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**COUNCIL FOR SCIENCE & TECHNOLOGY**

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**TECHNOLGY MATTERS**  
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Attached is a response from Lord Sainsbury's to the Council's report on the exploitation of science & technology by UK business, which was published on 6 March 2000 under the title *Technology Matters*.

*CST Secretariat*  
*OST*  
*February 2001*

{ TEXT OF COVERNG LETTER OF 1 MARCH 2001}

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1 March 2001

### **CST REPORT ON TECHNOLOGY MATTERS**

Following the recent publication of our new White Paper on Enterprise, Skills and Innovation, entitled "*Opportunity for all in a world of change*", I thought you and your colleagues would wish to consider the Government's response to this report at the next meeting of the Council for Science & Technology (CST) on 5 March 2001.

You and Sir Christopher Evans presented the report to the Chancellor, the Rt Hon Gordon Brown MP, and colleagues at a meeting on 29 June 2000. We have also taken the opportunity to pursue the recommendations during the course of Council meetings last year, for instance in connection with the Budget 2000, Spending Review 2000 and the July 2000 White Paper on Science and Innovation, entitled "*Excellence and Opportunity*".

Accordingly, I now attach the Government's response, covering all the recommendations but focusing on the most recent developments. Copies are being sent to all your Council colleagues and to David King, the Government's Chief Scientific Adviser.

I should like to take this further opportunity to acknowledge personally, and on behalf of my colleagues, the contribution the Council has made to our work in creating a modern, thriving economy with science and technology as its bedrock.

After the meeting, I shall be arranging for this letter and paper to be published on the Council's web site

Yours sincerely

DAVID SAINSBURY

# TECHNOLOGY MATTERS

1. The Government is most grateful to the Council for Science and Technology for its advice on the exploitation of science and technology by UK business in a report entitled "*Technology Matters*" and published in March 2000. This paper covers our policies and actions in relation to the report's principal themes. It follows the same order as the report's recommendations, which are reproduced in italics for ease of reference.

**General:** *Recommendation 1.* In developing its policies for science and innovation, the Government should concentrate upon:

- *increasing the capabilities of all its companies to create, apply and exploit advanced technology;*
- *broadening and deepening the UK's technology base, particularly in the strategically important sectors of the 'sun-rise' industries, such as computing, microelectronics, telecommunications, advanced materials and bio-technology;*
- *developing more dynamic clusters and strengthen links to the increasingly globalised sources of leading edge S&T worldwide and*
- *strengthening the nation's ability to create new technology based businesses and to grow them rapidly into large companies. This means they will need sufficient financial and other resources from the start. In our experience, the UK does not do as well as the United States.*

*Recommendation 2.* These further policy developments should be directed at meeting the need for:

- *government, and society more widely, to place technology on par with science in terms of the standing, recognition and value attached to each of them;*
- *a larger cadre of people who are highly skilled both as active technologists and in running a business;*
- *personal finance and tax incentive structures to be fully competitive internationally, especially with those in the US: business and the providers of financial resources need to become fully alive, and responsive, to the technology challenge; and*
- *the Government to play its full part in driving exploitation of the new technologies in all ways it interacts with business - sponsorship in the widest sense.*

3. In July 2000, the Government set out its strategy for Science and Innovation in the 21st century in the *Excellence and Opportunity* White Paper, aimed at:

- maintaining and enhancing the excellence of the science base, the bed rock of the UK's economy, through significant new investment in modernising the research infrastructure, and in key areas of research: genomics, e-science and such basic technology as nano-technology, quantum computing and bioengineering;
- opening up opportunities for innovation and interaction between universities and business, for instance through the Higher Education Innovation Fund, Business Fellows, Faraday Partnerships, Science Enterprise Centres, the University Challenge Fund, a new Foresight fund, new Regional Innovation Funds, and the Small Business Research Initiative;

- ensuring that people have a confident relationship with science by creating a robust, transparent framework for the Government's role, as an investor, facilitator and regulator..

