

All of these approaches reflect a determination to improve the knowledge base supporting innovation efforts, and to find better ways of connecting research evidence, in particular, with the demands and possibilities of educational practice.

Education is a system in which professionals, learners and organisations interact in quite different and variable ways.

There is no simple ‘supply chain’ for product development and dissemination. At every step of the pipeline a host of different

\begin{quote}
“There have been many recent attempts to create stronger connections between educational research, innovative development processes and practice – to improve the quality and the relevance of research and development within education.”
\end{quote}
Attempts to better connect research and practice

National Education Research Forum (NERF)
NERF was formed in 1999 by the then Secretary of State for Education, David Blunkett, to develop a national strategy for educational research. Following in-depth consultation and discussion, NERF established several programmes aimed at improving the quality and impact of research in the education sector. One of these is the National Strategy for Systematic Reviewing in Education, which brings together the main bodies undertaking systematic reviews to co-ordinate their work. The idea is to compile well-organised, thematic collections of validated basic research and evidence-bases supporting particular practices that are accessible and useful to practitioners.

Teaching and Learning Research Programme (TLRP)
Since 2000, TLRP has aimed to “support and develop research which leads to improvements in outcomes for learners of all ages and in all sectors of education, training and lifelong learning in the UK”. It operates twenty school-based research projects to investigate teaching and learning in formal and informal settings and publishes summaries of its basic findings as well as detailed reports. It also partly develops applications, drawing out evidence-based principles for ‘good practice’. At the end of the pipeline, TLRP directors work with a range of intermediary organisations (eg DfES, the Qualifications and Curriculum Authority (QCA), General Teaching Council for England (GTCE)) to distribute its findings.

The Innovation Unit
The Unit was established as part of the measures in the White Paper ‘Schools – Achieving Success’ with the purpose of energising schools to innovate and contribute to the spread of successful practice in order to raise standards. A key element of its work is to combine the expertise of those who work in educational institutions with the ambition of those who make policy. In its first phase, The Innovation Unit provided direct financial support to projects, practitioners and organisations developing promising innovations, and worked to connect them with policy development through the DfES and partnerships with other National Agencies. This range of activity has extended from the Leading Edge Partnerships of schools to the development of Futures Thinking tools for schools and teachers, from the redesign of classrooms as learning environments, to the development of policy on personalised learning.

Over time, The Innovation Unit’s activity has evolved towards a more specific model, concerned with identifying, nurturing and scaling up lessons from ‘Next Practice’. This model has significant potential as a structured process for linking long term challenges to new policy applications and identifying and developing practice-based innovation. In 2006, The Innovation Unit was established as an independent, not-for-profit company, limited by guarantee.
variables could influence the relevance, impact and quality of the methods being used. In every local area, the population of learners and professionals is different and the culture and history of the organisations will impact on their interpretation and application of new methods. Some schools are heavily involved with others in their local area, some have particularly good relationships with the DfES and other national agencies, and some schools are deeply connected with the concerns of their local communities and other service organisations. All of these profoundly effect how the pipeline process works in practice because they influence:

- how ideas and practice are developed
- which teachers listen to new ideas and practice
- how likely teachers are to be receptive to ‘the centre’ and its ‘products’
- the capacity of schools and individuals to adopt and adapt new ideas and practice
- the options for developing new organisations and services.

Furthermore, we know from various sources of research evidence that the ways in which people absorb, adapt and transfer knowledge do not follow a simple linear model either. The factors influencing the take up of new evidence and practice are the subject of a research category all of its own, both in education and in the study of innovation.

For example, a recent study by the University of Sussex\textsuperscript{23} found that transfer of knowledge is much more likely to take place when practitioners are directly involved in developing the knowledge, and that often moving experienced or expert people from one location to another has a greater influence than communicating new findings from a distance. Often it is the process of embedding new practices in a specific context and through working examples, comparison and refinement that new knowledge is really absorbed.

Research on corporate performance also illustrates how simply holding formal knowledge within organisations is not enough to ensure that such knowledge is enacted. Just as individuals do not all adopt innovations smoothly even when it might appear rational to do so, many organisations struggle to put into practice even the knowledge they are aware of.\textsuperscript{24}

And as critics of the new policy on synthetic phonics point out, all young people are different. Personalising and improving the learning experience of young people, as the government is committed to doing, means very different pictures of practice both within and between schools. It does not just involve teaching professionals and research into teaching, learning and curriculum development.

In fact, aspects of education policy have recognised the diversity, variation and collaborative interactions required to
achieve high standards of outcome in all the different circumstances, locations and communities that are covered by a national system. Collaborative exchange and development, diversity and flexibility, personalisation of curriculum and of student guidance, and the development of integrated children’s services through the Children's Act all show recognition of the importance of local flexibility, in conjunction with national standards, systems and accountabilities.

In education, there are already many familiar and different ways in which lateral flows of knowledge and resources co-exist with the vertical flows between centre, locality and individual school:

- A focus on local partnerships and networks is an acknowledgement of the importance of mutual support, learning and development. Education Action Zones, Networked Learning Communities, Leading Edge Partnerships and most recently, self-governing Trusts and, federations are centrally supported examples

- Integrated children’s services and extended schools require and encourage greater interaction between individual schools and a wider range of support services and user communities

- National policy has sought to give new freedoms and flexibilities to schools, colleges and groups of local providers, for example through a streamlined inspection and school development framework and 14-19 reforms designed to encourage personalised pathways for individual students, and interchange between schools, colleges and universities.

These structural changes have been accompanied by a proliferation of new communications channels which enable access to new research evidence, guidance, products and advice through a much wider range of routes than in the past. As well as formal government advice and curriculum requirements from the centre, a range of Non-Departmental Public Bodies (NDPBs) (eg National College for School Leadership (NCSL), QCA, GTCE) also produce their own research and advice. Online services from a host of providers, underpinned by the National Grid for Learning, provide another set of access points, and Teachers TV gives teachers a digital window into classrooms and a source of specially commissioned advice, demonstration and guidance. Educational resources for parents and children are proliferating through the efforts of broadcasters, publishers and entrepreneurs from the BBC to the ABC to homeschool.com, a user-generated website providing resources for parents.

