fst journal

The Journal of the Foundation for Science and Technology
(formerly Technology, Innovation and Society)

Volume 18, Number 9, September 2005

THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

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fst journal
Volume 18, Number 9, September 2005

contents

HEFCE response on strategic subjects

The Higher Education Funding Council for England (HEFCE) has announced it will initiate a series of activities to support subjects regarded as strategically important and vulnerable. However, it says that any intervention should be "effective, targeted and proportionate".

HEFCE was asked by the Secretary of State for Education and Skills to advise on whether intervention might be appropriate (see *FST Journal* 18[8], p2). The HEFCE Board set up a strategic subjects advisory group chaired by Sir Gareth Roberts. Its report was sent to Ruth Kelly, Secretary of State for Education and Employment on 22 June.

The report noted that mathematics, chemistry, chemical engineering, minerals, metallurgy, materials engineering and information technology have declined in terms of undergraduate provision between 1999 and 2003. Some engineering has seen increases in activity, including computer software engineering, electrical, electronic and computer engineering. Civil engineering, general engineering, mechanical, aero and production engineering have seen a steady state or only very slightly declining activity.

Biosciences and physics have seen virtually no change over the period, whereas pharmacy, medicine, dentistry and veterinary sciences have all seen a rise in activity.

The HEFCE Board agreed that any intervention would need to be based on a number of clear criteria:

- a clear evidence base;
- wherever possible it should support a market-led solution;
- issues should be considered holistically and problems of demand should not be addressed with supply solutions (and *vice versa*);
- wherever possible there should be partnerships with other interested parties;
- intervention should only occur where there is a clear understanding of the nature of the problem, its location and the appropriateness of HEFCE intervention;
- activity should be coordinated with the DfES and DTI review of initiatives to improve aspirations and attainment in Science, Technology, Engineering and Mathematics (STEM) subjects in the context of the Ten Year Science and Innovation Framework. ❏

www.hefce.ac.uk

US-led coalition on climate change

The Asia-Pacific Partnership on Clean Development (APPCD) was launched in July and was presented by the United States as a complement to the Kyoto Protocol process. Announcing a "vision statement on a new partnership on clean development and climate" at a meeting of the Association of South East Asian Nations (ASEAN), US deputy secretary of state Robert Zoellick said that the members of the partnership "view this as a complement, not an alternative" to the Kyoto Protocol.

The stated aim of the partnership is to: "promote the development and deployment of existing and emerging cleaner, more efficient technologies and practices that will achieve practical results". Few specific programmes or measures were outlined at this stage, though. Mandatory cuts in emissions form no part of the initiative, unlike the Kyoto Protocol. The initiative is led by the United States and Australia, and includes Japan, China, India and South Korea.

In the US itself, in contrast to the federal government's policy, nine north-eastern states are expected to formalise a cap-and-trade emissions pact in September. The bipartisan Regional Greenhouse Gas Initiative (RGGI) is likely to cap emissions from power stations of more than 25MW (there are 600 of these in the region) from 2009. A draft Memorandum of Understanding issued on 24 August says the cap will be implemented in two phases and that "emissions will be stabilised at approximately 150Mt[CO_2] from 2009 through 2015; followed by a 10 per cent reduction between 2015 and 2020". ❏

www.state.gov
www.rggi.org

Steps to counter threat of flu pandemic

EU veterinary experts met in Brussels on 25 August to discuss the steps that should be taken to prevent avian flu spreading to the Community from South East Asia and Russia (Siberia).

There was extensive discussion on the possibility of the disease spreading into the EU via migratory birds. Taking into account existing knowledge of the migratory routes of the species of birds that might pose a risk of spreading the virus, the group concluded that the immediate risk is probably remote or low, depending on the area of the EU.

It recommended that all member states urgently review and intensify the surveillance programmes already planned for 2005-06 by increasing sampling of migratory waterfowl along the flyways that could pose a risk of disease introduction. There should be improved cooperation between the member states, coordinated by the European Commission.

The expert group noted the specific preventative measures implemented or announced in the poultry sector of some member states in response to the outbreak in Russia, but considered a general ban on keeping poultry outdoors would be disproportionate at present. However, it recommended that bio-security measures (e.g. disinfection of vehicles moving between farms) should be reinforced wherever necessary based on a case-by-case risk assessment. This assessment should consider the migratory routes of waterfowl and situations where wild birds might have close contact with domestic birds (e.g. at ponds). In risk situations, vaccination might also be considered.

In the UK, the Department for Environment, Food and Rural Affairs (Defra) is to issue guidance to industry and veterinarians on assessing the risk of avian influenza locally. Biosecurity guidance for farmers is available on the Defra website, and there is also a contingency plan on the website too. Some £25 million is being committed to improving the detection and prevention of illegal imports of birds and products from affected countries.

The next issue of *FST Journal* will include a report of the Foundation's dinner/discussion on the threat of a flu pandemic. ❏

www.europa.eu.int/rapid/pressReleasesAction.do?reference=IP/05/1068&format=HTML&aged=0&language=EN&guiLanguage=en
www.defra.gov.uk/news/statements/050826.htm

Advances in brain science predicted

New treatments for disorders like Alzheimer's and Parkinson's Disease, improved treatments for addiction and the development of cognition enhancers, as well as a variety of products that improve mental functioning, could be less than 20 years away according to a Foresight report *Drugs Futures 2025?* published by the Department of Trade and Industry (DTI) in July.

The project, led by Sir David King, the Government's chief scientific adviser, identified a number of advances for the future of science and society. These developments may have wide reaching implications for society and highlight key opportunities and challenges for the 21st century.

The report suggests the greatest changes society will witness in the near future will be in our understanding of the brain, how it functions and performs, its capacity and limitations and how it affects our behaviour. ❏

www.foresight.gov.uk

The issue of identity cards is highly controversial but the Government is convinced their introduction is necessary. The Foundation meeting on 23 February 2005 examined the issues.

The time is right for identity cards

Katherine Courtney

Katherine Courtney is director of the Identity Cards Programme at the Home Office. She took up her current post in September 2003 after working in the private sector in telecommunications and IT. She has led major development initiatives for large global companies such as Cable & Wireless and BT, as well as directing business and technology developments for international start-up ventures.

Globalisation has led to the international movement of people on a scale unthinkable just a few decades ago. In 2003, for example, more than 90 million individuals arrived at UK ports. This increased freedom of movement, while bringing massive benefits, has also made it increasingly difficult to counter threats from illegal immigration, to protect people from identity theft and fraud, and to interdict the activities of organised criminals and terrorists. Correct identification and the ability to manage identity have become critically important as a result. Already, 21 member states in the European Union have identity cards – only the UK, Ireland, Denmark and Latvia do not.

One trend towards enhanced security focuses on existing identity documents such as the passport. The UK Passport Service will be launching a biometric-based electronic passport later this year, in response to both this country's increased security needs and also to the pressures in the European Union, the United States and elsewhere for biometric identification at border control points. In addition, the Passport Service is introducing a system where first-time applicants for passports will be interviewed in person, in an effort to make a more robust identity check before passports are issued.

In the worldwide drive to increase the security of documents on which people and organisations rely for verifying identity, it is important that the United Kingdom should not be left behind. Several years of consultation went into the policy decision, taken at the end of 2003, to introduce identity cards. As a result, key decisions were made about how the scheme would be delivered.

In 2002, a Cabinet Office study highlighted a growing trend of identity fraud which was costing the UK economy, under the best assessments available, £1.3 billion a year. Having your identity stolen is a painful and traumatic experience. It can take some individuals up to 300 hours to put their financial and personal records straight and to go back to their normal life once their identities have been stolen and misused by others. There is no doubt that identity cards will provide protection against identity fraud, and there is also no doubt that they will add to the armoury of the police and security services in their efforts to impede the use of multiple and fraudulent identities by organised criminals, terrorists and others.

Probably most importantly, identity management is becoming more and more important to citizens in everyday life. You are asked to demonstrate your identity when you open a bank account, or when you make on-line transactions. Government and private sector organisations need to know who they are dealing with, and individuals want to know that their identities are being treated securely. There is a need to be able to identify a person not just once, but every time there is a transaction with that individual.

These are the needs that are driving the Government to say the time is now right to introduce a robust, standardised form of identity for residents. The core proposition is to deliver a single, definitive and verifiable record of identity for anybody residing in the United Kingdom for a period of more than three months and over the age of 16 (which is the age when people will become eligible to register for a card).

Most people will register for an identity card as a matter of course when they come to apply for, or renew, a passport. Today, the Passport Service issues passports to over 80 per cent of the UK adult population. That is expected to grow, so the bulk of the population will come into the identity card scheme as their passports expire and they choose to renew them. EU and other country nationals who come to reside here will be registered, and that will be linked to ongoing developments of biometric visas and biometric residency permits. These are EU and UK policies that are already in train, so we will be building on them.

Biometrics are critical to the success of the scheme because a key priority is to ensure the system is secure. Our working assumption is that we shall be using multiple biometrics – facial, fingerprint and iris – in order to achieve two ends. First, to get the highest level of assurance that people cannot register multiple identities on the system. Second, to provide a quick, easy and verifiable way of linking an individual to their record on the register.

We recognise that biometrics, and particularly their use on this scale, present a new challenge, but there are already

many examples where they are being used quite successfully. The Police National Automated Fingerprint Identification Service uses electronic fingerprints. The Asylum Seeker Registration (ARC) system has already issued 200,000 ARC cards which use fingerprint technology to link asylum seekers to their records in the Asylum Screening Unit. The FBI has an electronic database covering 47 million subjects. The United Arab Emirates already has a database of 350,000 iris scans that they are using quite successfully and, in the United Kingdom, the Immigration Nationality Directorate is launching, at Heathrow Airport and other ports, an iris recognition system for the fast-track clearing of people through immigration control. All of these developments are going ahead, or are already in existence and work very well. We have also had a biometric enrolment pilot at the UK's Passport Service, which took 10,000 people through enrolment using all three biometrics. That gives us a great deal of confidence in moving ahead with our design.

The National Identity Register is not a 'Big Brother' database. It is a system that will hold solely the core information required to verify identity. This information is very similar to that on other government systems: name, address, date of birth, residency status, and so on. The advantage with the identity card system is that, in putting the information in one place, government service providers will be able to verify it, rather than constantly repeating intensive registration processes for every single service that people might need to use. Biometrics link that record to the particular individual.

We are building it incrementally, in the first place as people renew their passports. Government has a lot of experience of running big databases: the Passport Service itself holds 44 million records, while the Driver and Vehicle Licensing Agency holds 38 million records of people. We know that this scheme will be a little broader than that, so it is critically important that we focus on protecting the privacy of the individual in the design of the system – including the issues of how the data is held and how it is used.

A number of safeguards are being put in place. We will be introducing a new Identity Scheme Commissioner who will have oversight of the scheme, reporting to Parliament not just on how the scheme is being designed, but also on how it operates in practice and how organisations are using it. The commissioner will ensure that people are not misusing the opportunity to check people's ID. Second, the security considerations around the system have been built in from the very beginning. The intention is to slowly scale up the system on a voluntary basis as people renew their passports; a decision will then be taken by the government of the day (once the system has been proven to work and the public is comfortable with it) on whether to move to a compulsory registration scheme. All of these factors will, we feel, serve to 'de-risk' the programme.

We are subjecting the scheme to a great deal of oversight and scrutiny, in addition to the Office of Government Commerce Gateway Review process. In particular, the scheme's governance includes representation from all the key stakeholders who will be using it, to ensure that their requirements are being met. We are also introducing an independent assurance panel within the programme, including a biometrics assurance group chaired by the Government's chief scientific officer: this is to ensure that our testing and feasibility analysis about the use of biometrics is robust.

The Identity Cards Bill completed its Commons stages in January. It was introduced in the Lords towards the end of February; the programme is now focusing on defining the requirements of the scheme, carrying out the feasibility analysis and defining the procurement strategies to ensure that, when the scheme goes to procurement, we will be seeking the best value for money for the UK taxpayer. The Government is confident that it has the support of the public: all opinion polls show that around 80 per cent of the public are in favour of ID cards. The time is right. We will be able to deliver the benefits of increased efficiency for access to public services, increased convenience for citizens and additional weapons in the fight to combat identity fraud and impede some of the other threats to the country. ❑

The Identity Cards Bill was reintroduced in the House of Commons on 25 May. It is expected to receive its Third Reading this autumn.

Convergent and divergent strategies

Ian Watmore

Ian Watmore is head of the e-Government Unit at the Cabinet Office. He joined the Unit in September 2004 from management consultants Accenture, where he was UK managing director. Ian chairs the IT Industry Board of eSkills UK (the Sector Skills Council for IT and Telecommunications). In a personal capacity he is on the Board of the English Institute for Sport.