4. The new White Paper on Enterprise, Skills, and Innovation, which was published jointly by DTI and DfEE on 13 February 2001 and entitled "*Opportunity for all in a world of change*" builds on these policies. It announced a range of additional measures, in line with the Council's recommendations:

- supporting the growth of successful industrial clusters;
- promoting regional investment in research and development;
- fostering innovation and technology transfer through a major new network of world class university innovation centres and new technology institutes;
- investing in the development, application and take up of leading edge, world beating technologies in existing, emerging and future sectors of the economy;
- boosting new business formation through a new incubator fund;
- establishing new innovation growth teams for pro-active work on creating the right conditions for the growth industries of the future: and
- making markets more competitive.

5. Responding to the National Skills Task Force report last year, "*Opportunity for all in a world of change*" also contained measures for raising basic literacy and numeracy skills; rationalising vocational qualifications by the autumn of 2001 to provide a world class vocational and technical framework; developing a work force with world beating ICT skills; and for fostering creativity and enterprise across the national education and training system.

6. The "*Excellence and Opportunity*" White Paper included measures for making school science better, and others are being taken to modernise schools, post 16 education and training, and higher education. The recent Green Paper, "*Schools - Building on Success*", for instance included plans for the establishment of specialist, secondary schools in engineering, science, and business and enterprise.

7. As for investment in technology based innovation by business, the Budget in March 2000 introduced a number of fiscal and other measures, and further measures were contained in the Chancellor's Pre-Budget Report in November 2000.

8. These and other relevant measures are covered more fully in the remainder of this paper in relation to the Council's more specific recommendations.

**People:** *Recommendation 3. In partnership with business, universities and the Research Councils, the Government should seek to:*

(a) *increase appreciably the two way flow between companies and universities of senior people*

*engaged in the business of technology. This should preferably occur at early or mid career points and not only, as is all too frequently the case at present, after retirement; and*

*(b) improve and enhance the career pathways and options for the wider career development of post doctoral researchers, possibly through suitable tax incentives, thereby reinforcing the existing Research Careers Initiative.*

*(c) ensure that in the training of postgraduate students and postdoctoral researchers, university departments have the scope and incentive:*

- *to maximise interaction with business;*
- *to provide a range of training experience which will best meet the needs of all users including academia itself; and*
- *to offer flexible opportunities for courses of varying length, to meet the needs of a modern economy.*

*Recommendation 4. The Government should also continue to work through partnerships with universities, Research Councils and professional institutes to develop and strengthen the trust, norms, practices and networks that are so critical for businesses and universities to work together.*

*Recommendation 5. In the longer term, the Government will need to:*

*(a) take an even more holistic, systematic approach to the education and development of future generations of S&T entrepreneurs, managers and S&T professionals;*

*(b) ensure that the funding arrangements for universities evolve so that universities are able to respond dynamically to the huge challenges and opportunities ahead including the ability to compete in the global market for world class scientists, teachers and researchers; and*

*(c) continue to develop its fiscal, monetary and immigration policies to promote the UK's competitiveness.*

9. As already mentioned, the Government is investing heavily in the infrastructure and other means through which business- higher education interaction is supported and encouraged. Successful partnerships between business and higher education institutions (HEIs) are intrinsically a "people interaction", one in which success is predicated on there being mutual benefit, as a new, shortly to be published study shows "*Business Winning with Higher Education*"

10. Through Foresight, Science Enterprise Centres, Faraday Partnerships, the LINK programme, the Higher Education Innovation Fund and support for 20 Business Fellows, the Government is investing in higher education institutions' potential as engines of growth and prosperity. The Higher Education Innovation Fund (HEIF), constituting a permanent third stream of funding for HEIs in England will be £140m over the three years from 2001-02 to 2003-04, while the Business Fellows will lead their academic colleagues in working with business.

11. "*Opportunity for all in a world of change*" launched a network of dynamic hubs of growth comprising:

- World class innovation centres, lying at the heart of cluster development and support for new start ups and businesses that are growing in business incubators; and.
- New technology institutes. There will be up to two of these institutes in each region, formed by universities working with local colleges and

groups of small businesses and providing courses mainly at technician level, but also including foundation, first and post graduate degree level.