“In education, there are already many familiar and different ways in which lateral flows of knowledge and resources co-exist with the vertical flows between centre, locality and individual school.”
who want to educate their children at home.

As the range of access points has broadened, users have become surrounded by a blizzard of information and competing approaches. There is little clarity about how they add up to a coherent whole in terms of research and development, validity and impact, priorities and timescales. Often this means making choices on preference and instinct. For this reason, we still tend to fall back into traditional patterns, as the synthetic phonics example illustrates, when it comes to organising public R&D efforts and linking them to policy.

It is very difficult to move away from setting priorities for R&D from above when there is no clear way of understanding where they are emerging from ‘below’, and certainly no clear system for aggregating and making sense of dispersed priorities.

**The changing nature of R&D – beyond the pipeline**

Recent developments in wider R&D practice and theory also suggest flaws in the traditional pipeline approach.

Much of the ‘version one’ model emerged in the second half of the 20th century when big institutions – firms, universities, government departments – dominated the organisation of knowledge-creating processes.

In the last 15 years, the long term impact of ICTs, particularly the transparency and new patterns of interaction that emerge from the spread of digital networks, has changed the environment.

> “In the last 15 years, the long term impact of ICTs, particularly the transparency and new patterns of interaction that emerge from the spread of digital networks, has changed the environment.”

This process has led to a critique of traditional approaches which outlines some serious issues:

- **Patents raise barriers to entry**
  It has long been argued that the patent system prevents smaller players from entering the market, building on other people’s ideas, or entering the race. To get there first is just too expensive. The result is that a smaller pool of researchers and developers is involved in generating ideas and thinking about their applications. It stifles innovation. It is the long established, oligopolistic players who dominate the market for innovation in different fields and, unless a more vibrant range of smaller, niche operators can engage with the market, innovation is likely to suffer.

- **Imperfect information between firms and users makes for sub-optimal products**
  However good our market research, it is not the same as being a user. Goods
and services often just are not as well suited to their users as they could be. When this is combined with the dominance of smaller numbers of large players in generation innovations, the result may be a narrowing of the flow of creativity to a particular field.

These limitations are amplified by the changing organisational and technological environment, creating several new challenges for traditional R&D centres:

- In a world where ideas move on quickly and can be brought to market at great speed, patents that protect ideas and applications for many years can lose their value.
- High labour mobility means that people move around more, taking their ideas with them.
- We are better networked so information is shared more quickly and easily in informal and often unstoppable ways.
- As consumers, we are more demanding and have higher expectations for services to be closely tailored to need, a phenomenon largely driven by technological advances.
- We care about more than value for money. We want firms to match our ‘human values’ and have a purpose other than the pursuit of profit.
- Increasingly diverse and heterogeneous societies will drive the need for more innovative and differentiated markets.

Essentially, the basic building blocks of R&D systems need to change. Instead of a closed pipeline, where the market is only let into the process in the final stages, this new world should be one of ‘open’ or democratised innovation. As Charles Leadbeater argues, “consumers are increasingly a source of creativity. A modern innovation policy should be focused on mobilising the power of user-innovators as well as company R&D. Failure to do so could have disastrous consequences for productivity growth.”

Two fundamental changes stand out. First, new ideas, research breakthroughs and applications could arise anywhere across a sector, not just within the boundaries of a formal R&D programme. Smarter strategies will search, connect and develop across these much wider and more networked fields. Second, users will also be creators. Rather than user testing close to the end of the R&D process, users take on a much more integral and direct role in sparking, shaping, validating and spreading innovation. But the right platforms and processes must be found to involve them effectively.

“Essentially, the basic building blocks of R&D systems need to change.”

As Henry Chesbrough, one of the leading theorists of open innovation, says: “Now it’s about harnessing the most effective sources of innovation – from wherever they are derived. This is not just about ideas – it’s about their realisation.” He sums up the two approaches, and their key differences, as follows:
Open Innovation
Most of the smart people work elsewhere
Many external ideas in play
High labour mobility
Active venture capitalist (VC) funding
Numerous start-ups
Universities important
Examples of industries: personal computers, film

Closed Innovation
Most of the smart people work for us
Largely internal ideas in play
Low labour mobility
Little venture capitalist funding
Few, weak start-ups
Universities unimportant
Examples of industries: nuclear reactors, mainframe computers

For producers, the benefits of an open system are clear. Firstly, the pool of researchers and ideas grows exponentially. And the quantity of ideas developed in innovation matters. As Gary Hamel says, the ‘corporate sperm count’ is crucial. “Sometimes it is only by producing the many that we can produce the few great works or ideas.” Secondly, the appropriateness and ‘saleability’ of ideas is likely to increase radically from the current position, where manufacturer-driven innovation only has a success rate of about 25 per cent.

Finally, there is also likely to be a ‘softer’ outcome. Customers who feel listened to and valued by the companies they spend their money with are more likely to be loyal and committed to that brand. This is important to education, where brand commitment does not just mean sticking with a product – it means pupils and parents putting in time and energy inside and outside the classroom to make the most of opportunities.

When users are involved in shaping the service they can be expected to become more active and responsible participants. Involved patients are more likely to attend clinics, involved students to do homework.

But it is not just producers getting a better deal. For users, the benefits can be manifold. The first and most obvious outcome is simply that they receive better goods and services that are suited to their needs. A current example is the success of user-led organisations of disabled people supporting their peers to access the support they need to lead full and independent lives. First-hand experience

“When users are involved in shaping the service they can be expected to become more active and responsible participants. Involved patients are more likely to attend clinics, involved students to do homework.”
Expanding the innovation pool

Thomas Edison was prolific in his experiments. His development of the electric light took over 9,000 experiments. That of the storage cell, around 50,000. He still holds the record for the most patents — over 1,090 — in his name. After his death, 3,500 notebooks full of his ideas and jottings were found.

