BUDGET 98

Innovating for the Future:

investing in R&D

a consultation document

HM Treasury

Department of Trade and Industry

CONTENTS

FOREWORD

In today's competitive world, businesses need to innovate to succeed. They have to stay one step ahead of the competition – upgrading existing products and services and inventing new ones; creating new markets; and finding new ways to anticipate customer needs.

Innovation therefore has to be a continual process, taking place throughout the economy. It involves every business and employee – private and public sector. Successful innovation will expand our productive potential, provide the highly skilled jobs which will sustain and improve our standard of living and quality of life, and enable our companies to compete successfully in the world market.

While all types of innovative activity have a role to play, there is an increasing premium on the successful exploitation of new technology. This is why the Government attaches so much importance to examining what can be done to improve the UK's performance on R&D investment.

In terms of spend, our R&D performance has declined relative to that of other major economies over the last 20 years. However, some sectors and individual companies match the world's best and there have been improvements in recent years, for instance in new business creations out of universities.

These examples serve to highlight how much further others have to go. Improving investment in innovation and R&D is mainly an issue for companies and their employees. But the Government can play a role in a strategic partnership with business to:

- improve the understanding of the importance of R&D and innovation to long-term growth;
- identify barriers to R&D investment;
- ensure that the relationship between the science and engineering base and industry prospers; and
- examine the regulatory, legal, accounting, and taxation arrangements which influence R&D.

This subject is important to the work of both our departments. We are therefore pleased to publish this joint document, the work of the Enterprise and Growth Unit within the Treasury, and of the DTI. This document is intended to stimulate debate, the results of which will inform both the Competitiveness White Paper the DTI will be publishing later this year, and preparations for the next Budget. We hope that the widest possible audience will respond.

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Please send your views, to arrive by 30 June 1998, to either:

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INTRODUCTION

THE WIDER REVIEW

1.01 The Government is committed to increasing the trend rate of growth of the British economy. This is essential if we are to increase our prosperity and create more job opportunities for the benefit of us all.

1.02 A key driver of growth in the modern world is the degree to which companies embrace innovation of all types. More innovation, allied to increased investment in skills and in equipment, is a necessary condition for British companies to succeed in the global economy.

1.03 The Government is determined to examine all the factors relevant to the successful take-up of innovation by firms, to see what can be done to improve the UK's business performance in this area.

1.04 The development and diffusion of new technology, for which R&D is becoming increasingly important, is a key component of innovation. By itself new technology is no guarantee of success, but in general the Government believes that an increase in R&D activity would be of benefit to the economy. It is therefore concerned to examine what steps might be taken to encourage more R&D, including whether possible adjustments to the taxation system would be cost-effective.

1.05 The Pre-Budget Report announced that the Chancellor and the President of the Board of Trade would be taking a wide-ranging look at ways of improving the UK's record on investment in R&D. As part of this wider review the DTI and the Treasury have been sponsoring a number of working groups (see Box) designed to examine, with business, what can be done to improve the UK's record.

1.06 At the heart of much of this work are the associated issues of technological innovation and R&D. This document discusses the main barriers to successful R&D, many of which are being considered within the current working groups. But to ensure the widest possible consultation, the Government is now seeking the views of all key players, including those in: innovative businesses; universities and research organisations; the financial community; and the legal profession, on how best they can work together in partnership with government to overcome the barriers to R&D and technological innovation.

HMT and DTI working groups

The financing of high-technology companies

The Paymaster General is sponsoring a group examining the financing of high-technology companies, particularly in the start-up stage. The group aims to identify any barriers that may exist in that context to their growth. A key focus will be providing the right environment for encouraging R&D. The group is being chaired by Dr Keith McCullagh, chief executive of British Biotech plc, and includes senior figures from high-technology companies, financial services and the venture capital sector.