12. There are already a very wide and diverse range of partnerships, including collaborative research, customised training, placements and consultancy. The Regional Development Agencies have been asked to address further centres of growth in their strategies for economic development and innovation

13. Regarding post-graduate research students and post doctorate researchers:

- PhD student stipends will increase by just under a quarter in real terms over the next three years, following the increases announced in 1998. The basic stipend will rise from £6,800 this academic year to £9,000 in 2003–04. The Research Councils are free to increase the basic rate further, as they judge necessary.
- The Engineering and Physical Sciences Research Council is introducing Doctoral Training Accounts which, alongside earlier introduction of Masters Training Packages, give institutions greater freedom to take postgraduate provision in new directions and in partnership with industry and other research users.
- The Research Councils are working with universities and the Higher Education Funding Council for England to develop standards for research training. A related aim is to ensure provision equips students for employment inside and outside academia. increasingly, funding is likely to depend on satisfactory compliance with such standards.
- The Research Careers Initiative will continue to monitor and encourage best practice in the career management and development of the many postdoctoral staff employed on fixed-term contracts in universities. Surveys by the EPSRC, Institute of Physics and others suggest that many postdoctoral researchers make a significant contribution to the wider economy outside academia. A significant quantity of "role model" and other career guidance material is now available to enable them to pursue options outside academia.
- HEFCE is developing proposals to release new funding for pay and human resource development in return for strategies from university employers which, among other things, equip staff to meet their current needs and also prepare them for future changes.
- Separately, the Government has committed to provide, jointly with the Wolfson Foundation, some £4 million each year over five years to enable universities to recruit, reward and develop researchers of outstanding achievement and potential. The scheme will be run by the Royal Society and awards made under it will be known as Wolfson-Royal Society Research Merit Awards. This is in addition to the new money via HEFCE to improve pay and management in English higher education institutions more generally, amounting to £50m in 2001-03 and £170m in 2003-04.

14. To facilitate the entry into the UK of individuals who possess skills that are in short supply, a number of changes have been made to the work permits system and immigration rules. These include an expansion of the defined shortage occupation categories, greater flexibility for overseas students wishing to stay in the UK to work, a simplification of other aspects of the work permit system, and a reduction in processing times. In addition, pilot immigration routes have been launched to attract entrepreneurs with innovative business proposals, and highly skilled independent migrants with a record of outstanding achievement in their field of specialism.

15. As for education and training more generally, a new curriculum for post -16 education was introduced in September, 2000, providing a broader range of study options and a new key skills qualification covering the application of number, communication and IT. Additionally, a Council for Excellence in Management and Leadership was established last year under the chairmanship of Sir Anthony Cleaver. Its interim report is due shortly.

16. Several members of the Council are involved in a further important initiative, *Enterprise Insight*, which was launched by the Prime Minister in May 2000 with the aim of creating a more enterprising culture across the UK over the next 5 to 10 years.

**Technology:** Recommendation 6. *The Government should:*

*(a) seek to boost the standing and importance of technology and technologists.*

*(b) investigate what more it could do, possibly as part of the implementation of the second round of Foresight, to help meet needs of companies in dealing with the technology aspects of their strategies and plans and to improve their capabilities through the promulgation of good practice.*

*(c) develop and increase its support for small firm R&D, including the further development of its support services to help and encourage small firms to develop from merely using technology ( e.g. in the form of new machinery) into technology based businesses i.e. investing in the creation and application of new technology for their business purposes. Such support needs to take account of the distinctive needs of small companies;*

*(d) develop and increase its support for the creation of advanced technology in joint programmes with companies, permitting the participation of companies overseas, including companies outside the EU when this is warranted.*

17. To ensure that the UK is at the cutting edge of S&T research, the underpinning research infrastructure is being upgraded and modernised through the new £1 billion Science Research Investment Fund (SRIF). This fund builds on the Joint Infrastructure Fund (JIF) which ends in 2001-02 and will have provided £750 million for science infrastructure, also in partnership with the Wellcome Trust. SRIF comprises;

- £675 million for universities to fund new building, refurbishment and equipment from the DTI Science Budget (for the UK) and DFEE (via the Higher Education Funding Council for England) (for England only);
- a £150 million fund provided by the Wellcome Trust for investment in buildings for sciences within the Wellcome Trust remit, drawn from top-rated but unmet bids submitted to JIF;
- a separate £75 million of Wellcome Trust funding for biomedical science project related equipment/refurbishment, run on the basis of competitive bidding from universities;
- £100 million to be retained by the Office of Science and Technology to modernise research council institutes and to contribute to large national projects.