The Toyota Corporation’s in-house suggestion scheme generates over 2 million ideas a year and over 95 per cent of the workforce contribute suggestions; that works out to over 30 suggestions per worker per year. The most remarkable statistic from Toyota is that over 90 per cent of the suggestions are implemented. This has enabled them to develop services that are closely suited to their users.32

And there are other potential benefits too. Many writers and user-developers suggest there is an inherent joy to the innovation process itself — that exercising the creativity of problem solving can be a satisfying outcome. Furthermore, as Erik von Hippel says, “if you’re innovating, it’s unlikely that you’re the only one”33 and there are benefits to engaging in networks of like-minded people. Being challenged by others with similar expertise does not simply improve your ideas, it also has knock-on effects. Von Hippel talks about the importance of ‘reputation effects’ in networks of users — if you care enough about a product or service to be involved in its development, you are likely to care that people know about your input. This immediately has resonance with education, where networks of practitioners care deeply about improving outcomes for learners; it is a badge of pride to contribute to furthering that aim.

Finally, all of us like to feel valued, especially by individuals, organisations and communities that we ourselves value and respect. When BMW first opened its ‘Virtual Innovation Agency’ to the ideas and input of users, they were expecting to have to pay them. In fact, the 15 participants who were ultimately picked to come and talk to BMW product developers in person, based on the ideas they submitted, were just thrilled to be involved.

Although we have only described it briefly, the strategic opportunity for R&D in education is clear. The current approach is an uncomfortable hybrid: it invests in long term research but is not always clear about the translation from basic to applied knowledge; it initiates many linear efforts at generating new knowledge, but is weak at connecting, synthesising and disciplining what arises from them to maximise their positive applications in practice; and it encompasses many different, often overlapping approaches to knowledge transfer, from central direction to local collaboration, but it lacks clarity on how these different approaches need to be aligned and connected at different levels of the system.

However, the plurality of approaches within the current system creates an opportunity for an education R&D system and strategy which is more open and flexible, and also...
“...the plurality of approaches within the current system creates an opportunity for an education R&D system and strategy which is more open and flexible, and also more focused and rigorous.”

more focused and rigorous. It also signals an opportunity for the more widespread adoption of a term that has been in use in various parts of the education sector – Development and Research as opposed to Research and Development – D&R as opposed to R&D.

The essential components of a D&R system for education

The following sections set out the basic elements of a D&R system for education. The challenge is to create a system that is open and flexible, which connects development and practice at its roots rather than creating artificial institutional boundaries between the two, and which can clarify overall priorities without choking off unexpected sources of innovation.

We need a system that:

• combines a shared mission and sense of purpose built by and for the sector, with clear long-term, system-wide priorities
• invests in rigorous basic research without attaching the wrong strings to it
• expects multiple failure, incentivises continuous experimentation and undertakes rigorous evaluation, always ensuring that valuable feedback from users flows through the system
• harnesses the benefits of central direction, market competition and open communities of collaboration, and provides opportunities for innovation that is both multi-disciplinary and inter-disciplinary
• makes knowledge and new applications available and transparent in quick, easy and interactive ways
• makes the most of user-driven innovation and demand to shape new methods and create knowledge, by systematically identifying and supporting lead users to put their innovations into practice, and fostering peer review and improvement.

“A number of approaches have the potential, if combined properly, to deliver a system with these qualities.”

A number of approaches have the potential, if combined properly, to deliver a system with these qualities. Here we explore the importance and potential of the following: future proofing, basic research, validation, evaluation and feedback, hubs and clusters, collaborative product development, and next practices and lead users.
Future proofing – establishing clear long-term, system-wide priorities for D&R

Confidence about long-term priorities depends on the quality of the analysis shaping those priorities. This analysis can be greatly enhanced when government and other institutions systematically address the future context and the forces reshaping it. This means horizon scanning – finding out about tomorrow in order to identify opportunities, assess what we should think and do today. It involves asking questions about the wider context. What changes in the social, economic, organisational landscape may provide new opportunities and sources of knowledge? What would be the implications for existing activities? How are these converted into political and development priorities?

However, the usefulness of thinking about the future is not about predicting what is going to happen, but about recognising the importance of uncertainty itself – how can we best set ourselves up to respond and adapt to change?

As Eamonn Kelly, Chief Executive of Global Business Network, an international ‘futures’ consultancy says: “Paradox and the unknown are uncomfortable. Most of us have learned to present our bosses with answers and solutions, not questions and problems. But by adopting this approach and sticking to certain tried and tested strategies, we run the risk of using counterproductive coping mechanisms and ultimately moving backward, rather than forward”.34

In other words, we have to get used to and better at working openly with uncertainty.

At the same time, assessing long term change can help us to shape that world as it emerges. Mapping possible futures allows us to make choices about the types of world we definitely do not want to see, and to take steps towards creating a more desirable future. Successful horizon scanning may mean looking beyond the existing barriers of ‘education’ as we understand it. For the Organisation for Economic Co-operation and Development (OECD), this means thinking about the future of learning, not of schooling: “we risk limiting our perspectives on the future by assuming that it will take the form of schools more or less as we know them”.35

“... we have to get used to and better at working openly with uncertainty.”

Combining the very big picture with the micro picture of people’s experiences is also important. Understanding future contexts for learning involves pulling together demographic as well as economic, social and cultural change on the national and global stage, but it also involves understanding the changes that people feel in their daily lives, and the learning and support that they personally value.

This is a combination that Demos and The Innovation Unit have used to help headteachers, teachers, pupils and parents to think about the future of learning in a variety of different contexts.
“Successful horizon scanning may mean looking beyond the existing barriers of ‘education’ as we understand it.”