I first became interested in the subject of identity management in 1984. I was a junior member of a team preparing an IT strategy for the NHS, and I was asked to look at identification as far as the NHS was concerned. For a blissful three months I became fascinated by the origins of what we know today as the NHS number. I discovered it was actually the war registration number issued to British citizens on 3 September 1939 and was still being used for rationing in 1948 when the NHS was born. They carried it on until 1984, by which time its usefulness was running out. My second involvement came in 1988, when I was working for the Department of Social Security. I was testing and implementing the Departmental Central Index: this was the first index of all British citizens, as far as we could tell, on-line and available to public servants. In 1988, with the technology available at that time, it felt like building Concorde or putting a man on the Moon. However, while we were building that index, the NHS was building another one, the tax people were building a third for National Insurance, there was bound to be one somewhere down in Swansea for the drivers, there was probably one for passports, and so on. I could see that not only did we have a proliferation of identifiers to identify people, but we had a proliferation of databases behind the scenes.

I have kept those two memories with me ever since and then, last year, I became effectively the head of IT for the Government. I started to look at this subject again and the more I looked at it the more convinced I became that, if we leave this subject to its own devices, we will end up with an incoherent and unusable proliferation. At some point in the future, we will have to retrofit a framework to enable

discussion

Concerns. There were serious doubts, given the history of large public IT projects, whether the ID card system could be delivered on time and function appropriately. Existing databases, such as the Driver and Vehicle Licensing Agency's, contained a high proportion of inaccurate information. How could anyone be sure that their information was correctly held? How would access to it be controlled? How could misuse of the system be prevented by future regimes of a different character from the present UK system of governance? Could the system be made hacker-proof? None of these problems could be definitely excluded, but there were many safeguards around the project.

us to go forward again. So, the sooner we establish the strategic framework into which this whole subject can fit, the better.

I think that this subject has become important not so much because of ID cards but because of the introduction of widespread online transaction processing systems in the public and private sectors. It is in those areas that you begin to join up services and systems across traditional boundaries, whether they are Government department boundaries or public/private ones. Those are the things that are forcing all of us to face up to the issue of identity management.

Let me give you an example. This week, I received a letter from the Driver and Vehicle Licensing Agency to say that my car tax needed renewing. Normally when I receive such a letter, I get a sinking feeling because it means that I have to find my insurance certificate, find a post office that is open on a Saturday morning (which is increasingly hard to do) and then trudge down with all the documentation and get my tax disc renewed. I have only two weeks to do it and two Saturday mornings that are probably already committed to watching my children play football. In this case, the letter told me that I could now do this online. All I had to do was to type in a long registration number they gave me. So I went online and typed in this long number: up came details about the car as well as the details of my insurance certificate which they had mysteriously collected from somewhere. They then asked if that was all correct and I confirmed that it was. They then asked for my credit card or debit card number and details; I gave these, my £160 transaction was completed and two days later the tax disc arrived in the post. It was brilliant; the sort of thing that we would hope to aspire to across Government because we want to provide services that are every bit as good as the private sector.

My only reservations about that service were the long registration number that I had to type in, and how they had managed to match me, behind the scenes, with my insurance details from a private sector body.

One last example: I visited a leading local authority which is trying to join up the information it holds about citizens in its deprived areas. They put up on screen the details of one person who had six different interactions with the various local services in that region - housing, social services or whatever - and every single one of those records had a different unique identifier because it came from a local system. In order to preserve the 'joined-up' approach, they had created a seventh! This is a leading authority doing good work to join up services to improve social outcomes, and behind the scenes it is creating a proliferation of identifiers and identity management issues for us in the IT industry. We need to reverse that trend, because otherwise it will become unmanageable.

So, why is convergence important? First, it is important to us as consumers of Government services – take my tax disc as an example. I also think it is important for people who may act as intermediaries between us and the Government. For example, I am hoping that the insurance companies, when they are trying to get me to renew my motor insurance with them, will also do the tax disc for me. Perhaps more important is the voluntary sector and areas such as Citizens' Advice Bureaux. CAB operators could take a huge load off the state and improve the service to the citizen, if only they could get 'joined-up' access to all the local and central government services that work in that area, and provide a seamless service to that one person sitting in front of their desk. The other big issue is the Government's intention (whatever the political hue) to create individual social outcomes; that requires a more 'joined-up' understanding of how we, as citizens, interact across Government. According to Baroness Scotland at the Home Office, by the time a domestic violence case reaches the criminal justice arena there have been, on average, 35 different interactions with the public services (such as health and social services, for example). With better knowledge of those interactions, we could do a much better job in handling the case.

That is why I think that we need to establish a convergent approach. Against that, we have the concerns of 'Big Brother' and the lack of privacy, and I understand that. I am not recommending that we all go to one unique identifier which gets used for everything; I think that is potentially a step too far. I am not sure I would want the NHS systems keyed on the same identifier as the ID card. People tell their doctor things that are very private, and which are important to ongoing health care provision in this country. There is strong evidence that people would not reveal that information if they felt there was a chance of it being used by other parts of the state. So it may well be that health is something that we keep as an 'island'. Certain types of financial transaction – interest, tax and benefit, paying of excise duties, car taxes – may be another area that we keep separate. I do not know what the right outcome is, but I do know is we need to stop 'diverging and exploding' in our approach to identification and we need to converge into something that makes sense for all the different business priorities that I have outlined.

My final observation is that, in setting that framework up, we have to judge the risk management aspects. First of all, it is quite clear that the more joined-up we make access to particular services, the more convenient it is for us to use. However, when we put all the eggs in that one basket, it makes the security of that basket triply important. If people can access that one identity framework they can get into so much else. This is a risk that we have to balance. The other thing we have to consider is the fact that, by the time any of these solutions is implemented, the technological base will have changed massively, so we have to have a

discussion

Government duty. It was asserted that the Government had a duty to provide a robust system for proving identity, and it was a pity that the Home Office had not acted more quickly without such widespread consultation. On the other hand, there was a danger in overselling the benefits of the system and promising benefits that did not materialise. The emphasis had been put on anti-terrorism and security as a reason for its introduction, but this was too narrow, although understandable politically, and could well backfire if terrorist incidents still occurred.

solution that can move with the times and with technology. We also need a solution that moves with public opinion. This has changed over 20 years and it will change again – it may harden or soften on this particular subject – and we need to have a solution that is flexible enough to move with it.

We are trying to set the ID card debate in a wider context. We hope to publish our wider IT strategy for Government, of which this will be a part, by November. We aim to lay out a convergent framework that has a strategic flexibility, so that people can build their systems and design their solutions knowing they are converging towards a result that will stand the test of time. ❑

The glass consumer

Ed Mayo

Ed Mayo is chief executive of the National Consumer Council (NCC), the independent consumer policy body. He has worked in the non-profit and the private sector and was the strategist behind the anti-poverty campaign, Jubilee 2000. He contributes to a wide range of public interest organisations, including the Fairtrade Foundation and AccountAbility.

The author, James Baldwin, said, "Identity is the garment with which one covers the nakedness of the self, in which case it best be that the garment be loose": today that garment is integral to the working of both markets and the state. I want to share with you some of the concerns of the National Consumer Council on issues of identity, and consumer perspectives on that issue.

In the book we published this summer, we focus on the experience of what we call the 'glass consumer'[1]. This term reflects the fact that our lives are more than ever something of an open book in a digitally inter-connected world. In this context, identity management covers a huge range of issues: the roll out of the identity card, the personalisation of public services, the roll out of 'chip and pin' at the moment, the push to tackle crime, and so on.

What I think underpins all these issues is the re-negotiation of individual rights and responsibilities for a new world; and that is one reason why I think that the concept of identity management is in itself inadequate. The focus tends to be on the management of identity by companies or public services, rather than people managing their own identity. The law talks of us not as citizens in this regard but as data subjects; yet if these issues of identity and privacy are reduced to the language of something to be managed, then I think we will find few lasting solutions to some of these emblematic issues of the world we are moving into.

What do we mean by identity? In simple terms, identity may be evidenced by what you are (biometric data, DNA), or by what you carry (an ID card or an RFID-enabled loyalty card), or what you belong to (a charity membership number or your passport), or what you know (PIN, passwords and the like). All of those relate to identity in the sense of identity management, which tries to reduce the complexity of our true character to something in the nature of tokens.

I would like to talk about three examples from a consumer perspective. Like all the best stories, each has a moral attached.

The first is radio frequency identification devices (RFID). These are small tags that emit a radio frequency so that you can transmit data across a short distance. They are likely to replace the barcode for everyday shoppers in 10 years or so. Already, in the Baha beach nightclub in Barcelona or the Bar Sober in Glasgow, you can have chips implanted when you go into the nightclub and you can pay for drinks without credit cards: this is very much an emerging reality. RFID presents quite a few challenges to consumer privacy, security and dignity, and there has been something of a backlash against retailers that have looked at rolling this out – which happened because those organisations paid little attention to any of these issues. Take the Oyster travel pass in London, for example. If you have an Oyster card, your personal journeys are logged on a computer and kept for two months. No such database existed in the past and probably very few people are aware of that. Now it may be that, as consumers, we are increasingly willing to trade off our anonymity for access to new services but, equally, as the take-up of the

discussion

Choice of technology. There was concern that the proposed system, relying on biometric profiling, was too tightly tied to one particular technology. For example, the implant of an RFID chip in individuals would be more secure and easier. However, such a proposal would currently be politically impossible. A number of speakers expressed concern that public opinion could turn rapidly against the system unless there was early evidence of benefits – which should lead to a surge of voluntary use of cards – and a clearer understanding of how terrorists, who would actively avoid using cards, would be deterred.

telephone and mailing preference advisory services show, consumers do not like nuisance and they dislike any service that becomes a disservice.

At the National Consumer Council, we have had some success in encouraging regulators to issue some guidance on RFID. However the example illustrates what I would call the vacuum approach to technology development which is 'talk to no-one', let alone consumers; you might market test them but you certainly do not talk to them. The moral here is that you have to earn trust and not assume it.

The second example is 'chip and pin'. The industry introduced it, arguing that it will cut fraud losses and allow financial service institutions to pass over liability for some fraud to retailers. Again, there are concerns about some of the ways in which this is being implemented. In particular, insufficient attention was given to people with disabilities who may have difficulty using the chip and pin cards. You can request a 'chip and signature' card and sign for goods as before, but there is very little information about this out there. Mystery shopping by the disability charity RNID found recently that only one in five banks was giving out correct information on this to their customers. They probably did not want their customers to take up this option, but that is a short-sighted approach. Similarly, drivers with disabilities have found themselves in difficulties on the petrol station forecourt: before, people used to come out with things that they could sign, but now they will not bring out the cordless keypads. There needs to be some guidance to those garages. Maybe this was the result of inevitable teething problems, but the moral here is that you have to assume diversity. If your project is not identity management but identikit management, you are certainly going to trip yourself up.

The third example is the NHS electronic health services. We are very enthusiastic about the billion pound programme for NHS IT which we think has the potential to transform the way in which we experience the health service as patients. At the NCC we have been looking at how well-equipped consumers are for this new world. We have looked at what the World Health Organisation calls health literacy, and we have found that electronic services really do reach down the income scale to help people manage and take more control of their own health.

However, there is much to do on the demand side, if you like, of identity management. Today, around seven out of eight low-income consumers do not or cannot read so they cannot understand the information leaflets that come with pills and medicine. Those with low literacy in this regard also have worse health outcomes. So the moral is that, if you are going to invest in new services, you may also have to invest in the capacity of consumers to use them.

These are hopeful examples of where identity and identity management can pay off to consumers. There are, however, some cautionary notes, in particular around the fair use and integrity of data. Markets will not thrive if information practices are poor, and what I call rogue data is bad news for consumers and for businesses. The way that we have handled these issues over the past three decades is through data protection law, but it has real limitations. Looking forward, we may need to review the way this works, both the Data Protection Directive at EU level but also the Data Protection Act. At present, these operate reactively rather than proactively.

I want to leave you with two paradoxes that I think we need to grapple with in order to see how this re-negotiation of rights and responsibilities in society needs to work. The first paradox is that the less privacy we have as individuals, the more, as a society, we will be concerned to re-create it. William Gibson, the author who coined the term 'cyberspace', argues that, driven by the acceleration of computing power and the simultaneous development of surveillance systems and tracking technologies, we are approaching a theoretical state of absolute information transparency. It is, he says, becoming unprecedentedly difficult for anyone to keep a secret, and I am sure that the politicians among us would endorse that comment. The paradox is that we cannot discard a concern for privacy because it is part of the human condition. There is some pioneering work by Stephen Margulis that points to the central role of privacy in our psychological make-up and its centrality in both personal development and stable interpersonal relationships.

The second paradox is that every act of inclusion is also an act of exclusion. Identity management opens up new services and can promote competition in the market, but it also promotes selection in the market. A particular concern for us at the NCC is how and whether the tools of identity management could reinforce social exclusion. This is not, or not just, a story of lackadaisical banks that hide behind money laundering regulations to prevent the poorest consumers from opening a bank account (if you think that is overly cynical, have a look at some of the reports from the regulator). But it is about market exclusion: what we find, time and again in our research with consumers up and down the country, is that the poor pay more, or get less, for a range of services. Identity management and personal information are going to have a major impact on that dynamic of poverty and exclusion, both for good and for ill.