The management of high-tech businesses

The DTI is sponsoring the "Tech-Stars" group. This group aims to identify priority areas for action to remove the barriers to growth faced by small, emerging, technology-based firms. The group is chaired by Ronald Cohen, chairman of the venture capital firm, Apax Partners and Co, and the group includes representatives from the high technology sector and academia.

Competitiveness working parties including those looking at investment and innovation

The Investment Working Party is taking a wide-ranging look at investment, and aims to identify the constraints to both physical and intangible investment. The group is chaired by Lord Hollick and is made up of representatives from the financial sector, including banking and venture capital, and small and large firms in both manufacturing and service industries.

The Innovation Working Party is examining the barriers to innovation and looking at ways of how UK business can improve its performance in innovation. The group is chaired by John Battle, Minister for Science, Energy and Industry, and includes representatives from small and large firms in both manufacturing and service industries.

The importance of innovation

1.07 Innovation is the successful exploitation of new ideas and new ways of doing things. It involves not just the exploitation of new technology, but changes in the whole range of business practices. It implies a willingness to look ahead and think about longer term opportunities and threats.

1.08 Innovation is vital to business and wider economic growth. Firms which are successful at innovation will secure competitive advantage in rapidly changing world markets; those which are not will be overtaken by competitors. Economies which generate and sustain such firms will prosper. These economies need to be receptive to new ideas; to educate, train and use a highly-skilled workforce; to welcome organisational change; and be capable of designing and marketing new products and services. The US economy which combines these attributes to a greater extent than, perhaps, any other, has demonstrated a capacity to create new firms and develop new products at a rate, and on a scale, larger than that of any of its competitors

1.09 The issue for the UK is how it can create a similarly stimulating economic environment. In part, this is a question of creating the right economic structure – an economy which is sufficiently stable to enable firms and individuals to plan over the long term, but is enterprising and competitive enough to engender and exploit constant change. The measures the Government has introduced to create a more stable macro-economic and fiscal framework and to update the UK's competition law will assist in creating a more innovation-friendly environment; as will the Government's emphasis on education and training. But we will not reap the full benefits of these changes unless we identify the economic, legal, institutional and cultural obstacles to innovation, and do what we can to remove them.

Innovation and R&D

1.10 Innovation entails anticipating and embracing change in all its forms. It need not be complicated. It can be about incremental change to organisation and management. It can involve stock control procedures as much as high scientific endeavour. It will more often mean a firm learning from others rather than inventing everything for itself. But in today's fast-moving global economy there is an increasing premium on the successful commercial exploitation of new technology; hence the potential importance of technological innovation and R&D. However, to be successful, R&D has to be combined with expertise in design, marketing, organisation, systems, production and the effective management of people. When so combined, R&D can play a vital role in enhancing company performance and promoting economic growth.

1.11 There is evidence of a positive relationship between business R&D and economic growth. This results from the gains which accrue to those businesses undertaking R&D investment, but also from the spill-over effects to other activities and enterprises. Such effects, deriving for example from the diffusion of knowledge, will gain in significance as the importance of R&D increases and the use of advanced technology spreads throughout the economy.

The UK's Record

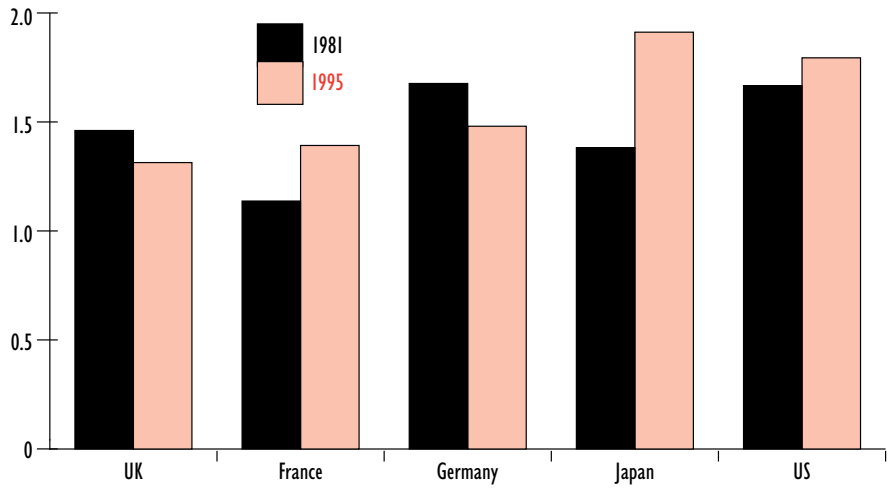
1.12 Innovation is difficult to measure. Many of the activities which make up innovation are not shown in national statistics or in company accounts, although this problem is being addressed by both statisticians and accountants. The Innovation Unit at the DTI has been working on ways of characterising innovation in descriptive terms with considerable success, but developing reliable quantitative measures of innovation is proving much more elusive.