The Picture This! workshop looks specifically at those interactions between teachers and young people that are most effective for their learning and uses this as the basis for developing future scenarios.36

Basic research – creating knowledge without attaching the wrong strings to it

For education, knowing better how the brain works promises potential leaps forward in understanding learning. The OECD is pursuing a major programme of work in this area with the aim of formulating “a sounder basis for the understanding (and, over time, an improvement) of learning and teaching processes and practices”.37

As Manfred Spitzer argues in a recent OECD publication, “In the past, most scientists have claimed that at birth, the human brain has all the neurons it will ever have. However, with the advent of new technologies, this fact is being challenged. Some mechanisms, such as those that control our basic survival instincts are in place at birth, but most of the newborn’s mental circuitry results from experiences – how and when these connections are formed is a subject of debate. Some scientists argued that these circuits are completed by age 3, others believed that they continue until adolescence; more recently, a consensus seems to have emerged, implying that synaptic connections are formed throughout the life cycle. This emerging and recent consensus can have profound implications as to the way the education system is organised.”38

Chris Yapp, former Head of Public Sector Innovation at Microsoft, draws a parallel between our understanding of a ‘computer’ in the 1930s – a person computing a problem – and our default conception today – of a machine. He believes the next wave of change in computation will be, “in the space between computing and life sciences in an area of mathematics called computational systems biology. This means redefining computers in terms of the language of complex adapted systems. That is maybe 5, 10, 20 years away – but we can see it coming and it will change everything that we do.”39

The implications of biological research for computing, and of brain functioning for education are still unknown, and may take decades to clarify. In pursuing basic research, we have to keep Vannevar Bush’s dictum in mind (pages 7/8); seeking to accelerate, direct or apply it prematurely will very often undermine the value of the discovery. As David Hargreaves has written: “Current and emerging technologies produce both interesting and promising results, but these will prove even more relevant and useful for education if previous misconceptions and misbeliefs about science are eradicated.”40
Maintaining a healthy, continuous stream of knowledge creation through basic research is essential, and relies on long-term public investment in basic research.

**Validation, evaluation and feedback – testing, refining, reporting on and approving different practices**

There is no lack of knowledge or information in the education system – this paper is all about how to make sense of and get the most from it. Validation of multiple sources of information or the effectiveness of a new development is a crucial piece in the puzzle – how do we know what is any good and, vitally, what would be any good for us? How can we identify excellent developments and enable them to have any national impact?

As we explored earlier, these have always been major challenges for the education system. A recent paper from the (now ended) National Education Research Forum (NERF) outlined the case for a National Evidence Centre for Education (NECE). The authors stressed the importance of its intellectual independence for both policy makers and practitioners, and outlined its core function as being to “create a more secure and more accessible evidence base for teaching and learning”. It would aim to co-ordinate existing networks to offer a one stop shop for existing materials, create capacity to synthesise research and translate research into appropriate materials for practice.

It is a nascent idea, relying on a central body for quality assurance and making sense of the content by setting priorities for which materials would then be gathered. Organisations in education and other sectors have made similar attempts, and it is possible to extract rules of engagement for each of these resources, as well as a common operating system and a source of quality assurance.

In most of the history of education, validation has occurred through the control of experts and the approval of central bodies; the emphasis of this new effort to encourage validation should be different; encouraging rigour in the selection and assessment of different practices, but doing so in part by making the tools and practices of validation itself more widely available and easily used.

Effective innovation cannot be a free for all where evaluation and validation are concerned. The test of a new practice has to be more stringent than ‘what works for me’ and must also go beyond the image of an academic or policy maker’s ‘star chamber’ sitting in judgement on competing approaches and handing down approvals to an obediently waiting system. Neither the validation nor the take-up of innovation actually work like that – building the perspectives and expertise of users systematically into the rules and processes used for validation could have a dramatically positive effect.

> “Effective innovation cannot be a free for all where evaluation and validation are concerned.”
The Social Care Institute for Excellence (SCIE) SCIE’s aim is “to improve the experience of people who use social care by developing and promoting knowledge about good practice in the sector”. They use knowledge gathered from diverse sources and a broad range of people and organisations, to develop resources which are shared freely. Individuals or groups of users, provider groups, academics or consultants are all able to register to become trusted partners for future commissions. The idea is to encourage collaboratives of smaller organisations to sign up, ensuring that non-traditional ‘gate-keepers’ to legitimacy are given a voice and potentially leading to “a more efficient commissioning process and better quality work”. SCIE do not just want to produce research. They want to incorporate product development into their commissions to create “learning objects that are highly engaging and meet the needs of social work educators”. Knowledge alone is not enough, and anything produced must be highly accessible and compatible with existing systems. Validation of both product and content are intertwined.

The Open University (OU) The OU is also creating an open access centre for many of its most popular and successful learning resources. Their system of validation is based on outcomes rather than the credibility of contributors. Central to the resource is the distinction between the Repository – a supported open learning site for learners, and the Depository – a supported open ‘sense making’ site for creators. In other words, the Repository will offer the validated material for use, whereas the Depository will contain both the material from the Repository and new content that will be modified, improved and customised by users in the community such as educators, tutors, learners and others. Material moves from the Depository to the Repository when it has been validated by a quality assurance panel tasked with upholding quality, as with the NECE proposal.

Connexions Other examples rely on another type of approval – peer validation. Richard Baraniuk, founder of Connexions, is a big believer in the power of peer review. He explains his motivation: “Peer review is severely broken. Publishing takes too long and then books are too expensive” he says. “This is about cutting out the middlemen and truly making information free.” Connexions aims to enable authors to publish and collaborate, instructors to rapidly build and share custom courses and learners to explore the links among concepts, courses, and disciplines. In place of central control, it has rigorous rules of engagement. Private workgroups can be formed to develop material but operate under certain conditions, and each module has a discussion group offering opinions on the quality and best use of materials. So validation is achieved entirely collaboratively and is distributed.

Futurelab Futurelab is an organisation dedicated to “bringing the creative, educational and technical communities together” to generate and spread educational innovation. Based in Bristol, UK, it evolved out of the Learning programme at the National Endowment for Science, Technology and the Arts (NESTA). Futurelab combines different sources of knowledge and expertise, using literature reviews, software programming skills and design-based prototyping to develop new formats, content and methods to encourage learning. Working with a range of companies, communities and public agencies, Futurelab is dedicated to developing approaches to educational R&D which make learners integral to the process of creation.
Hubs and clusters – harnessing the benefits of multiple contributors and open communities of collaboration

Much has been written about the role of universities in commercial R&D. Businesses know that accessing the processing power and networks of universities can be of tremendous commercial value. Some of the value and techniques of close collaboration with universities have real resonance with the parallel situation in education, where harnessing knowledge and expertise from this sector is a perennial difficulty.