More than ever before, our personal information and identity defines who we are, it defines who others think we are and it defines our opportunities in life. Whatever your role is in this, if you consider the consumer interest, you are part of the future. But if you fail to look, in your projects, through the eyes of the people whose identities you are trying to manage, you will build in your own obsolescence. ❑

1. Susanne Lace (2005) *The Glass Consumer: Life in a surveillance society*. The Policy Press in association with the National Consumer Council. ISBN 1 86134 735 9. **www.glassconsumer.com**

discussion

Public trust. It should not be assumed that the public automatically trusted the Government to work for the citizen's, rather than its own, benefit. Trust was crucial: it could only be built, first by making promises which were plausible and, second, by ensuring they were delivered. The greater the use that could be made of a single system and the more it was integrated with others, the more suspicion would grow that privacy had been eroded and central control over the lives of individuals increased. Only the growth of trust could allay such suspicions.

discussion

Advantages. Some of those present felt it was misleading to concentrate only on the possible disadvantages and dangers of this project. It could be of great value to the citizen in making life simpler and easier (there would, however, need to be much greater protection of identity information, to ensure that it would not be misused). It could, for example, be much easier for someone to prove that he should not be the subject of a police investigation, and more difficult for one person to gain access to the financial assets of another.

Using technology to manage road congestion

Graham Pendlebury

Graham Pendlebury has been director of Road and Vehicle Safety & Standards at the Department for Transport (DfT) since November 2004. He was previously head of the Aviation Environmental Division within the Aviation Group of the DfT, where he was responsible for all policy matters on control of civil aircraft noise and emissions in the UK, including negotiation and implementation of European Union legislation. He also represented the UK on the ICAO Committee for Aviation Environmental Protection.

The use of technology in congestion management is a very large subject. I propose to paint a very general picture of the ways in which technologies might be used to address congestion and then focus on one particular technology that the Department for Transport (DfT) is considering.

A major problem in managing any aspect of transport is what one of my colleagues has referred to as the 'waterbed syndrome': whenever you change one part of it, you get ripples spreading out in unpredictable and unexpected ways. We could, for example, increase throughput down the A303 to the West of England by driving a four-lane motorway through Stonehenge but that would have major environmental and heritage implications. Similarly, we could increase traffic volumes on the M25 by getting the vehicles to travel at half their present spatial separation, but that would have safety implications; road safety is a major element in my portfolio.

Our traditional approach to transport provision includes measures to damp down the demand, to increase capacity and to try to improve the efficiency with which capacity is exploited. Traffic lights, variable speed limits, congestion charging, information campaigns and park-and-ride systems have been used on the 'supply side'. We have also taken steps — speed cameras are an example — to try to change people's behaviour in order to reach an optimal balance between mobility, throughput, safety and the environment.

But all this is old-fashioned technology; we now have a new set of tools available, known collectively as intelligent transport systems (ITS). These introduce information and communication technologies which work alongside the hard engineering and the social sciences.

Within the department, we are looking at the application of a variety of general ITS techniques. As an example, electronic vehicle identification can improve the processes currently carried out by automatic number plate recognition and the traditional vehicle excise duty disc on your windscreen. At the same time we must preserve the individual's privacy and ability to travel without the perception that Big Brother is watching.

The way we use our vehicles is changing. For instance, the use of e-shopping means that households are making fewer trips with their own vehicles to shopping centres but their purchases are then delivered to them by middle-sized vans. Changing work patterns (such as teleworking and flexible hours) are likely to influence the demand for public transport and road space. But it is clear that we need flexibility and a fast response to change.

One promising new concept to cope with these trends is the Co-operative Vehicle-Highway System (CVHS). We start with a smarter vehicle fitted with sensors and wireless communications. Already a number of vehicles are fitted with intelligent cruise control, whereby forward-looking radar senses the presence of the other vehicle and slows down from the set cruise speed to a matching speed at a safe following distance. When the vehicle in front moves out of the way, the original chosen speed is then restored.

Reverse radar and parking distance control are increasingly common. And sideways-looking radar is beginning to emerge from the research labs. In this, the vehicle sensors can look sideways and behind and monitor the blind spots for the driver: if the driver begins a manoeuvre and the sensors detect another vehicle travelling towards the same road space, then the driver is given a warning. In all these cases, the systems need not necessarily stop at warning the driver. If the on-board electronics sense a genuinely dangerous move is being attempted, they could be programmed to override the driver's commands.

Importantly, it is possible to share information between vehicles. If many vehicles are sharing information with each other, one might detect icy and slippery road conditions and broadcast that information to other vehicles in the area.

The Highways Agency is preparing an experiment, to take place on the M42 near Birmingham, on vehicle infrastructure co-operation. When the infrastructure detects that a particular type of incident has occurred, the vehicles are re-brigaded, using the hard shoulder for running in order to try to maintain traffic flow while negotiating the incident. The extension of vehicle-to-vehicle and vehicle infrastructure co-operation could ensure that, over a fairly large area, a network of informa-

tion collection and sharing takes place, which will maximise traffic flow while maintaining the highest levels of safety. The combined use of satellite communication, roadside sensors and vehicle-to-vehicle communication would tell the driver what is going on, while maximising traffic flow and safety.

The ultimate CVHS could be a 'road train' of vehicles under infrastructure control, allowed to bunch together and move through the network at high speed as one large unit. Obviously, there are numerous social, legal, institutional and behavioural aspects in putting this sort of research system into production. Our current thinking is that it might be useful on long stretches of motorway — not the M25, for example, with its many junctions — and for freight vehicles where guaranteed transit times and higher average speed are important factors.

We thus have many things in our potential CVHS toolbox, ranging from simple information to drivers, through advice and warning systems, to those where either the system takes control from the driver in the event of an imminent emergency or the driver hands over control in order to benefit from a more predictable journey.

The more powerful the impact on congestion of a particular technique then the more likely it is that the driver's personal freedom of action will be voluntarily or involuntarily restrained. So, if we take this concept just a little bit further, let me close with a final speculation – and I must stress this is not some established Government policy – it is a speculation. We could have a new design of twin, four lane motorway where the two outer lanes are 'turn up and drive' (perhaps charged at a certain number of units per kilometre). The inner two lanes are controlled by the infrastructure and the driver pays a reduced charge per kilometre in return for handing control of the vehicle over to that infrastructure. The drivers would also book a path through the system, rather as private pilots get clearance from air traffic control, rather than simply turning up and driving: so you pre-book, you form the road train and off you go. ❑

Technology on the road network

Archie Robertson

Archie Robertson OBE was appointed chief executive of the Highways Agency in November 2003. Prior to joining the Agency he spent seven years as director of operations at the Environment Agency for England and Wales. His previous career was spent in BP's international downstream operations.

The Highways Agency is responsible for the management, maintenance and operation of England's motorways and other strategic roads. These roads make up just 2.8 per cent of the country's total road network, but carry a third of all road traffic and almost two thirds of all of the freight that is moved in this country.

This network is valued at £65 billion and represents the Government's single largest public investment. At the current rate of unrestrained traffic growth, we can expect a 40 per cent growth in demand in the next 20 years. These numbers tell us that we cannot build our way out of congestion: we must manage traffic better.

The Highways Agency has been a leader in terms of technology over the years. We are attempting to influence traffic behaviour and, should there be road-user charging on a national scale, we would expect to make a contribution to that. At the same time, we are always working to reduce the safety hazards on the network.

Technology is largely about information and there are three elements. First, there is the information that we need in order to manage a lot of traffic on the network. Second, the information that we need in order to plan where to develop the network next and where to put the control systems. And third, there is the information that we can give road users, in order to make their journey better.

The Highways Agency is in the process of replacing a network of about 30 communications and control centres, operated by the police, with seven regional control centres owned and run by the Agency, where we work with the police to manage traffic in a strategic way. In parallel with the introduction of these control centres, traffic officers are being introduced to tackle congestion arising from road incidents.

Our main challenge is to keep the roads safe. A recent advance in this area is queue protection: this is one of our fundamental tools, but road users are probably unaware of it. The key is MIDAS, the Motorway Incident Detection and Automatic Signalling system, based on sensors under the road that can detect a queue almost before it forms. We can alert drivers of trouble ahead and, hopefully, stop them joining a huge traffic jam, or even worse a huge accident. MIDAS, just a few bits of wire in the road, microprocessors, a clever computer algorithm to make sense of it all, and a system of road signage, saves this country about £40 million a year in terms of jams and personal injury.

We are increasingly using 'ramp metering'. Particularly on the M27 and M6, we reduce congestion by staggering (metering) the volume of traffic that can enter the motorway from the 'on-ramps'. Ramp metering has been used successfully in the United States, but that does not necessarily mean it will work here. On average, the motorways of Great Britain have motor vehicle flows of 75,000 vehicles per day (although this varies considerably across the motorway network). The busiest section of the network – the western M25 from the A1(M) to the M23 – had a maximum vehicle flow of 196 thousand vehicles per day in 2003. Nonetheless, the controlled motorway system on the M25 does smooth the flow of traffic down to the point where it is usually possible to keep traffic on the move. This approach is relatively cheap and we will see a lot more of it.

By summer 2006, we shall be using the hard shoulder of the M42 as a running lane during peak times on one of the busiest parts of the network, serving the National

Exhibition Centre and Birmingham Airport as well as a lot of through traffic. This is an area where some critics tell us we are being almost rash, since the hard shoulder is traditionally reserved for access for emergency vehicles and as a place of refuge. We can cope with this aspect by constructing refuges, and using computers to control traffic flows very quickly, but here is an example where some observers advise us to slow down whilst others urge us to hurry up.

On more microscopic levels of technology, people working in the control centres need to have data in order to oversee what is going on. The Motorway Traffic Bureau provides the information which allows those who run our network to make good decisions. Motorway On-Line Assistance uses data from the regional centres to model traffic on the road network, predicting what road conditions will be like up to an hour ahead and assessing the effectiveness of different control strategies. This is used by Kent police when they activate Operation Stack, the arrangement to park freight on the M20 when the ferries are not operating.

At the National Traffic Control Centre we are assimilating, under a Private Finance Initiative (PFI) project, all the information that is available on our network so that we can tell travellers what is happening ahead, or on other parts of the network. On our website we are providing information, collated nationally, that will enable people to plan their journeys better.

We are working with the Department for Transport on new ways of monitoring traffic conditions, including data from CCTV as well as loops in the road. We are about to invest in another PFI programme that will install fibre optics throughout the road network, making it possible one day to transmit CCTV images of traffic congestion to your home. Of course drivers will want that sort of information in their car, and that might become possible if international standards are established for such a system.

Finally, the technology itself is not the problem. Choosing the right technology is a challenge, but getting humans to accept it is the biggest challenge of all. When deciding what technologies to adopt we need to ask: are we too risk averse or do we not take enough risk with public money at the end of the day? Are we getting the balance right: should we be putting more into technology and less into tarmac, because the Agency spends the best part of a billion pounds a year looking after the existing infrastructure and another half a billion pounds a year on enhancing the network? ❑

www.highways.gov.uk

Geographic information and traffic management

David Rhind

Professor David Rhind CBE FRS FBA is vice-chancellor and principal of The City University in London. He is chairman of the Statistics Commission, chairman of the Universities UK Business and Industry Strategy Group and chairman of the ESRC UK Data Forum.

Managing congestion and other road traffic issues requires geographical information — specifically geographic coding such as postcodes, grid references and global positioning system (GPS) locations. The use of computer systems for handling geographic information has grown enormously during the past few years. Globally the market size is about $19 billion a year. Expenditure on software alone is over $1 billion a year and it is certainly expanding very rapidly. The United Kingdom led in this area in the 1970s, but the market is now dominated by the United States.

In this country we have the best traditional mapping in the world. The Ordnance Survey's MasterMap is available across the whole country and is updated every six months or so for important features. Overlaid on top of, and fitted to, that MasterMap by others – central and local government, businesses of all kinds and many others – is a huge amount of other data. Using the map as a framework gives something – added value – almost for nothing, enabling many more data sets to be used in combination. Virtually *all* the information collected by the Government and many private sector organisations in Britain is referenced geographically to the OS map framework. A simple example is the mapping of data on noise pollution, collected and assembled by the Department for Environment, Food and Rural Affairs (Defra), which shows the huge variations in noise adjacent to different roads.

As GPS receivers become ever-more compact and cheaper, their use is spreading into new areas. Using this tracker technology we can monitor human behaviour with real data, as opposed to relying on what people say they do. This is enormously important for planning facilities. The Norwich Union 'Pay As You Drive' scheme, which sets car insurance premiums based on how often, when and where a car is actually used, shows what can be achieved. Even so, GPS data usually needs to be linked to a map framework.

The technology is not the problem. The problem lies elsewhere and it is about policy coherence, intellectual property rights, legal constraints and much else. I will consider just one element of that: the data policy, insofar as it relates to UK government data and whether we charge for it or not.

