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## Innovating for the future: Investing in R&D

### Introduction

The Department of Trade and Industry (DTI) and the Treasury issued a joint consultation paper in May 1998 entitled 'Innovating for the future: Investing in research and development'. In its response to the document the Royal Society welcomed the opportunity to comment and stressed the great importance of the issues covered in the document. The Society particularly welcomed the government's recognition of the importance of the fiscal system in the innovation process.

This document contains the full text of the society's response to the DTI and Treasury and covers sources of finance, tax and accounting treatment of R&D expenditure and issues surrounding intellectual property. The response was endorsed by the council of the Society, and was prepared by a group chaired by Professor Michael Brady; other members were Dr Tim Cook, Dr Chris Evans, Professor Cyril Hilsum, Sir Kenneth Murray, Mr Peter Norman, Professor Graham Richards, Professor Ian Shanks, Sir John Skehel, Dr Jeff Skinner, Professor Edwin Southern, Professor Ian Sutherland, Sir Martin Wood and Dr Rebecca Bowden (Secretary).

The three main issues that the Society recommended be addressed by government in order to increase innovation are as follows:

1. Improvement of links between researchers and investors.
2. The use of tax incentives as a means of encouraging corporate venturing.
3. Development of a fast track system for protection of intellectual property rights.

In the remainder of the document the Society lists its responses to the specific questions raised in section 1.20 of the DTI/Treasury consultation document under the headings:

- (i) Sources of finance for innovation and R&D (Chapter 2 of consultation document)
- (ii) Accounting treatment of R&D Expenditure (Chapter 3 of the consultation document)
- (iii) Tax treatment of R&D expenditure and intellectual property (Chapter 4 of consultation document)
- (iv) Intellectual property (Chapter 7 of consultation document)

### **(i) Sources of finance for innovation and R&D**

- *How can communication between company management and financial institutions be improved?*

We feel that the shortage of potential funding for new ventures is not the real problem. What is lacking is a link between scientists and those willing to invest money.

A major obstacle in funding of start-up companies is the fact that such ventures in the UK are often set up by scientists with little business or financial expertise and a general lack of ability to 'sell' the company to potential investors or produce a well thought out Business Plan<sup>1</sup>. The government should encourage cooperation between financial experts and scientists in such ventures.

There is a general lack of assistance for researchers in universities who wish to set up companies, with notable exceptions such as ISIS in Oxford, UMIST Ventures, Imperial Ventures and several others. Access to experts with knowledge of business, finance (initially seed-finance - see page 3), intellectual property and personnel, and access to incubator space for a new company is crucial. These problems may be helped to some extent by teaching such subjects at undergraduate level. However, there is no substitute for experience and access to a network of well-qualified advisors would be far more beneficial.

It is difficult to identify ways in which the government could directly improve communication between company management and financial institutions as this is primarily the responsibility of individual companies. However, on way in which the government could facilitate communication would be to fund seminars at regional and national levels to bring together financial companies and SMEs to focus on specific issues.

- *What steps can be taken to improve knowledge and understanding of R&D related investments among finance providers, pension fund trustees and institutional fund managers?*

We welcome the University Challenge scheme as this appears to encourage dialogue between universities and investors<sup>2</sup>.

The funding of a particular project is often based on the people involved rather than an appraisal of the science. This is due primarily to lack of scientific expertise within UK financial institutions, although this situation is improving. Academic institutions could address this by offering to act as a consultancy service to appraise potential new projects, a routine procedure in other countries. This process could be facilitated by the government by the provision of funding to assist in the development of regional registers of expertise to which investors could refer. Such a scheme would also be beneficial at a national level. An example of such a scheme for experts in the biotechnology sector has recently been set up using Millennium funding.

The government should encourage universities and research bodies to invite investors to visit researchers and learn about their research projects. It is also beneficial for SMEs to visit financial institutions to give presentations about the science in which they are involved. Such presentations could be organised at a national level with DTI assistance. It is notable that in other countries it is common practice for MBA graduates to tour libraries to meet researchers whereas this does not happen in the UK.

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<sup>1</sup> An example of a venture which is aiming to address this lack of knowledge is the Biotechnology Young Entrepreneurs Scheme which aims to give undergraduate and postgraduate scientists training in the production of business plans and associated issues such as intellectual property rights and marketing.

<sup>2</sup> A £50 million University Challenge fund is to be set up to 'turn British inventions into British business'. £20 million will be provided by the Government, with the remainder being provided by large companies and charities. The fund will be run as a competition and bids assessed by a panel of experts.