1.13 The data on R&D are better. However, figures on R&D spending measure inputs, not outputs: so a high rate of R&D expenditure is no guarantee of success.

1.14 Nevertheless, the available evidence suggests that:

(i) In aggregate, the amount of R&D undertaken by UK firms has declined relative to our competitors: the UK now ranks fifth amongst the G7 in terms of total business enterprise R&D as a percentage of GDP (see chart). In part, this is due to a relatively slower growth of business enterprise R&D financed by UK firms, but more recent declines in R&D financed by government are also partly responsible .

Chart: Business enterprise R&D as a percentage of GDP



Source: OECD. Note: 1995 Germany figure distorted by unification.

(ii) Latest figures show that only in a few industries do UK companies spend comparable (or larger) amounts on R&D as a proportion of sales than other G7 countries. Our position has deteriorated over the last decade or so as large increases in competitors' R&D intensities, together with the falls in the R&D intensities of some UK sectors (for example, metal products, machinery and equipment, and electrical apparatus), have not been offset by increases in emerging R&D intensive sectors (for example, pharmaceuticals). UK company performance improves slightly in high-tech industries where the UK ranks above Germany and Japan but below France and the US.

(iii) While the available data shows aggregate expenditure on R&D by small and medium-sized enterprises (SMEs) to be low, the R&D to sales ratio of some SMEs, particularly those in high technology sectors, is very high. Moreover, evidence suggests that although measured R&D is low, SMEs account for a significant part of UK innovation. This reflects, in part, under-recording of R&D by SMEs; but it also reflects the fact that SMEs make relatively greater use of other means of developing new technology (for example, the use of advanced engineering skills and software engineering). The 1995 DTI/ONS survey showed:

- SMEs in some sectors such as chemicals and electrical engineering (including electronics) do spend substantially on new products and processes, and introduce technology quickly. Others spend little and show relatively slow rates of technological change.

- less than half of all manufacturing SMEs employ qualified scientists and engineers (QSEs). Just under half of firms employing them do so in an R&D capacity, though the presence of QSEs in production and management roles may also be helpful to technology diffusion and innovation generally.

1.15 This evidence presents a mixed picture. Some parts of UK industry spend substantially on R&D; many others do not. However, there is no doubt that our overall rate of spend on business enterprise R&D has declined relative to that of our major competitors. This is supported by the DTI's R&D Scoreboard which shows that large UK firms spend significantly less on R&D as a proportion of sales than their overseas counterparts.

1.16 This might not matter if there were evidence that UK R&D spend was more effective than that of our competitors. But accepting the difficulties of interpreting data on patents, the UK's share of US patents has fallen more than that of other major industrial countries over the last twenty years; and studies of the competitiveness of UK firms and sectors suggest that the UK tends, if anything, to lag behind our principal industrial competitors in exploiting technology. It is right, therefore, to be concerned about our record of business enterprise R&D.

1.17 Importantly, the evidence of the UK's performance on R&D is consistent with the picture that emerges from the DTI's benchmarking report, published in November 1997. This pinpointed the under-performance of much of UK industry relative to the best in this country and overseas.