In the United States, the Federal Government does not claim copyright on its information products and no restriction is placed on the further dissemination of those data (this is not true of all US states). In general, US geographic framework data are of much lower quality than in the UK. In this country, the policy environment is varied. The present Government abolished the previous regime which had imposed a charge for a number of official statistics. Many Government bodies, like the Office for National Statistics (ONS) and Defra, make much information available freely. However, other Government bodies which operate on a trading fund basis, notably the Ordnance Survey, the Met Office, HM Land

Registry and the Hydrographic Office, have to pay their own way and, consequently, charge whatever they can for their data or license it to other people who charge. Such trading funds generate around £350 million a year from selling data and services to users rather than being supported by taxpayers. Local authorities have not been subject to any particular rules and there has been a great deal of freedom for them to do as they believe fit. A new Office for Public Sector Information will be set up after the election [May 2005] which will take over the Crown Copyright and HMSO responsibilities, moving beyond central government's information provision to include both the NHS and local authorities.

There are plausible arguments both for and against the selling of Government data. We have good mapping in this country because it has been properly funded and organised. However, if one Government department, which makes its own data freely available, also incorporates OS data with it, then complications arise. More generally, because of the differing policies and the fact that no one is in overall charge, we get a whole series of difficulties.

Two transport-related examples illustrate the problem. The DfT is currently thinking of developing a road database, including speed-limit information for all the roads in the UK. Potentially, many different organisations will be involved in providing information. There is no single up-to-date source of information about the road speeds that are set by all of the agencies involved; the information has to be drawn from many sources in central and local governments. There are some substantial potential benefits from having this and making it generally available, perhaps in cars: to make it useful, though, the coordinates of every section of road are needed and the obvious source is OS. Ideally, the DfT would like to make the entirety of this data – including the coordinates – freely available; that is, free from copyright and easily shareable, in the public domain. This appears to be enormously difficult.

Another example of the 'many players' problem involves address lists, also used in many transport applications (e.g. guiding ambulances to houses). Addresses also underpinned the collection of data from the last Population Census in 2001, which cost about £250 million. There were problems in finding about a million people, especially in inner urban areas. This has big knock-on effects – Westminster City Council stood to lose about £50 million per year. There are many different bodies involved in dealing with addresses (collecting them, putting them together, checking them) in this country. There have also been over three years of official studies about how to get to one consistent, coherent, up-to-date and continuously maintained address database; we are not there yet but the Office of the Deputy Prime Minister is now taking it forward[1].

Thus there is a real problem in regard to data policy in the UK. The quality of some Government data is better than you would get elsewhere in the world because the users pay and have leverage. On the other hand, free Government data has certainly resulted in wider use of Government statistics and other geographic information. None of this would be such a big problem if data sets from organisations on different business models were not necessarily used in combination. Since data linkage is essential for many applications, there remains a big problem because of the different policies of various Government departments. I think we have real issue about how 'joined-up' policies are between different departments. This is not, of course, unique to the UK but it is particularly important here because charging for information does not apply in some other parts of the world. ❑

1. Afternote: on 26 May, the Office of the Deputy Prime Minister (ODPM) announced plans for a new national, high-quality spatial address infrastructure building on the work already undertaken by Ordnance Survey and local government. Local government minister Phil Woolas said: "I'm pleased that ODPM has been able to facilitate an agreement between key stakeholders." On 11 August, Ordnance Survey and the Improvement and Development Agency (IDeA) announced that plans to transfer ownership of the National Land and Property Gazetteer (NLPG) to Ordnance Survey as an input to the NSAI had not reached agreement. The Financial Times *of 26 August commented: "The heart of the issue is thought to be the fees that bodies such as the local authorities, which have contributed the data, would have to pay the OS to get access to it." It seems as if the public interest – including the cost to the taxpayer for the next census – has not figured large thus far.*
David Rhind

A long term strategy for integrated transport is needed

Tony May

Tony May OBE FREng is professor of Transport Engineering at the University of Leeds and recently completed a term as director of the Institute for Transport Studies. He was a director of the transport consultancy MVA Ltd, and spent 10 years with the Greater London Council.

The Royal Academy of Engineering's report *Transport 2050 — the route to sustainable work creation*, published in March 2005, looks forward 50 years at transport policy in the round. I will be considering here the key points in the report, focusing on road congestion. However, it is important, when tackling road congestion, to take care not to aggravate other problems.

We need to be looking ahead to the long term. Many of the things covered by the other speakers could be implemented in the relatively near future. These would have dramatic impacts on the transport system and the way we use it over several decades, so we have actually started from the other end, looking 50 years ahead at what we need from our transport system and how best to achieve it. Technology, including technology to provide information for users and for management of the system, is very important but not the only solution. We have argued that we need a holistic approach, the sort of thing that almost 10 years ago was being referred to as an 'integrated transport strategy' by the new Labour Government. No one has ever been absolutely certain what an integrated transport strategy was, so we have dodged that word, but we are clear in our own minds that what is needed is an overall, holistic approach.

Road congestion is a serious problem, on several counts. First, we have the worst road congestion of any European country.

discussion

The chicken and the egg. Government ministers would only be likely to commit themselves to long-term struggles over policies, it was argued, if they felt that there was public demand for them. Such demand only grew from public understanding of the problems, and an acceptance that solutions had to be built on a long-term strategy. But does such public understanding exist? On the one hand, there appeared to be public support for the London congestion charge, but, on the other, Edinburgh had failed. The vociferous campaign against speed cameras should be opposed by anyone who had safety at heart, but there was little evidence of this.

Figures from a recent European Union study put the annual costs of congestion in the United Kingdom at about £15 billion. That is about 15 per cent per capita more than in France which is the next worst. Second, although we have one of the best road safety records in the world, we still have in the order of 3,000 fatalities a year and nearly 300,000 casualties. Third, even with recent advances in cutting pollution from vehicles, up to 10,000 deaths a year are thought to be brought forward through traffic pollution. In addition transport contributes around 20 per cent of global warming gas emissions and up to 28 per cent of carbon dioxide emissions. Transport is the one sector that is likely, if we do nothing, to increase its contribution to this problem.

We are talking about roads and cars in the main and understandably so, but we need to bear in mind that over a quarter of households in this country have no car. Yet outside London, we have one of the least coordinated public transport networks in the world, with some of the highest fares.

We argue that transport needs to be planned as an integrated system because that is the way it operates and our holistic approach draws on five key planks. Of these, pricing is at the centre, but we also need to see enhancement of infrastructure, better use of technology, better management and regulation of our transport system, as well as proper integration of land use planning and transport.

We advocate 'true-cost charging'; that is, all users should pay the true costs of the journeys they make, including the costs of maintaining, operating and enhancing the network they are using, but also the indirect costs incurred in terms of congestion, pollution and accidents. For most road users that will almost certainly involve distance-based charging. For public transport and air travel the same principles apply and we have considered environmental taxes on air travel. However, we propose simplified fare structures so that the public transport system is easier to use and to pay for. But whatever we do with pricing, it is clear that more investment in infrastructure will be needed.

We considered rail investment and our view is that it is far more cost effective to put investment into relief of bottlenecks than into new high-speed links between major cities. That is where the main benefits are to be gained in terms of improving the lot of rail users and providing an alternative to road use. We see a key opportunity for more investment in public transport infrastructure in urban areas with a mix of guided bus and light rail. We also believe that the Government is probably broadly right in its airport strategy, but that we need a counterpart strategy for port investment before we are left totally behind continental European investment.

Another area that we considered was the bus network. For many people in urban areas the bus is the principal alternative to congested road use. We are currently stuck with a deregulated system in which local authorities have no ability – or limited ability – to influence either service patterns or fares. We feel strongly that the system operating in London, where Transport for London can influence both, is significantly better than what happens elsewhere and we need to move in that direction.

The interaction between land use and transport is crucial. Land-use policies alone do not significantly reduce travel but they provide the context in which our pricing, management and infrastructure policies can work more effectively. We must promote higher density development with public transport and continuing controls on private parking. We must avoid committing ourselves to major developments in areas where the transport system cannot adequately meet their needs.

We have also considered the question of governance. We argue that a national strategy must be developed by the Department for Transport to cover all modes and policies consistently and, at the very least, must look ahead 30 (we would prefer 50) years. We must do more to attract all-party support. We further argue that whereas government (national, regional or local) should be determining the strategy, the implementation is better carried out at arms' length. We have proposed an expansion of the Highways Agency's role into what we call the National Road Corporation. This would, amongst other things, manage the pricing system.

In conclusion, we think that it is appropriate to set a 50-year vision and we believe it is right to commit ourselves to achieving a world class transport system. However, we cannot wait 50 years for improvements, we need to act now. For us, the key areas of action are pricing, infrastructure investment and improving governance – and in all of those areas we must commit ourselves long-term and consistently. ❑

Transport 2050 can be downloaded from the Royal Academy of Engineering website at: **www.raeng.org.uk/news/publications/list/reports/Transport_2050.pdf**

discussion

Public attitudes. While some thought that flexitime working, home working and so forth could lead to significant shifts in time of travel, others were sceptical – people like to work together and meet at the same time. Some thought that an ageing population might use more public transport, others thought that increasing physical infirmity would lead to more of them wanting to use the car. But many agreed that plans based on changing patterns of land use, or housing density, would take many years to have effect; social conditions, on the other hand, changed so rapidly that ideas might change before the full effects of land-use changes could be felt. There were different views about the public's understanding and willingness to accept new technology. Many of the technologies considered had been around for some time, but there was a strong reluctance to accept any which appeared to put information, about the private affairs or movements of individuals, in the hands of the Government (perhaps the success of the London Congestion Charge, which in theory did give such information, marked a change in this area). If an individual were able to choose whether or not he could use the technology, he would be much more likely to welcome it, than if its use were imposed on him by the Government.

Why does UK productivity lag behind that of our major trading competitors? That was the issue debated at the Foundation meeting on 23 March 2005.

Driving productivity forward

Vicky Pryce

Vicky Pryce is chief economic adviser and director-general, economics, at the Department of Trade and Industry. She was previously a partner at London Economics, partner and chief economist at the accountancy consultancy KPMG, corporate economist at Esso Europe and chief economist at Williams and Glyn's Bank, later the Royal Bank of Scotland. She has been elected to the Council of the Royal Economic Society, is a member of the Society of Business Economists and is on the Court of the Company of Management Consultants.

Why does productivity matter? The short answer is that our standard of living depends upon it. We in the United Kingdom have achieved very rapid economic growth over the past few years in relation to other countries, particularly European countries, and we now have the fourth largest economy in the world. Consequently, our average per capita income has increased substantially.

However per capita income is a product of two components: output per worker (or productivity) and the proportion of the population in work. In the UK, labour has tended to be cheaper than capital, partly because of our more flexible laws, with the result that companies have rightly gone out and employed more people. Hence the proportion of the UK population in work is high. However, the productivity of our workers is, according to international comparisons, relatively low. In part this may reflect the fact that people entering the workforce for the first time or returning after a period away may be less well-trained and thus less productive. So, although productivity has been increasing, certainly over the past seven years, it has not been growing as rapidly as might have been expected.

Of course there is a natural limit to the proportion of the population in work. Once all those who want to work at the prevailing wage have found work, further growth in national income can be achieved only through increases in productivity. This suggests that the UK's relatively weak productivity performance is likely to be the most important long-term constraint on the UK's growth performance. Government policy has recognised this for some time - this is why after 1997 the Government placed productivity at the heart of its economic policy.

The Government has identified five drivers of productivity growth. These have been shown – in growth accounting studies and other research – to account for the difference in productivity levels between the UK and its major competitors. The drivers are: investment, innovation, skills, enterprise and competition[1]. The drivers interact – for example, a firm's decision to invest in capital goods or innovation will depend on the perceived costs which will also be influenced by the skills and capabilities of its workforce.

The UK's performance against these drivers is periodically reviewed. The last assessment[2] in 2003 showed that while the UK is strong in some areas, the picture is rather mixed. For example while several indicators indicate UK strength – such as the UK's lead in many fields of science (we gain more citations per head of national population than our competitors), others suggest relative weakness. UK businesses perform relatively less R&D – by this measure we rank fifth out of the top seven major industrialised countries. Yet the UK offers a quality of science and a business environment that have traditionally made it an attractive location for R&D outside the United States, although this trend may change.

These indicators tell only part of a more complex story. R&D in itself has limitations as a measure of innovation. While it could be considered a lead indicator in terms of necessary investment for technology-based innovation, successful R&D does not guarantee profitable innovation and, in many sectors, it is not critical to innovation. It is therefore necessary to use a broader definition of innovation that embraces factors such as the introduction of new products and processes. To illustrate, lower levels of R&D by UK businesses appear to be largely due to the fact that many of our most successful, globally competitive companies operate in markets where R&D is a less important input. Those companies that do operate in industries with high levels of R&D, such

discussion

Returns on R&D. The UK is recognised as being weak at exploiting R&D. Some speakers wondered whether this was because venture capitalists look for rapid returns. A desire for quick rewards was also suggested as a reason why companies lose skills. Chief executives do not seem to be expected to stay for more than a couple of years, and the returns on their salaries would be worth investigating.

as pharmaceuticals and aerospace, tend to invest on a par with their competitors in other countries.