- *How can the impediments to investment in technology-based SMEs, including the availability of management expertise, be addressed?*

The decision of the Charities Commission to allow charities to fund start-up companies could be an invaluable source of finance in the UK and the government should continue to encourage charities to invest in innovation.

There appear to be two extremes of capitalism with a continuous spectrum in between. The first seeks a return on investment via the capital growth of the shares held over a period. This is prevalent in certain countries, ie Japan, Germany, and in certain sectors in the USA. It results in corporations driving for market share and to create or enter new markets and seem to nurture R&D and long-term innovation. At the other extreme, returns are sought as annual dividends and there is great pressure for these to grow. This tends to be the case in the UK, where the principal shareholders are largely institutional (such as insurance companies and pension funds), and need an annual income to pay out on policies and pensions. Also in the UK there has been little distinction between income tax and Capital Gains Tax (CGT). This extreme is believed inimical to longer term, more risky innovation. The recent tapering of CGT in the UK may well help to alleviate this and the Government may wish to consider increasing the taper, if the early response to it is propitious.

The use of a segmented process for technology transfer can be beneficial and can be compatible with the above (see page 4). Entry into each stage of the process is controlled by a 'Gatekeeper' and each stage would involve creating a team which comprises all the needed skills and experience - technology, marketing, supply chain, financial/commercial, and others where relevant - who work together to bring the project to the next stage. It could also include a post-launch evaluation leading to wider roll out of the innovation and the generation of a further product, if justified.

Failure and bankruptcy carry a stigma in the UK, not nearly so obvious in other countries such as the USA; the consequences for the UK innovators are usually disastrous and punitive. We need to learn to distinguish between valiant failure and incompetence failures. Our laws and perceptions need to reflect this and to be changed to mitigate these problems. Investment in start-up ventures may be encouraged if seed-funding<sup>3</sup> that failed was made tax deductible. Particularly in the case of existing SMEs who may have to risk everything in order to pursue an innovation. The risk of innovation would also be decreased if tax losses were allowed, or loans provided that were repayable only when profit emerged.

The government might, for example through the HEFCs, or other appropriate bodies, provide a grant element to the universities to cover the costs of employing temporary cover for staff who wish to set up in business, or to work with existing UK companies to progress the exploitation of radical innovations. This would make such an endeavour more attractive to the staff and would also give the universities first hand knowledge of the abilities of potential staff recruits.

- *What can be done to encourage the UK venture capital industry to take more interest in early stage finance?*

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<sup>3</sup> Seed finance - finance provided to research, assess and develop an initial concept before a business has reached the start-up phase.

The profile of the venture capital<sup>4</sup> industry in the UK is completely different to that in other countries (such as the US) where Corporate Venturing<sup>5</sup> may be the norm. In certain sectors in the UK very few venture capital companies will invest in start-up companies as the costs are too great. In other sectors, such as biotechnology, a large proportion of the investment has been from venture capital. This difference is primarily due to the fact that biotechnology companies typically require a much larger start-up sum than do those based on physical sciences innovation. The difference in sectors highlights the fact that sectors should be treated individually in strategies for increasing innovation.

As structured at present, the UK does not have a ready source of the smaller sums (£100Ks) to take innovative ideas through the initial prototype at which point more conventional funding may be employed.

The main problem lies with innovations that are radical and long-term or involve the use of new knowledge. The time to market, the higher risk levels, and a tendency to underestimate the prospective benefits, conspire to make a discounted cashflow cost/benefit analysis usually appear very unattractive, particularly in contrast to safer, shorter-term, or more incremental, options (eg depositing the money in a bank, or building society, or purchasing shares, or unit trusts). The more so if the high initial risks are used to discount the high costs of the later stages, for example through averaging both risks and annual spend. In addition, the major benefits in a radical innovation are usually obtained from the second, or subsequent, generations of products, or services. A model which avoids this involves segmenting the endeavour into stages and requiring the (notional) purchase of an 'option to proceed' by the members of the subsequent stage. Only if the output of the previous stage is deemed of sufficiently good value as an investment will the innovation progress to the next stage. This allows the high initial risks to be used to discount the low initial spend and for the subsequent risks to be used to discount the subsequent high costs of each later stage. This form of analysis might well encourage venture capital companies to invest more in start-ups and radical innovations. The Society would be willing to work with government to discuss what might constitute a 'stage' or how a stage would be closed before moving on to the next stage.

- *Does more need to be done to bring together business angels and SMEs?*

We strongly support the fact that the European Commission has stated that it will be exploring ways to set up a European Business Angels network. We feel that the government should explore ways to support this initiative.

At the European level, we also support the LIFT Help Desk for Financing Innovation, which has been set up as part of the EU Innovation Programme. This seeks to support and direct participants in Community research, technology and development programmes in finding sources of finance for exploitation of results.