1.18 Improving performance on R&D is most likely to accompany a general upgrading of business performance, as weaknesses across the board are tackled. Nevertheless, if that improvement is to come about, business and government need to work together to overcome the barriers that prevent individual firms from realising their innovative potential.

1.19 Some of these barriers are internal to the firm, others are part of the environment in which it does business. But these, and how the different key players interact, will all determine the extent to which innovative activity takes place. The following chapters explore:

- **sources of finance for innovation and R&D** (Chapter 2). Access to the appropriate level and type of finance is important for long-term investment, such as R&D. The nature of the financial constraint facing individual firms varies greatly, depending on their size, sector and stage of development. In the case of large companies this appears mainly to be a question of how they allocate internal resources. For SMEs the main problem is one of access to external funds on suitable terms.

- **the accounting treatment of R&D** (Chapter 3). If financial markets are to have a thorough understanding and appreciation of spend on R&D and innovation, then companies will need to describe this expenditure clearly in their financial statements.

- **the tax treatment of R&D and Intellectual Property** (Chapter 4). This chapter considers how far taxation influences R&D. It also examines the tax treatment of intellectual property (IP) and the treatment of royalties.

- **the management of individual firms and the relationship between firms** (Chapter 5). We need to understand better how firms organise themselves to encourage innovation. Inward investment is often cited as a source of innovation. The UK-based car industry is a well known and important example.

- **the ability of UK firms to access technology and the relationship between the science and engineering base and industry** (Chapter 6). There is a widespread belief that the UK is good at science, but bad at innovation. Whilst this is a simplification of the UK's history and potential, it is unlikely that across the board we are making the most of the commercial opportunities afforded by our sources of scientific excellence in our universities and elsewhere. We need to develop more effective collaboration between industry, the science and engineering base and government, especially in translating science and engineering research into new products, processes and services. We also need to encourage the flow of highly trained people between the science base and industry.

- **the relationship between intellectual property and its protection and dissemination** (Chapter 7). We need a better understanding of how the current framework for the protection of intellectual property impacts on the availability of finance and the ease of collaboration; and what improvements can be made to the system.

1.20 Amongst the issues raised in this document, on which views are sought are:

(i) Sources of finance for innovation and R&D (Chapter 2)

- How can communication between company management and financial institutions be improved?
- 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?
- How can the impediments to investment in technology-based SMEs, including the availability of management expertise, be addressed?
- What can be done to encourage the UK venture capital industry to take more interest in early stage finance?
- Does more need to be done to bring together business angels and SMEs?
- What can be done to encourage more corporate venturing, and to encourage cooperation, more generally, between large and small firms to promote innovation?

(ii) Accounting treatment of R&D expenditure (Chapter 3):

- 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?
- Does the limited ability to capitalise R&D discourage spending on R&D and innovation?
- Does (FRS)10's treatment of intangible assets provide sensible incentives to managers?
- How can 'know-how' best be reflected in company reporting, given the constraints of (FRS)10?

(iii) Tax treatment of R&D expenditure an intellectual property (Chapter 4):

- How desirable is reform of the tax treatment of IP-related transactions?
- What form and degree of detail should further guidance take on the scope of existing tax allowances for R&D?
- What changes could be made to the tax rules governing the deduction of income tax from royalty payments, so that they better achieve the two objectives of supporting UK innovation while not encouraging tax avoidance?
- 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?

(iv) Management issues (Chapter 5):

- How can the message about the need to innovate be broadcast more effectively?
- How can we develop better ways to measure the benefits of R&D and innovation?
- What lessons can we learn from other countries on innovation?
- How can businesses anticipate customer needs better?
- How can businesses be encouraged to identify and exploit future technological and marketing opportunities?
- How can we encourage wider participation in the Foresight process?