18. One further round of University Challenge (with £15 million available) and one further round of Science Enterprise Challenge (also with £15 million available) will be held shortly. The Government is also making £10 million available next year to encourage the commercialisation of research carried out in the public sector.

19. The Science Budget allocations, which were announced in November 2000, also included a total of £252 million in three cross-Research Council programmes in key areas of science:

- **Genomics**, leading to the development of new diagnostics, drugs and materials and will open up new perspectives across biology and the study of the natural environment;
- **E-science**, tackling key computing problems across a range of scientific disciplines, with additional investment to develop core generic technologies.
- **Basic technology**, creating fundamental new capabilities that will form the basis of the industries of the future through multidisciplinary research programme in such areas as nanotechnology, quantum computing, photonics and sensors.

20 In "*Opportunity for all in a world of change*" an additional £90 million was announced for the exploitation of these commercially promising new technologies of genomics, e-science and basic technology.

21. The Small Business Research Initiative, which was announced in the "*Excellence and Opportunity*" White Paper last year, will open up to SMEs R&D procurement worth up to some £1billion, with a target of procuring £50 million of research from them. "*Opportunity for all in a world of change*" contains further measures for supporting the creation and application of technology, covering:

- a new Manufacturing Advisory Service to spread best practice by delivering practical support and information to SME's from regional centres linked in a national network: and
- the development and take up of more resource efficient and environmentally friendly products and energy systems (including solar photovoltaic cells); a faster roll-out for broadband technology; promotion of the take up of digital TV; and the faster development of content for digital technologies.

**Private Sector Risk Finance:** *Recommendation 7. The Government should continue to work with the financial and business communities to identify what would drive higher levels of investment of private, institutional and venture capital for technology based businesses, especially at the stages of start up, early development and point of initial public offering of shares, taking account of the issues which we highlight.*

22. In response to concerns that there may be factors encouraging institutional investors to follow industry standard investment patterns - which focus overwhelmingly on quoted equities and gilts - and avoid investing in SMEs and other smaller companies, the Government has launched a review by Mr Paul Myners, (Chairman of Gartmore Investment Management). His final report, which will be completed in time for the Budget 2001, will address the following and other issues concerning investment by institutional fund managers – pensions and life assurance companies:

- whether regulatory provisions have unintended effects on investment decision making;
- how pension funds make their investment decisions and the role of professional advisers
- how institutional investors' results and charges are reported; and
- the incentive effects of the methods used to assess fund performance.

23. In September 2000, the Small Business Investment Task Force, chaired by Sir David Cooksey, was launched to advise on ways to stimulate the supply of SME finance, including the establishment of regional venture capital funds. The establishment of this Task Force is just one of a number of actions taken since the Small Business Service came into operation in April 2000. Within its first six months, the service also launched the UK High Technology Venture Capital Fund. This fund has already reached its target of £125 million and is investing in UK-based specialist technology funds

24. The Budget 2000 contained a number of new fiscal measures for boosting enterprise and innovation, covering R&D Tax Credits for SMEs; new guidelines on what constitutes R&D for this and other tax purposes; a Capital Gains Tax (CGT) relief, corporate venturing tax relief, SME (share option) Management Incentives, a new all employees share plan and corporate venturing.

25. In his Pre-Budget Report in November 2000, the Chancellor announced further initiatives, covering reforms to the taxation of intellectual property, insolvency and business rescue; employee shareholding; additional measures to help SMEs prepare business plans for securing external equity finance; and the case for extending the R&D tax credit aimed at boosting R&D across business.

26. "*Opportunity for all in a world of change*" contains measures for improving access to finance, and particularly small amounts of risk capital for investment in intangibles such as R&D. These measures cover the development of new early growth funding for start ups and smaller growing businesses by the Small Business Service and the private sector, as well as new funding streams to plug the funding gap for start up firms.