Given that there is a very strong relationship between productivity and R&D, should the Government take action? The answer is: only if there is a market failure. In the case of R&D, economic research suggests that there could be significant market failures that lead society to under-invest in R&D. In recognition of this there have been significant increases in the science budget, the introduction of R&D tax credits and a well-funded three-year technology strategy run by the DTI to complement existing R&D tax incentives. The 2005 Budget also made provision for the creation of more Science Cities. In addition, the Government must ensure that the environment is conducive to a productive economy. Interdisciplinary collaboration is important here: we learn from the scientists, the scientists learn from the economists, and we can then see where the issues are and develop the right policies.

Even if Government has the levers needed to influence levels of productivity in the UK, we operate in an international environment that is changing substantially, so that in many ways we have to run just to stand still. Why is this? One reason is globalisation, with increased competition in both manufacturing and services. Major changes are taking place both inside Europe through enlargement and outside Europe in countries such as China and India. A second reason is our ageing population, a trend that looks set to continue. Projections to 2050 show this pattern being repeated in both developed and developing countries. At present, Japan has the oldest population, followed by Italy, Switzerland, Germany and Sweden. Africa remains the area with the youngest. Although in the UK we are living longer, we are having fewer children. This means that the population of working age will decrease relative to the total. In addition there is a third factor that could have substantial economic and social impacts – this is climate change. European summer temperatures have risen consistently since around 1980 and that trend cannot be explained by normal natural phenomena alone. We at the DTI, being responsible for energy policy, are working together with the Department for Environment, Food and Rural Affairs (Defra) and other Government departments to examine this issue and its implications.

How will we meet these challenges? We cannot compete with low wage costs, nor can we adopt a protectionist approach. Although China is on course to become the largest economy by the year 2050, it will still have an average wage that will be far below that of even the poorest countries in Europe. It is clear that we must think much more creatively in order to devise ways of meeting the productivity challenge, and there is no doubt in our minds that an emphasis on scientific and commercial innovation is absolutely essential. We need to increase value by generating and exploiting knowledge, as outlined in the DTI's recent *Science and Innovation Investment Framework – 2004-2014*. The UK has already taken a significant step forward in terms of repositioning its economy to move into high value-added areas. Almost 50 per cent of total value added in our economy comes from knowledge-driven sectors. Over 20 per cent of our exports are high- and medium-technology goods, while over 60 per cent of services exports are in knowledge-based services. We are starting from a position of relative advantage. ❑

1. HM Treasury (2000) *Productivity in the UK: The Evidence and the Government's Approach.*
2. DTI (2003) *UK Productivity and Competitiveness Indicators.* DTI Economics Paper No 6.

The factors affecting productivity

Jonathan Haskel

Jonathan Haskel is professor of economics at Queen Mary, University of London. His research interests are productivity, labour and industrial economics. Jonathan is a fellow of the Centre of Economic Policy Research and a research associate at the Institute of Fiscal Studies. He has taught at the University of Bristol and the London Business School, and been visiting professor at the Stern School of Business, New York University, and the Australian National University. He is on the editorial panels of *Economica* and *Economic Policy*. Jonathan is currently a member of the UK Competition Commission.

In 2002, gross domestic product (GDP) per citizen per day was $96 in the United States, compared with $71 in the United Kingdom. In sub-Saharan Africa, large numbers of people live on $2 per day – the same amount allocated to subsidise the average European cow. Differences in GDP among countries may be due to productivity or to employment rates, although both these factors are usually involved.

Looking first at productivity, we can compare the time taken for a worker in the US to produce what other workers produce in a year. After about a fortnight, such an individual has produced everything that a Kenyan worker produces in a year; after nine months, a US worker has produced everything that a UK worker produces in a year. These are significant gaps in productivity between countries and as such are topics of much concern among policy makers.

The causes of these gaps are, first, inputs and, second, the efficiency with which these are used. Inputs are items such as capital, labour and raw materials. There are two concepts in productivity that I think are useful – labour productivity and total factor productivity (TFP). Labour productivity is output per unit of labour, while TFP is an attempt to measure output in respect of both labour and capital. The question follows: how much of the productivity gap between countries is caused by differences in amount of capital and how much by differences in efficiency?

We know that output per employee is highest in the United States, followed by France, Germany and then the United Kingdom. Interestingly, France leads in terms of capital per employee; the French economy as a whole is the most capital-intensive. The skills index is higher in both Germany and France than in the US, which is similar to that of the UK – perhaps reflecting differences in the quality of secondary education in these countries.

TFP is much higher in the US than in either France or Germany, and is lowest in the UK. The difference between the United States and the United Kingdom in this regard is striking. Although the former is slightly more skilled and has

more capital, the main difference seems to be in output per person, which is much higher in the US. That, I think, is the major issue we continue to struggle with: our economy is now fairly close to that of Europe but still lags a long way behind that of the United States.

So what is the explanation? We need to look at two areas: competition and skills. I would also like to refer briefly to what I call 'turbulence' in the economy; specifically job creation and job destruction in UK manufacturing. From the 1980s up until 1991 the overall change in employment was negative – about two million manufacturing jobs disappeared during that period. In fact, over that period of time, six million jobs were created and almost eight million destroyed. The overall loss hides a very substantial amount of job creation on the part of expanding and new companies. This amount of turbulence indicates that competition is a very important factor. Companies are trying to compete as best they can, and that might have something to do with productivity.

A closer look at these figures reveals that 43 per cent of new jobs were created by small companies; large companies accounted for 56 per cent. However, small companies also destroy quite a lot of jobs as well, because they tend to go out of business – 35 per cent in fact. This leads to the 'long-tail' hypothesis, which has been proposed as an explanation for the productivity gap. Its proponents argue that the best UK companies are just as successful as the best companies in other countries, but that we are let down by a long tail of poor performers. Indeed, there is a wide spread in productivity in UK manufacturing, with a gap in labour productivity of about 5:1 – that is, those at the top are five times more productive than those at the bottom. The TFP gap is 2:1.

So, how does productivity in the United Kingdom compare with that in other countries? Is the 'long-tail' hypothesis true? By examining data from three countries – the US, the Netherlands and Finland – it is possible to compare their average productivity (measured as purchasing power parity, or PPP) with the UK. The top 25 per cent of US firms have an average PPP of $80,000 per year, while the figure for the top group of both Finnish and Dutch firms is around $60,000. If the 'long-tail' hypothesis is correct, we would expect to see our leading companies keeping pace with the US, but with a number of companies trailing behind in the bottom three quartiles. Sadly, the data do not bear this out. The United Kingdom lags behind the other three countries over all four quartiles of industry. Again, this suggests that competition may be an issue.

I mentioned economic turbulence. This can be described as a sorting mechanism that is inherent in competitive market systems which contributes to the growth in productivity. This mechanism ensures that incumbent companies – Marks & Spencer is an example – will continue to grow and in the process will take some of the market share left by companies that have exited. In addition, new companies will continue to enter the market. This can be seen in the standard deviation in productivity between manufacturing firms over a period of a few years. This decreased steadily between 1986 and 1992 as the sorting process occurred, the least successful firms were eliminated and the better firms continued to improve their performance. This process is an important source of productivity growth.

An offshoot of this in retailing is the issue of supermarket size. The United States is generally regarded as being highly productive in retailing, and one reason for that may be the size of its supermarkets. The Competition Commission has calculated that the most efficient size for a supermarket is around 3,000 square metres, a scale commonly reached in the United States but not in Europe. Clearly, these large stores have environmental and social implications, but they operate more efficiently and act as spurs to competition. These are considerations that must be taken into account when making decisions regarding planning and zoning. ❑

Skills, management and innovation

John Van Reenen

John Van Reenen is professor of economics at the London School of Economics and director of the Centre for Economic Performance. He has published widely on the economics of innovation, labour markets and productivity. He has been a senior policy adviser to the Secretary of State for Health and other parts of the UK Government. He has also been visiting professor at the University of California at Berkeley, research fellow at the Institute for Fiscal Studies, professor at University College London, a partner in Lexecon (a leading economic consultancy firm) and chief technology officer of a software start-up.

Gross Domestic Product (GDP) per capita is the main item on the economic health bill of a country. It is composed of three bits - labour productivity proper (GDP per hour), average hours worked, and the employment rate (the proportion of workers in the population). If we compare GDP *per capita* in the United States with that in Europe we see that it is much higher in the United States, even though GDP *per hour*, or productivity, is relatively similar. This is largely because many more Americans are in work and, when they are in work, they work many more hours.

We should not condemn Europeans as lazy ne'er-do-wells, nor vilify Americans as workaholics. Essentially, average hours are social choices, as illustrated by the French who have chosen to take some of the benefits of their GDP in the form of a shorter working week. It is important to keep such choices in mind when making comparisons across countries. It is easy to focus too much on GDP per capita when the more important economic issue is productivity, or GDP per hour. Self-congratulatory comments in the United Kingdom to the effect that our GDP per capita outstrips that of France may be misguided: France is in fact superior to Britain in terms of GDP per hour.

Looking at output per worker, the UK has caught up with France and Germany, and to some extent the US. The reversal in our fortunes can be traced back to the early 1980s. Before that, and particularly during the period after the Second World War, the United Kingdom was falling behind in terms of productivity compared with France and Germany. Nevertheless, despite the improvements we have seen over the past 20 years, there remains a productivity gap of around 20 to 30 per cent.

How do we account for this? Much of the difference is because the

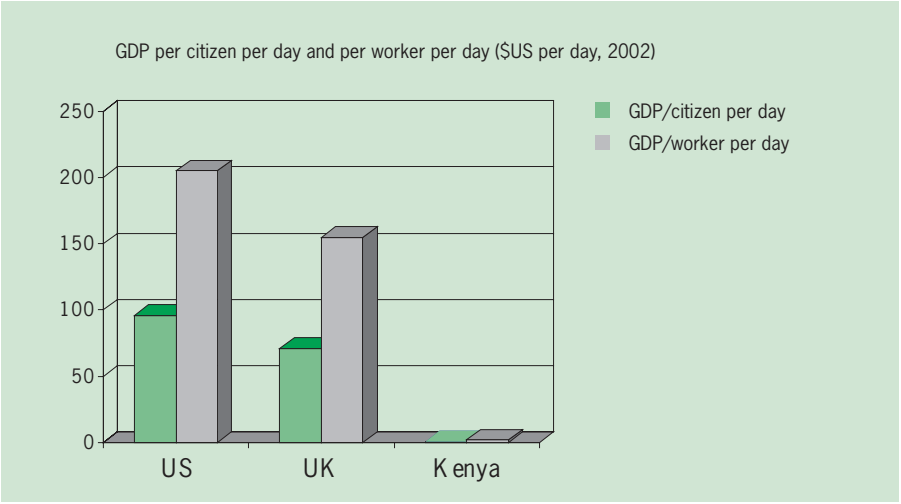
UK has less physical and human capital. However, even after taking this into account there are significant residual differences. These are likely to be attributable to variables such as technology, management practices and organisational change, all of which are very difficult to measure.

Skills are also very important and their significance is often underestimated. The United States has the greatest proportion of highly skilled, college-educated people, followed by the United Kingdom, with France and Germany coming third and fourth respectively. However, the UK and the US also have a much larger proportion of people in the least skilled group than either France or Germany. The difference here is that the United States compensates for this by having a greater number of highly skilled people, whereas the United Kingdom does not. Similarly, France and Germany have much greater numbers of intermediately skilled people, which helps them to compensate.

Many people believe that the real problem in the United Kingdom is poor management skills, as exemplified by the character of David Brent in *The Office*. However, most of the evidence regarding 'bad managers' has been anecdotal. Recently we have been involved in research on more accurate measures of management quality. We conducted a large-scale survey of British companies, working in collaboration with the management consultancy firm, McKinsey. Our results so far have shown that the UK does score poorly on overall measurements of management best practice.

Looking at the causes of bad management we found that tougher competition helps to weed out the poorly managed firms and give a 'kick up the pants' to those who remain. Openness to trade, foreign direct investment and new entrants also help management and productivity. However, the UK generally scores relatively well on these measures, so why do we appear to perform less well overall than other countries? One of the answers may be a lack of skills. Another may be the preponderance of family owned and run firms.

Management aside, science and innovation are at the heart of productivity growth. The United Kingdom has traditionally had a strong science and university base and performs very well on such indices as scientific papers per head and citations per head compared with other countries. However – and this is critical – translation of that strength in basic science into commercial innovations, R&D and patenting is much weaker. Expenditure on business R&D as a proportion of GDP stagnated between 1989 and 2002 and Britain has now been overtaken by Japan, the United States, Germany, France and Canada. Patenting in the UK is also low, which is surprising considering the strength of our science base.