(v) Access to technology (Chapter 6):

- How can we increase the attractiveness of science and engineering students to employers, for instance through greater emphasis on basic management training and other relevant skills in undergraduate science and engineering courses?
- How can we encourage smaller firms to take on more graduate scientists and engineers?
- How do we make university researchers more aware of employment opportunities in firms?
- How can we encourage universities to make it easier for staff to set up in businesses to exploit their ideas?
- How do we ensure that more recognition is given to those academics who choose to work with business? Should they be on a par with those who conduct basic research, or teach?
- How can we encourage universities to share best practice in the management of intellectual property rights, so that university research can be better exploited?
- How can we promote more effective networks and infrastructure for the transfer of knowledge in the UK? How can DTI's innovation efforts ensure that such an infrastructure works effectively, connecting both firms and the relevant parts of the science and engineering base?
- How can we encourage larger firms and supply chains to lead by example by being more demanding customers?

(vi) Intellectual property (Chapter 7):

- How much do problems with IP matter to the innovation process as a whole, particularly to the availability of finance and ease of collaboration?
- Do we have the right balance between protecting IP and allowing the diffusion of innovation?
- Should there be a greater number of options for the formal protection of IP, so allowing greater flexibility; or would this, by adding to complexity, make matters worse?
- How can the protection of IP be made more easily understandable, particularly for SMEs?
- How can the acquisition and defence of IP be made more affordable, particularly for SMEs and universities?
- 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?
- What more can be done to spread best practice in the use and role of IP?

2 Sources of finance for innovation and R&D

Introduction

2.01 Access to the appropriate level and type of finance is important for long-term investment, such as R&D. Large companies with established, successful track records in longer term investment face few difficulties, but others can be constrained. The nature of the financial constraint facing individual firms varies greatly, depending on their size, sector and their stage of development. In the case of large companies this appears mainly to be a question of how they allocate internal resources. For small companies the main problem is one of access to external funds on suitable terms.

2.02 An important influence holding back both companies and investors from making long-term investment has been the UK's record of economic instability: high inflation, large fluctuations in demand and large budget deficits all discourage long-term investment.

2.03 The Government recognises the central importance of economic stability:

- the Bank of England has been given operational independence;
- legislation will be introduced for the Code for Fiscal Stability.

These measures, taken with low and stable tax rates, will allow all businesses – large and small – to plan for the future with greater certainty and confidence.

This Chapter starts by looking at financing issues facing large companies, before discussing the financing difficulties of early start-up and early stage SMEs.

Large companies

2.04 The three main factors that determine the availability of finance for R&D for large companies are:

- the level of retained profits;
- the competition for alternative uses of internal funds; and
- how the market values companies investing in R&D.

2.05 R&D expenditure in large companies, like other types of investment is financed primarily from retained earnings. The availability of finance for R&D and innovation therefore mainly depends on the decision of how they allocate available funds between competing uses, including various forms of investment, net acquisition of financial assets, and dividends. When there are insufficient funds internally, companies need to raise funds from the financial markets.

2.06 Most large companies have access to the UK financial markets, where domestic and overseas institutions – rather than individual investors – hold the bulk of UK equities and are effectively the major providers of external finance to established companies. R&D is a long-term investment for such companies but should also match the needs of investors, such as pension funds and insurance companies, needing to generate returns to meet long-term liabilities.

2.07 The Corporation Tax reform in the 1997 Budget removed the bias in the tax system in favour of the distribution over the retention of profits. This will have improved the climate for all long-term investment, including R&D.

2.08 Nonetheless, there is a widespread perception that many UK companies and financial institutions place too little emphasis on long-term organic growth and too much emphasis on short-term efficiency gains; the relative decline in our expenditure on business R&D is consistent with this. This raises issues to do with company management, financial institutions' dividend expectations and the UK's strong takeover culture. More specifically, there are issues concerning the monitoring of fund managers, in which senior company executives play an important role as pension fund trustees; the way funds are valued; and the knowledge and expertise available to pension fund trustees, fund managers and analysts compared to their Wall Street counterparts.