Universities that have companies set up in order to provide advice and help to researchers wishing to start companies are able to hold seminars for Business Angels<sup>6</sup> at which

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<sup>4</sup> Venture capital - a means of financing the start-up, development, expansion, restructuring, or acquisition of a company. Venture capital provides equity capital to enterprises not quoted on a stock market.

<sup>5</sup> Corporate venturing - seed-funding or start-up finance provided by large, established companies to researchers in the science base or SMEs.

<sup>6</sup> Business Angels - individuals who are prepared to use their financial resources to make risk investments based on their experience and interests.

researchers can give presentations. The government may wish to explore ways to encourage such seminars at both regional and national levels.

The formation of a UK Business Angels network would also facilitate access to finance. Such a network could be initiated by DTI through the business LINK programme.

- *What can be done to encourage more corporate venturing, and to encourage cooperation, more generally, between large and small firms to promote innovation?*

Tax incentives are important to encourage corporate venturing. One way for this to happen would be via a fiscal regime such that the corporate venturing organisation would see an increase in its share value. It is notable that corporate venturing has been increasingly prominent in some sectors, in particular pharmaceuticals, in which companies are moving towards corporate venturing rather than buying up smaller companies as a means of growth.

Schemes set up by the government to encourage cooperation between large companies and researchers in the science base are welcomed. In particular, SMART and Teaching Schemes are valuable, although the financial benefits may be relatively unattractive. However, such schemes are presently far too complex. The sheer number of schemes is confusing to SMEs. In particular, with LINK schemes, the difficulty of applying for funding and the level of bureaucracy involved acts as a deterrent.

Efforts to improve innovation should be focussed not only on academia, or on SMEs, but also on large companies. To this end the government could reduce the real cost of R&D by allowances, or reduce the risk of losing money through market failure of an innovative product.

## **(ii) Accounting treatment of R&D expenditure**

- *Is it time to review the current accounting treatment of R&D? Are current arrangements leading to a bias against spending on R&D and innovation? If so, are the ICAS proposals a step in the right direction?*

Currently companies may employ different methods of treatment for R&D outlay. It would be advantageous if all companies were to employ the same method. Since a majority of countries use capitalisation of R&D expenditure this method would appear to be preferable.

- *How can 'know-how' best be reflected in company reporting, given the constraints of (FRS) 10<sup>7</sup>?*

'Know-how' is an important asset for a company but should not be treated in the same terms as financial reserves.

A long-term incentive scheme is a useful way of quantifying 'know-how'. A share-option scheme could be offered to researchers and other individuals within the company. Such a scheme would be shown in the accounts systems and could be averaged over several years to prevent loss of staff during short periods of decreased share value.

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<sup>7</sup> The Financial Reporting Standard (FRS)10, Goodwill and Intangible Assets (December 1997) requires recognition of intangible assets only if they have been purchased separately, or purchased as part of an acquisition and can be measured reliably on initial recognition.

### **(iii) Tax treatment of R&D expenditure and intellectual property**

- *How desirable is reform of the tax treatment of IP-related transactions?*

We believe that all IPR earnings and outgoings should be taken into account when compiling figures for taxable profit since this would highlight IP as an integral part of the business.

- *Is there a role for further tax incentives to R&D? For example, might an R&D tax credit be a cost-effective way of enhancing R&D and innovation?*

We are in favour of tax credit schemes for R&D expenditure, since we believe that by investing in R&D, the government will be indicating that it recognises its value and thus encourage other investors to do likewise. There is a strong correlation between countries that have in place a tax credit system and countries that are considered to be centres of innovation.

### **(iv) Intellectual property**

- *How much do problems with IP matter to the innovation process as a whole, particularly to the availability of finance and ease of collaboration?*

Increasing pressure for academic researchers to publish their results means that patents are often applied for before an investigation has been carried out into the potential application of the discovery and before any market research has been done. It is important that research scientists have access to information and advice on IPR. We strongly support a system that would allow an inventor to apply for a patent up to a year after publication of results, as exists in the US.

The number of patents held by an SME is sometimes given an exaggerated level of importance by venture capital companies as it is easier to quantify than 'know-how' of the individuals in the SME, although often the latter is far more important.

The complexity and expense of the patent system in the UK often impact upon cooperation schemes such as the LINK scheme run by DTI, in that it is necessary to negotiate complex secrecy agreements with sponsor companies before any work may commence. The government would be able to improve matters by pressing for a cheaper and more efficient procedure. We therefore support recent moves by the government to abolish certain fees charged by the Patent Office and to decrease others.