Alan Hughes, previously Director of the National Competitiveness Network of the Cambridge-MIT Institute,\textsuperscript{46} suggests that three of the most important benefits of collaboration are:

- increasing the stock of ‘codified’ useful knowledge
- problem solving – contract-based projects to address a particular issue
- influencing where people go to look for solutions, eg via meetings and conferences, and personnel exchanges like internships or alumni networks.

These principles reflect a deeper historical rule: that knowledge and innovative capability tend to evolve around specific hubs where specialists can cluster and where support services, infrastructure and collaborative relationships can grow up around them. It is important to understand how these partnerships work and how information is transferred within them.

Interestingly, it is a combination of informal contacts with readily available ‘conventional outputs’ like publications, or, as Hughes puts it, graduates themselves, that generate the most value.

“It is important to understand how partnerships work and how information is transferred within them.”

If informal contact is important, location must be a factor in success. In 2003, Microsoft opened a new ‘Advanced Technology Centre (ATC)’ in China for precisely this reason.\textsuperscript{47} Until then, Microsoft Research Asia had operated in Beijing, with product development remaining at Microsoft headquarters in Redmond, WA in the United States. Product development bottlenecks, different priorities in each part of the organisation and cultural differences all inhibited the Asian research from maximising its potential in its target market. Bringing together product development and research means that the first hand over of new technology ideas is sped up and some of the trial and error occurs before the end of the pipeline.

Michael Porter has analysed some of the reasons behind the success of research and development ‘clusters’.\textsuperscript{48} His theory of competitive advantage simply states that those with a relative abundance of a given commodity should exploit that advantage by offering the most competitive prices. Clusters have their own competitive
Collaborative product development – making knowledge widely available through new applications

When we think of R&D we often think of people in white coats in laboratories. And in the past, this has often been true of lots of product development. Researchers have worked within organisations to create faster cars, more efficient microchips, or just cheaper production processes. From this research, prototypes are born and it would be down to the developers in this pipeline to road test products and services with the market. But today, as discussed earlier, it is precisely this process that is being called into question. Not only is it harder for patents to be effective and lasting, anyone can be an innovator.

Organisations like Futurelab encourage educationalists and scientists to work together to develop applications of new technology to support and inspire learning. Their research and development process involves working with organisations like Cisco (who are leading experts in network systems), university departments, research institutes and media professionals like the BBC. Futurelab aims to draw general advantage in their combined resources – where research and development capacity are close together, their shared value is greater than the sum of their individual worth. It is this, says Porter, which universities and businesses should seek to exploit. Clusters form around specific concentrations of knowledge, or knowledge-creating organisations, and then come to have an accelerating effect on the processes of discovery, development and entrepreneurship because of the myriad interactions and interconnections that can be formed between participants in the same shared system. One might expect electronic networks to undermine this clustering effect, but there is no sign that it does so; rather, it makes it easier for knowledge clusters to interact with others all over the world.

It is not yet clear how clustering of specific capabilities or areas of specialist knowledge might impact on the innovative capacity of education systems, or how such clusters might emerge. Clustering of excellent educational institutes, whether in Boston, London, Toronto or Singapore, will certainly impact on the priorities of the school systems closest to them. Specialist practitioner knowledge and excellence in particular areas of the curriculum may well emerge and concentrate over time in specific geographical areas. But the distribution of specialist knowledge and the ‘local dynamics’ between different institutions and sectors will have a direct effect on the innovative performance of the sector overall.

“As consumers become more demanding, growth relies increasingly on understanding and responding to them.”
lessons about how digital resources can be used and designed for learning, as well as for sharing information about particularly successful individual applications.

As consumers become more demanding, growth relies increasingly on understanding and responding to them. But how does this happen? What we know from the leaders in this field is that it certainly is not just a free-for-all.

User-led networks require rules of engagement just like a research lab itself would.

Harnessing user-led innovation requires:

- a strong sense of shared purpose
- rules of engagement or non-negotiables that are mediated by light touch governance
- space to innovate, created by giving permission, resources, time and feedback
- networks that are strong and trusting for sharing innovation
- a common source of validation or ‘quality assurance’
- common operating systems.\(^{49}\)

Wikipedia is one of the most visible examples of a resource that combines these characteristics. Users are bound by the shared purpose of creating an openly accessible knowledge resource for the common good. There are clear rules of engagement and a combination of peer and central editing to validate information. Users share a common format for contributing and sharing ideas.

BMW has tried something similar with its Virtual Innovation Agency (VIA). Its basic idea was to canvass suggestions from people all round the world, but it realised that in such a technical area, it would have to provide resources, as well as permission, to allow people to really let their ideas flow. They received 4,000 ideas in the first week.\(^{50}\) At the same time, their openness is not limited to car aficionados. They realise that just like the earlier basic research component, insights can come from anywhere. For example, looking into evolutionary biological design took them to the dolphins and their streamlined bodies to give their aerodynamics engineers new ideas based on existing innovations in other areas. But stimulating a flow of ideas is only the first part of the process. Disciplining this kind of innovation is as much a challenge as triggering it.

“As... stimulating a flow of ideas is only the first part of the process. Disciplining this kind of innovation is as much a challenge as triggering it.”

As Paul Sloane says, the most innovative companies have to have an approach to trying out promising ideas that is like the philosophy of a venture capitalist: “The VC invests in a portfolio of different start-up companies, fully knowing that most will fail. A few may break even, and one or two may become successes. But one big success can pay back the costs of all the failures.” \(^{51}\)
So the challenge is to delineate the scope and methods of engagement for user-innovators, while also making it easy and worthwhile to contribute.

**Next practices and lead users – making the most of user-driven innovation and demand to shape new methods and create knowledge**

‘Fishing expeditions’ for exciting new innovations can be extremely powerful, but what about when research and development is not just about fishing for an end, but for a particular end? Or when there is not enough time or resource for the trial and error required in the venture capital approach? Thinkers like von Hippel still see a central role for users in this slightly different equation – but all users are not equal. Lead users or innovation ‘missionaries’, as Mulgan and Steinberg put it, are those people already ahead of the field – at the crest of a new wave of innovation. The lead user approach collects and harnesses information, “about needs and solutions from users at the leading edges of the target market, as well as from users in other markets that face similar problems in a more extreme form”.