2.09 Against this background, improvements in the following areas could help to better align the objectives of companies and financial institutions:

- the quality of communications and relationships between company management and financial institutions on longer-term corporate goals and financing policies, which would lead to greater mutual confidence in longer-term investment plans;
- the knowledge among institutions of specific industrial sectors and their understanding of the associated risks and rewards of investing in R&D;
- the knowledge and expertise of trustees of pension funds in setting realistic longer-term goals and in monitoring performance of fund managers in a long-term context;
- the accountancy and corporate governance arrangements.

2.10 Accounting issues and corporate governance are discussed in Chapter 3. Management issues are discussed in Chapter 5 of this paper.

Start-up and early stage for technology based SMEs

2.11 Technology-based SMEs in their start-up and early stages of development will usually need to obtain external finance, but they may face significant problems in obtaining it. When expenditure on innovation and R&D is high in relation to their existing turnover and profits, these firms may also face difficulties in obtaining finance in subsequent stages of their growth and development.

2.12 In recent years there has been considerable interest in the financing needs of high tech SMEs. The subject was examined in detail in the Bank of England's report *The Financing of Technology Based Small Firms*, and was also covered, in part, in the CBI report *Tech Stars – Breaking the Growth Barriers for Technology-Based SMEs*.

2.13 This chapter draws on the analysis contained in these reports.

2.14 For the majority of SMEs, bank finance, in the form of loans, provides the most important source of external finance. Loan finance can meet part of the financing needs for technology based SMEs, but it is normally not a suitable form of finance for technology based firms at start-up and early stages of their development. This is because:

- such investments are often perceived to be high risk in nature; but loan providers will not normally share the upside of the investment to compensate for the perceived risk

- the long lead times of some investments mean that firms can face difficulties making regular payments to service the debt.

2.15 Nevertheless, in practice the majority of high-tech SMEs use debt finance at some stage in their life, because the use of bank overdrafts can be an important way of meeting short-term financing needs, such as working capital.

2.16 In principle, however, equity finance is the most efficient way for SMEs to finance higher-risk investments because it allows the investor to share the upside risk, and helps the firm avoid the cash flow problems associated with debt finance. The high risk, high return nature of start-up and early stage technology-based SMEs might be expected to make them suitable candidates for finance from venture capitalists.

2.17 The UK has a strong and rapidly developing formal venture capital market. According to figures from the British Venture Capital Association (BVCA), the amount of venture capital investment in the UK has risen from around £140 million in 1984 to £2.8 billion in 1996. However, the growth in the market has been dominated by management buy-outs and buy-ins (MBO/MBIs), which now account for 74 per cent of the venture capital market. With investments in expansion accounting for over 21 per cent, the value of funds going to early stage finance accounts for only 5 per cent of the total. It is notable that the venture capital industry in the US is more ready to invest in start-ups.

2.18 There are a number of reasons why early stage finance attracts such a small proportion of the formal venture capital market. These include:

- the high risk of early stage investments relative to MBO/MBIs, which offer perceived comparable rates of return;
- the long lead times in some instances;
- the relatively high costs of appraisal and monitoring;
- the need for a clear exit route;
- the quality of management and marketing; and
- the reluctance of SME owners to give up an element of control to venture capitalists

2.19 Technology-based firms in their start-up and early stages therefore need to turn to other sources of equity finance. 'Business angel' investment and specialist 'seed capital' firms can be an important source of relatively small amounts of capital, though the informality of particular business angel markets means that some high-tech companies may find it difficult to identify potential investors. The continued development of business angel networks – which bring together companies and investors – is therefore essential if adequate funds are to be provided to finance R&D at the start-up and early stage.

2.20 One source of finance for technology-based SMEs is from large companies (corporate venturing). This is more prevalent in the US than in the UK. Large companies can also help SMEs in other ways, for example, by seconding experienced staff.