How important are science and innovation? There is a large body of literature suggesting that innovation does have an impact on productivity, but that does not constitute a reason for Government intervention. The fundamental reason why Government should intervene is that investment in R&D benefits not just the companies directly involved, but other companies who are able to exploit gaps in the market created by new products and which are commonly undersupplied by the original company. However, this argument is not as clear-cut as it may seem. One might also ask why, since the UK is relatively small, should we not take a free ride on some of the R&D carried out by other nations? Why not let the United States produce the excellent science and the R&D? We could just copy their innovations and thus reduce our spending on R&D.

There are at least two counter-arguments to this laissez-faire position. First, many of the benefits of R&D that 'spill over' to other firms are local, so it helps to be geographically closer to where the R&D is taking place. Second, there is some evidence that the country, industry or company doing more R&D is better placed to 'absorb' the ideas of others. If we do not have the scientists and engineers who can understand the scientific papers, then innovations elsewhere cannot be so effectively used.

This brings me to the R&D tax credit that was introduced in 2000. This is a major policy in the United Kingdom, costing about £430 million per annum. Yet so far, business R&D has remained at its previous level of about 1.2 per cent of GDP. I would suggest that we resist the pressures to either scrap the credit or massively increase spending on it; rather, we must wait and see, allowing enough time for this policy and others to bed down. Evaluate it rigorously and choose policy on the basis of real evidence rather than take knee jerk reactions one way or another. This is as true for innovation as it is for other areas of policy. ❑

discussion

A matter of scale. There were different views on the impact of the large domestic market on productivity in the United States. One speaker argued that, while this might matter for retailing, it is less important for manufacturing because production is for the world market. Productivity is also influenced by local conditions. The growth of productivity in the retail sector in the US is unmatched elsewhere, and it was suggested that planning laws are relevant to this. In the United Kingdom the costs of land and construction are a major constraint, particularly in the retail sector where big supermarkets have an advantage.

How successful is the UK in moving towards more sustainable patterns of production and consumption? Are we making good use of science and technology in this area? These questions and others were addressed at the Foundation's meeting on 27 April 2005.

Addressing consumption and production

Howard Dalton

Professor Howard Dalton FRS is chief scientific adviser at the Department for Environment, Food and Rural Affairs, and director general of the department's Science, Economics and Statistics Directorate. His main role is to gain public trust for Defra science, while raising both the quality and the public profile of that research. He is also a professor of microbiology at Warwick University and was president of the Society for General Microbiology from 1997 to 2000.

A truly sustainable economy is a successful economy that is also environmentally and socially sustainable. Defra and DTI are driving the environmental and economic aspects of this forward, through our programme on Sustainable Consumption and Production – or SCP.

My aim tonight is twofold: first, to share a vision of what SCP means and why it is crucial to achieving a sustainable economy; and second, to emphasise the importance of developing a reliable evidence base for SCP.

Sustainable Consumption and Production is about using our resources more efficiently, and at the same time reducing our environmental impacts. In other words, it is about achieving more with less. This is not just a desirable goal: there are limits to the capacity of the Earth to absorb pollution and provide natural resources. The recent Millennium Ecosystem Assessment concluded that the way society obtains its resources has caused irreversible changes that are degrading the natural processes that support life on Earth. And as the developing world grows economically, the pressures on the environment are set to increase. The Earth simply could not sustain global consumption patterns like ours in Western Europe – for example, in air and road travel, water use, or even diet.

There is a tension at the heart of modern consumer societies. We want all the things the economy offers – the huge variety of products and services available to us – but we do not want the downsides such as pollution, congestion, waste and adverse health impacts.

So, how much more resource efficient do we need to be? Some have suggested the notion of 'factor four' – halving inputs whilst doubling outputs. Others have argued that we need three planets' worth of resources to sustain our current level of consumption across the globe. SCP will require us to produce goods and services that have a minimal impact on the environment but still allow business to be competitive.

We have traditionally concentrated on protecting the environment by reducing the level of waste and other emissions and, where wastes are produced, by taking action to mitigate the associated environmental impacts. The SCP approach moves us back up the chain and concentrates on how we can make better products; that is, products that can be manufactured with fewer material resources, that use less energy and water, and that result in less waste.

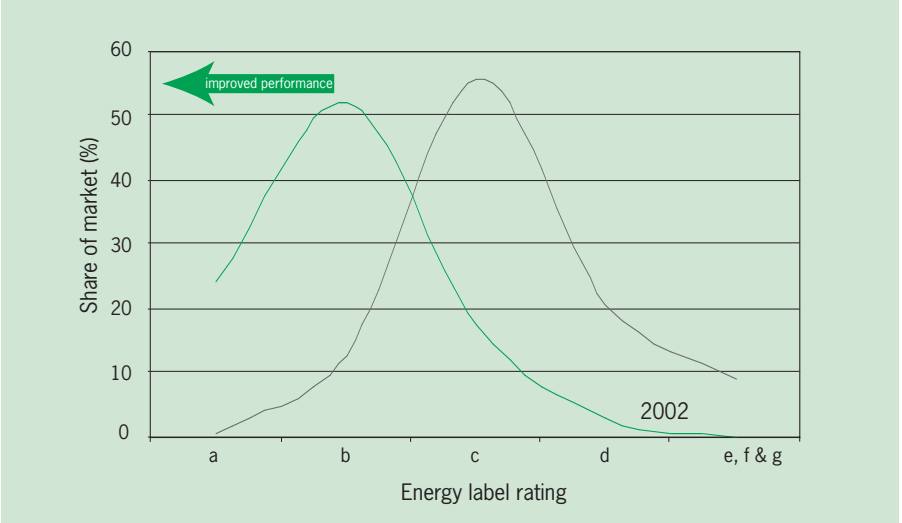


Figure 1. Sales of fridges bought in Britain and their energy performance, 1995-2002. Source: Defra

Using resources inefficiently is not only bad for the environment; it is a drag on the economy and undermines our competitiveness. That is why our SCP programme is a joint programme between Defra (given our focus on the environment) and the Department of Trade and Industry (given its focus on prosperity and productivity). Consider these statistics:

- 7% of profit for UK manufacturing is lost in wasted resources – this is equivalent to around £2-3 billion each year
- basic energy efficiency measures could save business £12 billion annually
- over 90% of production materials do not find their way into the final product
- production, distribution and consumption of food in the UK are responsible for 22% of greenhouse gas emissions

By using resources more efficiently there is considerable scope for both financial and environmental benefits. And business is increasingly recognising this. For example, the energy awareness campaign at British Telecom, targeted at over 165,000 employees, helped the company implement a programme to cut total energy consumption by 15% within five years, saving over £16 million per year. Autofil Worldwide Ltd, a yarn dyeing company, have achieved annual savings of around £90,000 through waste minimisation measures.

If we are to achieve a sustainable economy we will also have to make better products. We have a number of measures designed to encourage innovation in eco-design and promote best practice. Fridges are an excellent example of how we have shifted the market. Between 1995 and 2002, we have eliminated the worst products by setting a minimum standard through regulation and we have promoted the best products by introducing the A-G ratings on energy labels. You can see how the market has shifted: the most common energy rating has changed from C to B during this period (Figure 1).

There are a number of areas where action is needed. We need to understand the scope for change – how much room for improvement is there? What can be achieved with best practice? How can innovation take us further forward? We also need to develop and implement innovative solutions and that is why many Government departments are now developing and investing in innovation.

We can do much in the UK, but we need to work also on an international basis, particularly through supply chains. Companies are increasingly sourcing products from all over the world. In a global market it is rarely feasible to set unilateral standards for traded goods. Innovation too is international. New products emerge by bringing together cutting edge thinking from across the globe. And there is little value in improving the resource productivity of the UK economy at the expense of increased environmental degradation in other countries.

It will not be enough for us to implement techno-fixes, though. We can make products more efficient, but if demand for the products continues to rise, this may counter the improvements gained. For example, there have been real improvements in the environmental performance of the average new car. Yet in the first half of 2003 in China, car sales rose by 82% compared with 2002. Influencing consumption patterns is going to be one of our biggest challenges. And it is worth pointing out here that when I talk of influencing consumption I do not only refer to individuals – businesses also can make an important contribution to SCP through their procurement practices.

Without robust evidence, though, we will not be able to make sense of the issues or base our decisions on sound science. Although we have well-developed evidence for established policy areas such as climate change and waste, SCP is relatively new (particularly the life cycle approach) and is very wide ranging. We have some way to go in assessing the evidence that is already available and in identifying the gaps where we will focus our new research priorities. We need to:

- understand environmental limits so that we can gauge the scale of the challenge;
- know not just that we are on the right path, but how far we have to go;
- identify the most significant environmental impacts in a product's life cycle so that we can target our policy interventions effectively ;
- develop our knowledge base in support of improvement and innovation in product design, technologies and production processes.

And lastly, we need a better understanding of consumer behaviour so that we can understand what motivates us and how we can be influenced. ❑

www.sd-commission.org.uk
www.defra.gov.uk/environment/business/scp

Energy – the key ingredient

Bernard Bulkin

Dr Bernard Bulkin is chair for energy and transport at the Sustainable Development Commission. He is chairman of AEA Technology plc and up till 2004 was chief scientist at BP. He serves on the board of governors of Argonne National Laboratory, the Council of the Royal Institution and the Council of Scripps Institution of Oceanography.

Energy is a core issue for sustainable development. Energy interplays with all the big issues of sustainable development – health, land use, rural and urban development and regeneration, security, poverty.

We are at a really interesting time for energy policy. In the last few years it has become clear that we are entering a period of demand for two of the biggest fuels – oil and gas – and that this has sent us to new price levels, causing major change for a range of industries, as well as for individuals. The pressures on energy policy are clear: environmental (both local and global), security and diversity of supply, cultural change, and new technologies trying to come to market. So all the aspects of sustainable development – environmental protection, economic growth, social progress – intersect at energy.

The Government is engaged in a review of the climate change programme, and this will surface sometime after the election. A public consultation has been held: it has already closed and a lot of analytical work is in progress. The Sustainable Development Commission has been providing input to this review and here I will mention some aspects of this.

One thing is paramount: the big goals already set must be reconfirmed by this review. These include the commitment to a 20% reduction in CO_2 emissions from 1990 levels by 2010, and a 60% reduction in the longer term. These targets must be firmly in place. We can debate how to meet them, but we know

that we can meet them if we have the collective will to do so.

There is no one thing that is going to allow us to solve the climate problem. The portfolio approach, or what Robert Socolow calls the 'wedges approach', is the only way to think about this. To bring us down from where a business-as-usual approach (or even a moderate amount of conservation plus a moderate amount of growth) would take us by 2050, to a stabilised level, we need six to eight 'big things' or actions. As others have demonstrated, there are 12-14 of these terawatt-level actions available to us, and we have to have the political and collective will to choose which we are going to do.

One of the mistakes that has been made more than once is to look at any one of the things we can do and conclude that it cannot solve the problem: from there it is argued that nothing can solve the problem. That is completely wrong thinking, I am sure you will agree, but we have seen it happen over and over again. Not every country or region has to make the same choices, so there is room for preferences here – we will surely see that exercised over choices such as the role of nuclear power or the role of carbon sequestration. Yet choices do have to be made – and citizens must insist that Government is making those choices.

For the UK, what are these 'big things'? Well, we need at the very least step-changes in the efficiency with which we use energy in some key sectors. We need a significant increase in renewables in the power generation sector, consistent with the existing target of 20% coming from renewables in the medium term; and for the next decade at least this means we need a lot more wind power. Why wind? Because it can be done at scale, it does not add significantly to the cost of electricity, and it can have ancillary benefits to communities. The SDC is issuing a report on wind power that attempts to sort out all the key issues, many of which have been misrepresented.

We also need changes to the technologies we use in buildings and in road transport – moving to technology that is available today, but which needs policy to bring it into the marketplace faster and more effectively. Reductions of 50% in CO_2 emissions from road transport and 50% from buildings are achievable in the medium term, over the next 20-25 years. We believe this is a commitment that the Government should make in the climate change programme review.

Does this mean going to a hydrogen economy? Not necessarily. But it does mean policies that bring hybrid vehicles into the fleet much more rapidly, that change the buses, rubbish collection and other urban delivery vehicles, that look to new approaches to biofuels, and that deal with aspects of the rapid growth in air transport that can be dealt with technically. It also means ensuring that we have a rational pricing scheme for transport alternatives where they exist. It means building homes and offices to standards of energy efficiency that provide benefits for both the environment and the occupants. And it means finding creative policies to upgrade the existing housing stock to a much higher standard of energy efficiency. In short, we need to do for *everything* what we have already done for fridges! We need policies for areas of fast growing energy use, such as aviation and air conditioning.

In fact, we can use energy, raw materials, manufactured goods and people in more exciting, creative and intensive ways if we reframe the problem. Too often the issue of climate change and the economy is seen as a question of trade-offs. Yet there has been so much documentation of environmental protection – which is, after all, very often a question of reducing and eliminating waste – leading to better business results. From flower growing in Holland, to flaring in the oil industry, to reduced separations in chemicals; across practically the full range of business, the leaders in environmental protection have turned out to be the winners. Not only do they lead their industries, they develop new opportunities for export and increase their competitiveness. ❑

Wind power report: **www.sd-commission.org.uk/pages/media/list/wind.html**

The implications for health policy

Anna Coote

Anna Coote is head of Engaging Patients and the Public at the Healthcare Commission. She was formerly director of health policy at the King's Fund and deputy director of the Institute for Public Policy Research. As a journalist and broadcaster, she produced and edited current affairs programmes and documentaries for Channel 4 and was deputy editor of New Statesman. She is a member of the Sustainable Development Commission.