**Sponsorship:** *Recommendation 8. The Government should modernise the sponsorship role and activities of Departments in the light of the advent of Regional Development Agencies, the Small Business Service and Resource Accounting and Budgeting. It should take a fresh look at*

*(a) its overall approach to sectoral sponsorship, including the way it identifies, and determines expenditure priorities for business support within and between Departments, taking account of the national and international situation and prospects;*

*(b) how it identifies the technology based industries and sectors with real potential for growth and targets support at them, in partnership with the private sector, including the role of FORESIGHT;*

*(c) the arrangements to support the development of clusters;*

*(d) the arrangements for allocating budgets to meet the priorities including the balance of expenditure between existing and emerging industries;*

*(e) the way that Government departments and agencies use their own buying power; and*

*(f) possibly as part of the new Competitiveness index, develop a set of metrics to assess and monitor the UK's performance in the production of a strong platform of enabling technology and its commercialisation.*

*Recommendation 9. In relation to the group of UK technology based businesses, the Government should seek to improve the existing arrangements within and between Departments for fostering and supporting:*

- *corporate venturing;*
- *strategic alliancing;*
- *partnerships and collaboration with large firms and multinationals e.g. in R&D or marketing;*
- *intermediary activities, including financing or national and international networking;*
- *mergers and acquisitions; and*
- *mentoring and god-fathering.*

Recommendation 10. *The Government should also:*

*(a) promote good practice in R&D management and technology based innovation, facilitating, initiating and nurturing spin out activity, and assisting large firms in corporate venturing activities with smaller firms.*

*(b) directly and indirectly promote corporate venturing and facilitate the development of clusters.*

Recommendation 11. *More generally, it should:*

*(a) ensure that support measures are appropriately focused, strike the appropriate balance between existing and emerging sectors, have sufficient scale to achieve a step change in performance; and recognise the role of large technology based companies in the economy, and their critical importance in the establishment and growth of small ones; and*

*(b) systematically monitor and report on the outcomes of policies aimed at the creation and rapid growth of technology based businesses using still to be developed metrics for gauging the UK's performance in the production and commercial exploitation of technology.*

27. Since taking up office in May 1997, the Government's main goal has been to raise productivity faster than the UK's competitors through policies which ensure on macro economic stability while harnessing the main drivers of productivity growth in the private sector:

- *Competition*, driving innovation and better use of inputs by companies;
- *Enterprise and Innovation*, creating wealth by entrepreneurs exploiting market and other opportunities;
- *Investment*, developing the tangible and intangible assets of the nation's business base; and
- *Education and Training*, providing people with the increasingly higher levels of knowledge and skills that are so essential to building and sustaining a dynamic, competitive economy.

28. This goal is embedded in the 2000 public service agreements of Her Majesty's Treasury (HMT) and the Department of Trade and Industry (DTI), which share the objective of narrowing the productivity gap with US, France, Germany and Japan over the economic cycle.

29. DTI's objectives also include making the most of the UK's science, engineering and technology by:

- improving the overall international ranking of the UK's science and engineering base, as measured by international measures of quality, cost effectiveness and relevance: and by

- increasing the level of exploitation of technological knowledge derived from the science and engineering base, as demonstrated by a significant rise in the proportion of innovating companies citing such sources.

30 *"Opportunity for all in a world of change"* sets out the Government's active industrial and regional policy, aimed at building up the capacity and capabilities of individuals, businesses and the supporting infrastructure to succeed in this increasingly complex and competitive world. We will be working in close partnership with the Regional Development Agencies, the Learning and Skills Councils, the Government Offices, and the Small Business Service to boost the capacity of each region for innovation, enterprise and skills development.

31. We will also be strengthening the UK's global links through:

- a new enterprise Scholarship scheme for the brightest and best young graduates - particularly in high tech subjects - who want to come to the UK to develop their careers and start new businesses;
- encouragement to experienced British entrepreneurs abroad to establish companies in the UK to pursue innovative business ideas;
- national and EU research and development, which as the Council has recommended in its previous report on S&T across Government must be refocused towards the technologies of the future.

33. Within the Department Trade and Industry, cross functional teams with a broad membership drawn from the Government and the private sector will be set up to create the right conditions for the growth industries of the future. The teams will identify and tackle barriers to growth and target practical and measurable improvements in performance against international competitors.

34. Finally, as the Council recommends, progress will be monitored closely through the Public Service Agreements, the published plans for implementing the White Papers and the Competitiveness Indicators.

*OST/DTI*  
*February 2001*