Some businesses and organisations have already started to make use of this understanding to startling effect. So how do they do it? Systematically identifying next practices or lead users cannot be easy, or these beacons would already be evident. The 3M lesson above offers some simple, if intensive, solutions. Identifying lead users successfully relies on two key insights. Firstly, that lead users are most likely to appear where the need for a particular innovation is most acute. Secondly, that people with some expertise in a given area are likely to be the best conduits of information about the pioneers they respect.

**3M**, renowned for innovation, has been at the vanguard of developing the lead user approach in practice. Annual sales of lead user product ideas are conservatively projected to be $146 million after five years – more than eight times higher than sales for the average ‘traditional’ project conducted at the same time. Project teams at 3M start with people – individuals they think have some expertise – to begin the journey through a network to the experts on the leading edge. Then, they ask for a referral to someone who has even more relevant knowledge and before long reach the lead users at the front of the target market. The next step is to continue networking until lead users are found in markets and fields that face similar problems, but in different and often more extreme forms. 3M embarked on this work as a means of breaking free of the incrementalism that characterises much of R&D, where companies are seeking to take any step, however small, to distinguish themselves from the rest of the market to capture profits.
The first of these insights is well illustrated by the example of a car manufacturer. In designing a new braking system, it might start by trying to find out if any innovations had been developed by drivers with a strong need for better brakes, such as auto racers. It would then look to a related but technologically advanced field where people had an even higher need to stop quickly, such as aerospace.

Potential applications in the education system are clear. Parental engagement is a current priority for the DfES – how can parents be supported to understand and make the most of their impact on their child’s learning? Examples where parents are most involved with their child’s education, as for children with special educational needs, are likely to offer the greatest insights.

There is a crucial final step to this process. The raw idea is rarely enough to aid the search for ‘lead users’ whose innovative record is relatively well advanced in that area. It shows how such a priority area can be subject to rapid knowledge gathering, practice development and policy design, and how communities of lead users can be developed and sustained over longer periods of time, contributing both to policy and to the quicker diffusion of new practices across the rest of the system.

System impact – bringing the elements together

We have argued in this publication that a different approach to organising traditional R&D in education into D&R could have powerful positive effects on performance. Adopting a sustained, systematic approach to the creation, application and diffusion of new knowledge and practices is essential to lifting the performance and capacity of our education system.

But doing this in practice depends on achieving two difficult things in tandem: first the approach to innovation, knowledge creation and diffusion needs to move away from the traditional, research-dominated pipeline definition of R&D. A more flexible, user-oriented and interactive model of innovation is necessary. Second, although the overall approach needs to be close to the ground, flexible and adaptive to the needs of students and teachers, nonetheless the system architecture for organising these efforts needs to be carefully and coherently structured.
As Geoff Mulgan has recently argued, what is spent on innovation in the public sector is a tiny fraction of that spent on counting, monitoring and measuring for the purposes of audit and accountability. Very few areas of government are well organised for innovation: we saw that DfES policy in the past has included the creation of dedicated, standalone units and many on-the-ground programmes. In other areas, innovation is tackled through funding streams largely separate from the core business of a department or the system-wide implementation of policies.

Dedicated R&D or D&R activities need dedicated responsibility and resourcing, but they also need to be integrated into the wider framework of governance and organisation, in order to maximise both their relevance to current goals and the potential for diffusion and replication. Single units and separate budgets cannot achieve this alone. Neither can generalised injunctions to become more ‘innovation friendly’ or less ‘risk averse’; organisational cultures are rarely transformed by training programmes or the introduction of new creative thinking methods. Instead we should be seeking to introduce specific new capabilities in specific areas of practice which contribute to a cumulative effect in the wider system.

In our introduction we argued that effective innovation systems combine five functions:

- identifying opportunities
- creating new knowledge and capabilities
- creating new organisations and forms of production
- managing risk
- creating essential infrastructures.

A typical approach to public policy might seek to allocate these different tasks functionally to different parts of government and different agencies in the public sector hierarchy. But the key to innovation performance over time is how well connected these different activities are, and whether they operate in ways which reflect and amplify the strengths of the wider system that they operate within.

In Finland, a dedicated national agency (Sitra) is responsible for innovation and the future. Sitra does not take sole charge of innovation activities; it draws on the extensive connections between government, industry and research communities in different sectors. The combination of a high social investment and living standards with a highly flexible, networked enterprise has

“Dedicated R&D or D&R activities need dedicated responsibility and resourcing, but they also need to be integrated into the wider framework of governance and organisation, in order to maximise both their relevance to current goals and the potential for diffusion and replication.”
created very strong positive interactions between the generation of new ideas and knowledge and the process of adoption, adaptation and diffusion in both the social and commercial spheres.

Different systems will work in different ways, but there is no doubt that each will benefit from a clearly articulated framework for D&R which focuses on overall priorities and promotes collaboration and exchange between the different organisational players. The following recommendations are therefore directed towards building a coherent, effective approach to D&R for English education.

**Key Recommendations**

**a)** The DfES should lead a future-scoping exercise, conducted every two years, which generates rigorously developed scenarios for a 10-15 year horizon and feeds relevant considerations from them into its own strategic planning.

**b)** At the same time, the DfES should establish dedicated responsibility for D&R at its Board and Ministerial level in a way which maximises the linkages between D&R activities and their take-up by other parts of the system.

**c)** Government should strengthen its commitment to funding high quality basic research in a number of fields relevant to education.

**d)** Ofsted, the Office for Standards in Education, should be commissioned to examine the range of approaches to introducing new knowledge and capabilities into the education system, and the extent of linkages between different agencies, national and local, and including relevant non-government organisations where they have a significant impact.

**e)** Proposals should be developed for a national collaborative framework – a compact – between agencies responsible for improving the quality of 0-19 education, establishing a shared framework for investing in the spread of new capabilities and evaluating the effectiveness of different approaches to doing so.

**f)** Responsibility should be awarded for developing and executing knowledge-transfer strategies in different phases of education or geographical regions, to specific organisations or partnerships.