Put together, health and sustainable development should be a winning combination. It is possible to achieve better health outcomes by pursuing sustainable development, and to achieve more sustainable outcomes by preventing illness, reducing health inequalities and using NHS corporate resources strategically.

The evidence tells us that social isolation, poor education, fear of crime, disrupted family life and unhappiness are bad for health (happy people live on average seven years longer than unhappy people). Likewise, poverty, joblessness, powerlessness and economic insecurity are bad for human health. These are social and economic dimensions of sustainable development. Environmental damage is bad for health - air pollution, contaminated water, poor food supplies, heavy road traffic, dislocated neighbourhoods, poorly designed buildings. Climate change brings extremes of heat and cold, flooding, storms, drought and threatens the very essentials of human life.

What is more, these health risks tend to pile up in the lives of the poor and dispossessed in ways that are vividly reflected in health statistics. Poor people get ill more often and die much younger than people who are well off.

The Government's public health white paper *Choosing Health?* was produced after Derek Wanless reported to the Treasury that failure to prevent illness would cost the taxpayer £30 billion a year extra by 2020. The white paper acknowledges that, "the environment we live in, our social networks, our sense of security, socio-economic circumstances, facilities and resources in our local neighbourhood can affect individual health." It also calls for a "strong role for Government in promoting social justice and tackling the wider causes of ill-health and inequality in health".

The new sustainable development strategy for the UK includes indicators that measure progress in health terms:

- inequalities in infant mortality and adult life expectancy;
- healthy life expectancy;
- premature death rates from cancer and heart disease;

- trends in smoking, diet and childhood obesity.

The National Health Service has huge potential to do good – or harm – to the health of the nation and to the cause of sustainable development. The NHS is the largest single organisation in the UK and one of the largest and most powerful in the world. Its annual budget is more than £60 billion a year. It employs more than a million people. It spends more than £11 billion a year on goods and services.

The NHS today has a staffing crisis. It cannot find enough workers, so poaches doctors and nurses from the developing world. Yet many NHS trusts are located in neighbourhoods where there is high unemployment, and where conditions are such that people get ill because they are poor and jobless. If the NHS invests some of its billions in basic training for local people, to prepare them to take the first steps into employment, they will start coming into the hospitals as workers rather than as patients. Getting jobs make them less vulnerable to illness; the fact that they live locally provides the NHS with a reliable, committed workforce.

One of the scandals of the NHS is that some patients leave hospital suffering from malnutrition. The food is poor, they do not like it or cannot eat it and even if they do eat, it does not do their health any good. This slows down patient recovery rates and makes them vulnerable to further ill health. This is the same point that Jamie Oliver has been making over school food – kids do better at school if they eat well; patients do better in hospital if they eat well. If the NHS uses its resources more carefully – arranging its purchasing and catering policies so that it provides nutritious food in ways that encourage patients to eat and enjoy – it could do marvels not only for patients' health, but for staff and visitors too. It could also use its power as one of the largest food purchasers in the country to encourage local and sustainable food production, strengthening local economies, reducing the environmental damage caused by shipping foods across vast distances, as well as promoting organic and other environmentally sound agricultural practices.

There are many examples of good practice in the NHS, brought together under the auspices of an initiative to promote what has come to be known as Good Corporate Citizenship. This is about using corporate resources in things like employment, procurement and buildings, to promote health and sustainable development – creating virtuous circles that minimise risks to health and help to ensure the long-term viability of the NHS. This approach has been endorsed by the *Choosing Health?* white paper.

There is a potentially powerful, mutually reinforcing connection between health and sustainable development. But on both fronts – public health and NHS corporate activity – there are some seriously inhibiting factors that must be understood and overcome.

The first and perhaps most obvious is that health policy has to be produced by the Department of Health and yet most things that seriously affect health come under the auspices of other departments – work and pensions, education, trade and industry, and Defra.

The second inhibiting factor is that most health professionals do not have a strong interest in preventing illness. They derive their income, status and job satisfaction from making people better after they have become ill. They support policies that improve the health services they provide more readily than those that aim to prevent people needing these services in the first place.

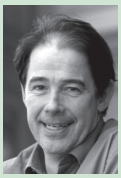
A third problem arises from the 'choice' agenda. This is the 'big idea' in the white paper, which is mainly devoted to encouraging individuals to 'choose' healthy lifestyles. Yet health policies that focus on choice – whether it is choosing health services or healthy living – usually favour the better off. They do not have the same effect on people who are poor, disadvantaged or socially excluded – the very people whose health is most at risk.

Another inhibiting factor is the Government's drive for 'efficiency', led by the Gershon review, which implicitly encourages purchasing decisions that go for economies of scale rather than longer-term value. There is still important work to be done to redefine 'efficiency' in sustainable terms and to embed that in the work of regulatory bodies such as the Audit Commission and the Healthcare Commission.

A final problem relates to priorities and incentives. The prevention of illness and the pursuit of good corporate citizenship are endorsed in policy, but they are not the sort of thing that ambitious health professionals

Time to be bold and clear

Jonathon Porritt



Jonathon Porritt is chair of the Sustainable Development Commission and director of Forum for the Future. He is co-director of The Prince of Wales's Business & the Environment Programme, which runs Senior Executives' Seminars in Cambridge, Austria, South Africa and the US. He was formerly director of Friends of the Earth, co-chair of the Green Party and chairman of Sustainability South West (the South West Round Table for Sustainable Development). He became CBE in 2000 in recognition of services to environmental protection.

Can the UK Government get on and stay on the path to a sustainable economy? Not if it continues to pursue progress through the blind, single-minded pursuit of exponential economic growth as it is doing today. Not if it continues to pursue improved competitiveness at the expense of continuing and extreme environmental and social externalities. Yes, if it were able to muster unprecedented levels of political will and help the electorate understand the true nature of the shift involved. At the moment, unfortunately,we are trapped in minimalist incrementalism.

The most complicated and certainly the most controversial point is that we will not get ourselves on to a sustainable economy path unless we change the model of economic growth. That makes politicians extremely nervous, for all sorts of understandable reasons; many of them are old enough to have lived through the economic growth debate back in the '70s, and they fear that any new debate would be cast in precisely the same style: on the one hand, 'no growth', and on the other, 'growth at all costs'.

At the Sustainable Development Commission, we do not believe it is possible to arrive at a sustainable society for the whole of humankind without economic growth. It is impossible to imagine how we are going to do that for six billion today, and nine billion by the middle of the century, without substantially increased levels of prosperity and material well-being for very, very large numbers of people: that will entail growth.

Even in the UK, to move away entirely from growth would bring about severe social dislocation and disruption, not least because the revenues that the Government would have for investments

in public services and infrastructure would be significantly diminished.

So, if we are not going to play the old – and I think increasingly irritating – debate about no growth versus growth at all costs, what kind of debate about growth do we really need? How do we move from what we have got today, which is no debate at all about our current 'dumb growth', to a debate about genuinely 'smart growth'? What would that actually mean? How could any government effect that shift in political discourse?

Firstly the debate about sustainable consumption and production is a critical part of the discussion about what smart growth might really mean; how to achieve systematic decoupling at every point in the economy to ensure that growth does not continue to generate environmental and social externalities.

Secondly, and not uncontroversially, a systematic attempt to internalise those costs is still needed because those costs are still, illegitimately, externalised on to society and on to the environment. Without this internalisation, markets cannot operate efficiently and transparently.

Thirdly, we have to move much faster to eliminate perverse subsidies of every kind. Depending on whose figures you choose to believe, tens or hundreds of billions of dollars every year are still invested directly by governments in activities and patterns of resource usage that systematically destroy the physical earth on which we depend. This is not smart; it is not good market economics, and it is certainly not sustainable development. In a world notionally driven by the logic of market economics, how is it that huge amounts of government money are still squandered on activities that undermine a sustainable economy?

Fourthly, we have to look at the role of GDP in our society, and the stranglehold this has on political intelligence and creativity. Politicians seem to be completely incapable of thinking through alternative, smarter ways of demonstrating whether progress is or is not being made. Ideas about green-GDP or adjusted-GDP, ideas about 'an Index of Sustainable Economic Welfare', thoughts about a Well-being Index – these have all been around for a very, very long time. It is disgraceful that a Government with the kind of majorities this one has enjoyed has been unable to rise to the challenge of bringing these new ideas into the fold of politics today.

That leads to a broader issue which is increasingly being defined as 'the politics of well-being'. Richard Layard has recently converted his very stimulating lectures on happiness, well being and economic growth into a book simply called *Happiness*[1] and I recommend it – it is a challenge to all those who think that it is impossible to talk about progress other than through the prism of economic growth. But how can the politics of well-being strengthen, enhance and sometimes even replace this very narrow politics of progress through economic growth?

My second opening assertion was that, if a government continues to pursue competitiveness with the kind of severe environmental and social costs that we are witnessing today, then I think it is impossible for any economy to get on to a sustainable path. That is not to say that a sustainable economy will not need to be competitive: it will. There is nothing good from the perspective of sustainable development in inefficient, uncompetitive capital allocation. But at the moment we are going through a period in the history of capitalism where the pursuit of increased competitiveness at the global level is definitely not working in favour of a more sustainable – let alone a more just and equitable – global economy. The so-called 'race to the bottom', with companies able to deploy capital in such a way as to benefit from marginal cost improvements anywhere in the world is certainly not helping. Take one example. At Forum for the Future, we have been working closely with the chemicals industry. The conventional chemicals industry is, in many ways, stuck in an old and dying paradigm: other countries can provide the same bulk commodity chemicals at a much lower cost, in a much more efficient way, than Europe and America. Yet the opportunity to develop new businesses – based on higher-value, speciality chemicals, which just happen to be both more sustainable and responsive to consumer concerns – is becoming more attractive to more and more entrepreneurs. It is, after all, impossible to conceptualise a sustainable society for nine billion people without chemistry absolutely at its heart.

Lastly, the issue of political will. Today, it is all incrementalism: a little bit of a tax shift on landfill, a little bit of a tax shift on pesticide, but we do not think about ecological tax reform in a strategic and embedded manner. What we have at the moment, in all honesty, is risk averse, directionless incrementalism. That is better than having absolutely nothing at all, but in order to make clear to people the scale of the changes necessary, we do need a much clearer sense of the step changes that are now required. ❑

1. Richard Layard (2005) *Happiness*. Allen Lane. ISBN: 0713997699

discussion

Engaging the public. Government would only use regulatory or fiscal powers to drive sustainable development forward if it felt public opinion was behind it. There were signs of growing environmental concern with, for example, people using different rubbish bins for recycling. Even here, though, strong leadership was necessary to make this issue a priority. The healthcare issue was much more problematic. Why should individuals take responsibility for their own health when public policy gives them little incentive to prioritise their longer term interest through sublimating their desire for immediate satisfaction (whether it be to eat a hamburger, or to drive everywhere by car).

discussion

Sustainable energy supplies. It was suggested that the true economic costs of wind farms were hidden, as they ignored the need to run baseload installations as well, in order to avoid the danger of power shortages or blackouts. Others thought that the need for back-up power was exaggerated: better design and prudent use of the peak/trough daily consumption pattern would meet the problem. It was argued that the UK was extremely favourably placed, geographically, to exploit wind power. Public acceptance of wind farms was also raised. It was suggested that, contrary to common opinion, the majority were in favour of them. Early installations had not properly engaged local communities, but new developments were handled with more sensitivity.

A first, essential step

Robert May

Lord May of Oxford OM AC Kt has been president of the Royal Society since 2000. He holds a professorship jointly in the Department of Zoology, University of Oxford, and Imperial College, London. Between 1995 and 2000 he was chief scientific adviser to the UK Government and head of the Office of Science and Technology. He became a member of the House of Lords in 2001 and was appointed a member of the Order of Merit in 2002

John Kay drew attention, in a recent article in the *Financial Times (26 July)*, to the report on climate change by the House of Lords Select Committee on Economic Affairs. The Committee's report has some sensible things to say about the need for good economic analyses of the impacts of climate change, but it digresses from economics in an eccentric account of the science of climate change. Unfortunately John Kay's enthusiasm appears to be for the conclusions drawn by the Select Committee about the science and its contentious criticisms of the Kyoto Protocol.

Not surprisingly in light of their lack of scientific expertise, the report by the Select Committee on Economic Affairs provides a highly selective and unrepresentative focus on some uncertainties in current knowledge. This reflects the fact that the Committee preferentially highlighted the views of those individuals with complaints about the Intergovernmental Panel on Climate Change (IPCC), while ignoring most of the work of the thousands of scientists on which the IPCC's consensus view is based. The IPCC's *Third Assessment Report*, published in 2001, remains a much better account of the science of climate change than the quirky report from this Select Committee.