It is also important to stress that different strategies for licensing may be appropriate for different products. For example, some products may benefit from a non-exclusive licensing approach rather than an exclusive one.

- *Do we have the right balance between protecting IP and allowing the diffusion of innovation?*

We believe that the current balance between protection and dissemination is adequate. However, we also believe that the acquisition of protection for inventions serves to facilitate the dissemination of information rather than inhibiting it.

- *Should there be a greater number of options for the formal protection of IP; so allowing greater flexibility; or would this, by adding complexity, make matters worse?*

SMEs frequently find the current system of IPR protection confusing and expensive and it is therefore likely to confuse matters further if alternative options are made available. It is often preferable to enter into Non-Disclosure Arrangements rather than attempt to obtain a patent.

There is an urgent need for uniformity of treatment of software internationally as currently it is not patentable in the UK and other countries, but can be patented in the US, Canada, and EU. Since hardware platforms are becoming standardised, at least with regard to the operating systems that run on them, increasing amounts of intellectual property are in the form of computer programmes. Software is subject to copyright laws, but in terms of creativity and intellectual property, patenting is preferable. An urgent review of this is necessary and we support a move to making software protectable in a way that is comparable to patenting.

We support the introduction of a 'fast-track' scheme for patent application which the government could consider incorporating into its 'One stop Shop' system. We also welcome the Cities initiative in providing basic training in how to write patent applications and protection of intellectual property rights.

. *How can protection of IP be made more easily understandable, particularly for SMEs?*

Appropriate training in IPR is vital at all levels, from undergraduate to senior researcher, whether of an organisation or a teaching or research establishment.

The US Patent Office is perceived as very open and actively encourages dialogue after submission of an application, whereas the European Patent Office is seen as non-transparent and unhelpful in many cases.

We strongly support the initiative by the UK Patent Office to make more information and help available. The protection of IP is a particular problem for many universities and SMEs. The British Technology Group (BTG) might help this, but is now a commercial concern. Perhaps the government could provide funds for initial advice and consultations, either with BTG, or a chartered patent agent. Alternatively, the government could create a central body for the purpose of selecting and protecting IP in return for a share of the royalties (even if these came from products sold exclusively by the owner of the IP). They might also operate road shows to spread the word about what can be protected and how to do this. There is also a potential role for more regional organisations to be set up to give advice to universities on IPR.

We support the formation of a financial resource for protection and exploitation of research. Such a resource could take the form of a percentage of research grants set aside specifically for this purpose, or maintenance of a central fund held by DTI for this purpose.

. *How can the acquisition and defence of IPR be made more affordable, particularly for SMEs?*

The cost of applying for patents at EU level is currently prohibitive, largely due to the fees for translations. The government should press for a reduction in the number of official languages into which an application must be translated, or provide financial help to SMEs for this purpose. The problem of cost applies even more strongly to the cost of applying for patents in Japan. Indeed, so much so, that one often relies on patent cover in the US, Canada and EU as providing the only cost effective cover worthwhile. We would support the use of a system similar to that used in the US, whereby the inventor can patent up to

one year after public disclosure, since this would offer a more affordable and flexible alternative.

Contingency payments for defence of patents would greatly reduce the disadvantage currently faced by UK SMEs relative to US companies, to which this facility is already available.

- *How can the benefits of IP for productive partnerships and the economy as a whole be better recognised? Does government have a role in this?*

We see no role for government in this area as the benefits of IP are driven by market forces. The main role would appear to be in increasing the assistance available to SMEs in IPR and increasing awareness of IPR in general. We support initiatives such as the SMART scheme, which allows researchers to budget for legal costs in addition to other expenses.

- *What more can be done to spread best practice in the use and role of IP?*

DTI needs to set up a project to identify what is meant by 'best practice' in this context in the first instance. It may also be advantageous to set up a list of example companies, in a similar manner to those companies set up as examples of good practice in manufacturing. A small sum could then be made available to individual companies in return for provision of advice to new companies on the issues surrounding IPR.

## **Additional information**

The Society would like to draw attention to the following Royal Society publications which are of relevance to this subject: *Intellectual Property and the Academic Community* (March 1995); *Technology Foresight* (October 1995); *Realising Our Potential Award (ROPA) Scheme* (August 1996); and *Response to the House of Lords Select Committee Inquiry on Engineering and Physical Science Based Innovation*. These publications cover management issues and access to technology as set out in chapters 5 and 6 of the DTI/Treasury consultation document. Hard copies of this response and the above publications are available from The Science Advice Section at the Royal Society (rebecca.bowden@royalsoc.ac.uk tel: 0171 451 2588 fax: 0171 451 2692).