**g)** A series of ‘lead user’ partnerships should be developed and funded, in which clusters of schools and practitioners known for excellence in specific kinds of knowledge, student mentoring, natural sciences, languages, community-partnerships, become involved in developing, testing and promulgating new practices generated both by policy and by the system at large.

**h)** Priority should be given to the development of ICT-based knowledge-sharing platforms which are designed to maximise user participation and takeup. This may involve the modification or linking together of existing platforms.
A D&R framework for English education

Establishing priorities and identifying opportunities

a) The DfES should lead a future-scoping exercise, conducted every two years, which generates rigorously developed scenarios for a 10-15 year horizon and feeds relevant considerations from them into its own strategic planning.

The exercise should be as transparent and as collaborative as possible, considerably more than the current Whitehall norm. Though it should inform strategy and policy development, its main purpose should be to generate a shared focus on what is changing in the wider environment of schooling, what risks and opportunities there are, and the broad direction of change.

While government departments can never publicise all aspects of their decision-making, engaging a wider range of organisations in the process of examination and discussion and creating a shared framework for identifying and assessing opportunities would have a powerful effect.

This future-oriented exercise should not be subject to formal ‘consultation’, but should instead involve a wide range of participants, from researchers to teachers and students, sometimes conducting their own scenario exercises.

b) At the same time, the DfES should establish dedicated responsibility for D&R at its Board and Ministerial level in a way which maximises the linkages between D&R activities and their take-up by other parts of the system.

One way to do this would be to locate managerial responsibility for innovation programmes in each major division, or policy area of the system, but simultaneously to cluster organisational responsibility with a Board member who could bring together managers from different Directorates and Divisions.

Creating new knowledge, capabilities and organisations

Where clear medium or long term priorities are identified, government should establish dedicated development programmes aimed at investigating, refining, accelerating and scaling up effective innovation. It should do this in conjunction with other agencies sharing a responsibility for those areas, and seek to involve non-governmental partners in the design and delivery as much as possible.

“... government should establish dedicated development programmes aimed at investigating, refining, accelerating and scaling up effective innovation.”

c) Government should strengthen its commitment to funding high quality basic research in a number of fields relevant to education.
Rather than seeking to make such funding conditional on premature application and commercialisation of research findings, it should focus instead on seeking ways to improve the quality and accessibility of the research itself, and by seeking evidence that researchers are able to draw effectively on internationally held knowledge and to work in interdisciplinary ways.

The government should establish a National Evidence Centre, possibly in conjunction with a leading university or other organisation with a record of positively influencing the practice of teachers and schools. The role of this centre would be to synthesise, test and validate evidence of effectiveness for new research findings and methods, and to develop and diffuse this knowledge base in direct collaboration with users of that knowledge.

Beyond these research-related goals, we also need an explicit framework for improving the existing interaction between research, policy and users, and implementation in the education system.

“... we also need an explicit framework for improving the interaction between research, policy and users, and implementation in the education system.”

As the recent 2020 working group on personalisation in the education system found, there is no clarity in the current system about who has responsibility for promoting the effective transfer of knowledge and capabilities around the system. Many different agencies have their own focus on innovation and agencies dedicated to promoting take-up of new approaches related to their own core goals.

Undue rationalisation is unnecessary, and would inevitably reflect a current institutional view of the world rather than the patterns that would evolve over time. But to make the current diversity of approaches genuinely productive, some common infrastructure and clarity is needed.

In particular, as David Hargreaves has repeatedly argued, the relationship between professional development and school-based innovation is more and more intertwined in reality, but remains confusingly separate in governance and regulation.

Schools should be able to access and choose from a range of collaborative networks, innovation support frameworks and development activities. But they might be able to get better leverage from their investment of time and other resources if they could link their obligation to conduct professional development with a clearer view of how and why they could develop specific strengths and capabilities that they can feed into the system, as well as drawing on specific knowledge from elsewhere.

This should be done by:

d) Commissioning Ofsted, the Office for Standards in Education, to examine the range of approaches to introducing new knowledge and capabilities into
the education system, and the extent of linkages between different agencies, national and local, and including relevant non-government organisations where they have a significant impact.

e) This study should lead to proposals for a national collaborative framework – a compact – between agencies responsible for improving the quality of 0-19 education, establishing a shared framework for investing in the spread of new capabilities and evaluating the effectiveness of different approaches to doing so.

f) Awarding responsibility for developing and executing knowledge-transfer strategies in different phases of education or geographical regions to specific organisations or partnerships.

g) Developing and funding a series of ‘lead user’ partnerships, in which clusters of schools and practitioners known for excellence in specific kinds of knowledge, student mentoring, natural sciences, languages, community-partnerships, became involved in developing, testing and promulgating new practices generated both by policy and by the system at large. One specific approach to this could be an ‘Expert Learners Programme’, including both teachers and students, and modelled on the successful NHS ‘Expert Patient Programme’.

One important insight from the wider innovation literature is that new knowledge is often not well utilised until it has a new organisational vehicle to carry it. Creating and nurturing new organisations is therefore an essential part of scaling up innovation effectively. Approaches built on that of NESTA, and similar social venture and accelerator initiatives around the world, may merit further investment by government in order to create the potential for new support and service providers to bring innovation to the existing school system.

Sharing risk, building common platforms

Successful innovation systems do not eliminate risk from the creation of new capabilities; but they make risk manageable by spreading it among partners and linking it to priorities. In much of the market economy, risk is handled by the workings of capital and equity markets, which impose their own discipline on the management and governance of firms and investors.

In many areas of new knowledge, product and process development, established market disciplines cannot account for the high costs and uneven rewards of innovating. In these areas, there is a gap between the incentives and finance available to established and mature firms seeking to exploit their existing capabilities, and new entrants seeking to develop a
potentially valuable application that could be taken up more widely at some later point.

The same is true in education, where new methods and products directed at refining standard practices are far more likely to find their way to widespread adoption than new methods which start from a different point or are potentially disruptive.

h) Because of this, urgent attention should be paid to developing platforms for knowledge sharing, feedback, peer review and evaluation of new practices.

The principle for evaluating these models is not how much information they can carry and integrate, but how effectively they encourage take-up and ongoing engagement in knowledge sharing by users.