It is perhaps useful to focus on John Kay's criticism of the Kyoto Protocol, which he described as "inconsequential". One should recall why the Protocol came into being in the first place. The 1992 United Nations Framework Convention on Climate Change (UNFCCC), which has been signed by 191 parties including the United States, commits the international community to "stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system".

The UNFCCC committed developed countries to "adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs". Article 4 of the treaty indicates that such measures should aim to return anthropogenic emissions to 1990 levels, but it did not set a timescale.

At a meeting in Berlin in 1995, the signatories to the UNFCCC agreed that the terms of Article 4 were "not adequate" and agreed to set "quantified limitation and reduction objectives within specified time-frames" for anthropogenic emissions of greenhouse gases. In 1997, the Kyoto Protocol was introduced, with targets for 38 countries during its first commitment period which would reduce their overall emissions to 5.8% below 1990 levels in the period between 2008 and 2012.

The targets of the first commitment period were never intended on their own to neutralise the threat of climate change, and this is clear from one crucial fact: whilst the UNFCCC commits countries to stabilising concentrations of greenhouse gases in the atmosphere at levels that avoid 'dangerous' climate change, the treaty does not specify what a 'safe' level is.

Some have argued that that concentrations of carbon dioxide should level off at 550 parts per million (ppm), about double the stable value of 270 ppm that occurred for several millennia before the Industrial Revolution in the eighteenth century, but there has been no agreement. It is for this reason that the academies of the G8 nations, plus those of China, India and Brazil, in a joint statement in July called for the initiation of a study into the level at which greenhouse gas concentrations should be stabilised. It is perhaps relevant that the last time carbon dioxide concentrations of 550 ppm occurred in the atmosphere was 25 million years ago, when sea levels were 50-100 metres higher than today.

Whatever the stabilisation level, the Kyoto Protocol will have represented only the first, but essential, step towards it. It is therefore misleading to perform a simple economic cost-benefit analysis of the first commitment term of the Kyoto Protocol, judging its value only in terms of the difference it makes on its own to stabilising concentrations of greenhouse gases, while not accounting for the fact that it establishes a mechanism through which stabilisation could be achieved.

Even more misleading are attempts to calculate costs and benefits of mitigating actions on a domestic basis only. Greenhouse gas emissions do not stay confined within national boundaries, and each country's approach to climate change has consequences for the rest of the world. It is the most vulnerable in developing countries who will bear a disproportionate cost of slow and inadequate action to tackle climate change. Costs and benefits need to be assessed on a collective and global basis.

Both the UNFCCC and the Kyoto Protocol explicitly state that developed countries should take the lead in devising technologies for reducing emissions and to facilitate their transfer to the developing countries. The treaty explicitly calls for co-operation in adapting to the effects of climate change. The criticism that these have not been given enough emphasis should be considered a comment on a lack of political will by the signatories, rather than on the shortcomings of the international agreements themselves.

It is clear that both the UNFCCC and the Kyoto Protocol are political agreements based on the principle that the industrialised countries should take the lead in tackling the threat of climate change because they have been responsible for most of the emissions of greenhouse gases from human activities to date. When the parties to the UNFCCC meet in Montreal at the end of November, I hope they move beyond the short-sighted wrangling and focus on determining a target for reducing emissions that the whole international community can work towards. ❑

www.publications.parliament.uk/pa/ld200506/ldselect/ldeconaf/12/12i.pdf

… but is it, really?

John Kay

John Kay is a visiting professor of economics at the London School of Economics and a Fellow of St John's College, Oxford. He has been professor of management at Oxford University and professor of economics at the London Business School, director of the Institute for Fiscal Studies, and founder and executive chairman of the consultancy London Economics. His principal activity today is writing, and he commutes between London, Oxfordshire and the south of France. He contributes a weekly column to the *Financial Times*.

In the *Financial Times* article to which Lord May refers, I attributed four propositions on climate change to George Bush. First, that there are uncertainties about both the science and the economics of climate change. Second, that the Kyoto Protocol would impose substantial costs and offers no discernible benefits for the United States. Third, that measures to reduce carbon emissions which exclude developing countries, particularly India and China, will be ineffective in addressing this problem. Fourth, that public expenditures should mainly be directed towards new technologies with the potential for large scale substitution of carbon based transport and electricity generation.

There is not really much disagreement on these questions. There is a wide consensus among scientists that the CO_2 content of the atmosphere is increasing at a historically alarming rate, that the global climate is warming, and that there is a significant anthropogenic contribution to that warming. On the magnitude and timescale of these effects and their consequences, there is uncertainty. The estimates of temperature increase over the next century in the IPCC report vary between 1.4°C and 5.8°C. The associated changes in sea level vary between 9 cm and 88 cm by 2100: but, as Lord May suggests, if these higher temperature levels persisted for a longer period sea levels might be higher by tens of metres. Very little research has been done on the costs of adaptation, which vary greatly according to the timescale in which such adaptation occurs.

Nor is there any dispute that Kyoto would yield more costs than benefits to the United States. Lord May argues that Congress should not look at it in this way, and he may be right on that, but we are now talking about a separate question. Nor that the Kyoto targets, even if met, would do little to alleviate global warming. Nor that the central issue determining the rise in atmospheric CO_2 concentrations over the next century is how increased demand for transport and electricity in China and India is met. These countries have a population today of 2.5 billion, compared with the 800 million in North America, Western Europe and Japan which account for 40% of greenhouse gas emissions today.

Indeed the only point on which I disagree with Lord May is on his - limited - enthusiasm for the Kyoto Protocol. Lord May accepts that the targets cannot have much impact, but points approvingly to the pious rhetoric demanding further action contained in the treaty and the framework that surrounds it. We agree that not much has happened. I interpret this as further evidence that the treaty is inconsequential, while Lord May describes it as a weakness of implementation. This is a matter of nuance not substance, but the issue it raises is important.

For Lord May the importance of Kyoto is that it is a start. But the brutal fact is that experience of Kyoto shows that few, perhaps no, nations are in practice willing to make material reductions in carbon emissions if this would involve significant net costs to them. One response is that we should be even more ambitious in our aspirations. Another is to acknowledge that these international agreements are not the road ahead, certainly not on their own, and perhaps not at all. The focus of attention should therefore be less on international dialogue and more on measures that would make emissions reductions attractive on a unilateral basis.

Throughout economic history, many issues of sustainability have been dealt with by the development of technologies that make large scale substitution attractive on its own terms. This is how the nineteenth century issues of exhaustible coal reserves, and of population pressure on food supplies – which caused analogous scientific concern at the time – were managed; through the development of oil extraction capacities and the fixation of atmospheric nitrogen. The most successful of modern international agreements in environmental matters – the Montreal treaty on chlorofluorocarbons – is proving effective because the development of substitutes offered direct advantages to users themselves.

Effective policies have a foundation in science and technology, in economics, and in international politics. The assessment of climate change is not a matter for scientists alone. The House of Lords Economic Affairs Committee found that the work of the IPCC in preparing economic scenarios was of poor quality and that its response to criticism of this work was unsatisfactory. The Committee had good grounds for reaching these conclusions. Although the scientific assessments of the IPCC are clearly altogether more serious and professional than its economic analysis, the Committee can hardly be blamed for having listened to the views of critics of the IPCC and for concluding that statements about the economic effects of climate change are made with considerably more confidence than the evidence would justify.

The contribution of science to public policy is the presentation of the state of existing knowledge. This is separate from advocacy – the promotion of particular policy objectives; and from political judgment – the unenviable task of deciding which among many geopolitical problems should have priority of attention and resources. All these are proper activities, but they are distinct, and readers should know which they are encountering. There are legitimate grounds for concern that these have become conflated, even in the work of the IPCC.

It is time to get serious about climate change. Today we experience a combination of apocalyptic predictions with policy proposals that bear no relation to the scale of the problem described. It is absurd that political attention and public money are devoted to wind farms – which even if implemented on a scale far beyond anything currently imagined could not make a significant contribution – while two years have been wasted debating whether fusion research should take place in France or Japan. On climate change, there is a surfeit of 'raising awareness' and a shortage of hard-nosed policy analysis. The House of Lords Economic Affairs Committee, which emphasises large uncertainties and tough choices, attempted to redress that balance. If that approach is 'eccentric' and 'quirky' – and perhaps it is – then it should not be. ❑

Education for all

Archimedes

Archimedes is an experienced observer of the evolution of public policy who contributes occasional comments on the character of the discussion at the Foundation's dinner discussions.

The eminent academics and distinguished professionals who took part in the discussion on 25 May, *The Education of 14-19 Year Olds [a report will appearin the next issue]*, must have been enthusiastic to learn and a joy to teach. They knew, from experience, how creative teachers inspired them with a fierce desire to learn. They knew that a teacher's one accountability was to his pupils and responded, as they had demonstrated, with outstanding achievement. Compulsory curriculums, prescribed syllabuses, rigid timetables, repeated testing, stifled creativity led only to more bureaucracy.

But what did they know of that great majority who found learning a tedious chore, and who made a teacher's task a grinding bore; or of the minority who hated school and made teaching hell? Indeed, did they know more than the vote-catching politicians, who responded to the concerns of anxious parents and frustrated employers by requiring accountability to ministers through prescription, standardisation, objective testing and – worst of all – league tables? Possibly, yes – but there must be more doubt than the discussion suggested. ❑

Recent lectures and dinner/discussions organised by the Foundation are listed below. Sponsors, for whose support we are very grateful, are shown in italics below the event. Summaries of these and other events are available on the Foundation website at www.foundation.org.uk

12 July 2005

Strengthening International R&D Partnerships - is there a case for increased US/UK collaboration?

Sir Gareth Roberts FRS FREng, President, Wolfson College, Oxford
Professor Charles Vest, Former President, MIT
Sir Robin Saxby, Chairman, ARM

BAE Systems, CCLRC, PPARC, EPSRC, CMI and QinetiQ

22 June 2005

Is the UK well-prepared for an influenza epidemic?

Professor the Baroness Finlay of Llandaff, House of Lords
Dr Jeremy Farrar OBE, The Wellcome Trust Clinical Research Unit, Centre for Tropical Diseases, Vietnam
Dr David Harper CBE, Director of Health Protection, Department of Health
Bruce Mann, Head, Civil Contingencies Secretariat, Cabinet Office

The Wellcome Trust and the Health Protection Agency

8 June 2005

The future prospects for the biotechnology industry in the UK

Dr Doug Yarrow, Director, Corporate Science Group, Biotechnology and Biological Sciences Research Council
Dr Martin Wales, Senior Analyst, European Biotechnology/Medical Technology, Equity Research, UBS
Dr David Chiswell, Chair, BioIndustry Association (BIA)
Dr Andy Richards, Serial Biotechnology Entrepreneur and Business Angel

Association of British Pharmaceutical Industries (ABPI) and South East England Development Agency (SEEDA)

25 May 2005

The Education of 14-19 Year Olds

Pauline Cox, Head, Tiffin Girls' School, Kingston
Lord May of Oxford, President, The Royal Society
Julie Bramman, Head of Curriculum, Specialism and Collaboration, Department for Education and Skills

Biotechnology and Biological Sciences Research Council and Comino Foundation

11 May 2005

Science Policy and Management

Sir Keith O'Nions FRS, DGRC, OST
Sir David Wallace CBE FRS, Vice-Chancellor, Loughborough University
Dr Mark Walport, Director, The Wellcome Trust

BAE SYSTEMS, The Council for the Central Laboratory of the Research Councils and Natural Environment Research Council

27 April 2005

Can the UK get on, and stay on, a path to a sustainable economy?

Jonathon Porritt, Chairman, Sustainable Development Commission
Anna Coote, King's Fund
Dr Bernie Bulkin, former Chief Scientist, BP
Professor Howard Dalton FRS, Chief Scientist, Defra

Department for Environment, Food and Rural Affairs and Natural Environment Research Council

23 March 2005

The UK Productivity Gap

Professor Jonathan Haskel, Queen Mary, University of London
Professor John Van Reenen, Centre for Economic Performance, London School of Economics
Professor Vicky Pryce, Chief Economic Adviser and Director General, Economics, DTI

The Gatsby Foundation and The Royal Commission for the Exhibition of 1851

9 March 2005

Transport Policy - How should road congestion be managed?

Graham Pendlebury, Director Road and Vehicle Safety and Standards Directorate, Department for Transport
Archie Robertson OBE, Chief Executive, Highways Agency
Professor David Rhind CBE FRS FBA, Vice-Chancellor, City University
Professor Anthony May OBE, Chairman, Inquiry into Transport and Emeritus Professor, Institute for Transport Studies, University of Leeds, Royal Academy of Engineering

Department for Transport and Lloyd's Register of Shipping

23 February 2005

Identity Management

Des Browne MP (represented by Katherine Courtney), Minister of State for Citizenship and Immigration, Home Office
Ian Watmore, UK Government CIO and Head, e-Government Unit, Cabinet Office
Ed Mayo, Chief Executive, National Consumer Council

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