Applying these principles to the evolution of existing sites dedicated to promoting ‘best practice’ and encouraging exchange between educational professionals should therefore be a major priority for the government. Maintaining a plurality of such across the educational ‘ecosystem’ is a good thing, creating a broader pool for innovation and a range of choice for users. But the range needs to include platforms which are models of integration and accessibility, and which help to bridge and link different providers and institutions on behalf of practitioner-users.

Our education system needs a sustained, focused and properly disciplined approach to D&R. There are many specific elements to such an approach. We need a coherent shared framework for investment and scaling up of innovation, led by government. We also need a competitive market in the generation of innovative practice and solutions which help to accelerate and discipline the search for

"Successful innovation systems do not eliminate risk from the creation of new capabilities; but they make risk manageable by spreading it among partners and linking it to priorities."

Government can help to reduce punitive concentrations of risk by reshaping its own approach to the management of risk and the way it is expressed in regulation, accountability, performance measurement and so on. But it is unlikely that such general changes in climate would have an immediate or radical effect on everyday practice.

It would be much more promising to seek and build platforms, or infrastructures, for comparing and sharing new and altered practices which reduce the costs and risks of changing it. These are implied by the earlier recommendations on evidence and user engagement.

The infrastructure that needs greatest focus is that which would help to spread risk by creating transparency and supporting precision when schools, teachers or students decide to adopt a specific practice or to invest their time in developing a particular approach.
"The principle for evaluating these models is not how much information they can carry and integrate, but how effectively they encourage take-up and ongoing engagement in knowledge sharing by users."

Our education system needs a sustained, focused and properly disciplined approach to D&R. We need a coherent shared framework for investment and scaling up of innovation, led by government. We also need a competitive market in the generation of innovative practice and solutions which help to accelerate and discipline the search for better methods in education. And we need a networked infrastructure encouraging schools, colleges and professionals to link and share their efforts to adopt and adapt.
References


5 www.innovation.gov.uk/randd/index.asp?v1=0&v2=0&v3=0&v4=0


9 Ibid.


12 Curtis, P (2005) Schools to adopt ‘phonics’ style of teaching reading, 1 December. http://education.guardian.co.uk/schools/story/0,1655015,00.html


16 Sternberg, RJ (1977) Intelligence, information processing, and analogical reasoning: The componential analysis of human abilities, Erlbaum, Hillsdale NJ.

17 www.tlrp.org/

18 www.esrc.ac.uk/

19 www.nerf-uk.org/

20 www.ioe.ac.uk/

21 http://eppi.ioe.ac.uk/cms/


be equal citizens, Demos, London.

33 Ibid.


35 www.oecd.org/document/6/0,2340,en_2649_34859774_31420934_1_1_1_1,00.html

36 www.innovation-unit.co.uk/

37 www.oecd.org/department/0,2688,en_2649_14935397_1_1_1_1_1,00.html


42 www.scie.org.uk/

43 Open Content Initiative project plan, http://kn.open.ac.uk/public/workspace.cfm?wpid=6478

44 http://cnx.org/

45 www.futurelab.org.uk/

46 www.cambridge-mit.org/


50 www.bmwgroup.com/via/

51 Ibid.

52 Ibid.


54 Ibid.


Acknowledgements

Thanks to Caireen Goddard for editorial support.

Cover photograph © Peter M Corr / Alamy.
The Innovation Unit

The Innovation Unit is one of the country’s leading organisations for innovation in education. We act as a catalyst for change drawing on talent from both the public and private sectors to improve education and other related services. We combine the expertise of people who work in schools with the ambition of policymakers. We have extensive experience in school leadership, education system reform, policy making, universities, the BBC, local authorities and the private sector. We also draw on a network of thought leaders from the UK and around the world.

We have a range of projects in our portfolio, the largest of which is our Next Practice Programme in which we support schools and local authorities as they take forward their own cutting-edge ideas to improve education. To support this work, we have developed products and services which will soon also be available to organisations who are not in the programme. We also support the web-based Research Informed Practice Site (TRIPS) and the National Teacher Research Panel (NTRP), as well as promoting teacher discussion about research in the Online Innovation Community.

This publication is the latest in a series of think pieces published by The Innovation Unit. Others in this series are:

- Working laterally: how innovation networks make an education epidemic by David Hargreaves
- Learning about personalisation: how can we put the learner at the heart of the education system? by Charles Leadbeater
- Systems thinkers in action: moving beyond the standards plateau by Michael Fullan
- The Shape of Things to Come: personalised learning through collaboration by Charles Leadbeater.

To download these, and to find out more about our work keep an eye on our website:

www.innovation-unit.co.uk
How can we ensure that we get the best performance from the education system? This latest Innovation Unit think piece, written by Tom Bentley and Sarah Gillinson, makes the case for a greater role for both research and development. The authors draw on what we know about innovation and research within education and in sectors like healthcare, information technology and pharmaceuticals, and outline the essential components of an R&D system for education and how it could be developed. They also consider what we are learning about the importance of users and collaborative development in generating and spreading innovation in other sectors – from manufacturing to social care. In effect, this signals a shift from the commonly used term research and development (R&D) to development and research (D&R). The idea of D&R has been around the education sector for a few years, but is now becoming increasingly important. This Innovation Unit think piece shows why.

Tom Bentley is Executive Director for Policy and Strategy in the Department of Premier and Cabinet in Victoria, Australia. He is also Director of Applied Learning at ANZSOG, the Australia and New Zealand School of Government, based in Melbourne. He was Director of Demos, the think tank, from 1999-2006.

Sarah Gillinson is Deputy to the President of the New York Public Library, a role which includes advising on policy, developing R&D strategy and building a performance and evaluation framework for the city’s 90 public libraries. She was formerly a senior researcher at Demos, where she worked on policy areas including personalised learning and disability.

Both contributors write here in a personal capacity.

You can download this publication from The Innovation Unit’s website: www.innovation-unit.co.uk. Alternatively, please e-mail contact@innovation-unit.co.uk to request a hard copy.

© Crown Copyright 2007
Extracts from this document may be reproduced for non-commercial or training purposes on the condition that the source is acknowledged.