2.21 The more successful companies will at some point reach a stage where they need to move from informal forms of equity finance to more formal types, such as institutional venture capital or listing on capital markets (e.g. the Alternative Investment Market (AIM)). Some of the barriers to formal venture capital, identified above, will still restrict finance at this stage, but they are less of a constraint than at earlier stages of company development.

Government action to promote investment in technology based SMEs

2.22 The Government takes an active role in partnership with the private sector in promoting investment in technology based SMEs.

2.23 The DTI has a number of schemes that assist in promoting access to finance:

- the SMART scheme provides grants for feasibility studies and product development;
- the Small Firms Loan Guarantee Scheme is being reviewed with the aim of improving access to finance for technology-based SMEs;
- Business Links provide information, advice and practical help on ways of accessing finance ;
- support for incubation schemes.

2.24 In addition the UK was instrumental in setting up the 125 million ecu European Technology Facility (EFF). The object of the ETF is to help finance small firms in high-technology work, through investment in venture capital funds.

2.25 The Enterprise Investment Scheme (EIS) and the Venture Capital Trusts (VCTs) both provide tax incentives to invest in unquoted companies. Some of this investment goes to technology companies.

2.26 The Government is continuing to look at ways of improving access to finance for high growth and technology based SMEs:

- The DTI is, amongst other measures, working with partners to improve the coordination between Business Angel networks, and is examining the scope for technology based firms to use specialist introduction services. This could involve use of the internet.

- The Paymaster General is sponsoring a group which is examining the financing of high technology firms, particularly at the start-up stage (see box in chapter 1).

- The DTI Small Firms' Minister is sponsoring a group which is looking more broadly at the barriers to start-up and growth faced by technology-based smaller firms. She is also working with the BVCA to examine the ability of the venture capital industry to assess opportunities for investment in early stage, technology-based firms (see box in chapter 1).

2.27 The Government is also establishing a National Endowment for Science, Technology and the Arts (NESTA) with significant funding from the National Lottery. NESTA's objectives include turning British creativity into products and services which can be exploited in the global market.

2.28 In his 1998 Budget the Chancellor of the Exchequer announced a package of measures that will be of benefit to high-tech firms:

- **Reforms to Capital Gains Tax to encourage longer term investment.** The introduction of the CGT taper will substantially reduce the capital gains tax charge on the disposal of long-held business assets.

- **A unified Enterprise Investment Scheme (EIS) and CGT reinvestment relief.** This will stimulate the provision of equity finance for smaller, higher-risk, trading companies.

- **Consultation on management recruitment incentives for high-tech SMEs.** The Government will consult on ways of incentivising managers through equity-based remuneration.

- **University Challenge.** A new challenge fund creating £50 million in venture capital to provide seed funding for the commercial exploitation of universities' research.

2.29 As part of the UK Presidency of the EU, the Chancellor of the Exchequer will be hosting an international conference on venture capital. This will examine ways in which barriers to venture capital investment can be overcome, particularly for high-tech SMEs. Speakers will include successful entrepreneurs from the US, and representatives from the European venture capital industry. The conference will take place on 2 June 1998 in the Guildhall, London.

Issues for consideration

2.30 We would welcome views on the following:

- How can communication between company management and financial institutions be improved?
- 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?
- How can the impediments to investment in technology-based SMEs, including the availability of management expertise, be addressed?
- What can be done to encourage the UK venture capital industry to take more interest in early stage finance?
- Does more need to be done to bring together business angels and SMEs?
- What can be done to encourage more corporate venturing, and to encourage cooperation, more generally, between large and small firms to promote innovation?

3 The Accounting Treatment of R&D Expenditure

3.01 If financial markets are to have a thorough understanding and appreciation of spending on innovation and R&D, then companies need to describe this expenditure clearly in their financial statements. These should also explain how the investment in innovation and R&D is likely to benefit the company.

3.02 When a company decides to go ahead with investment in innovation and R&D it has to decide how to treat its spending, and the likely returns, in its company reporting. The two treatments permissible are:

- writing off costs immediately to the profit and loss account; or
- capitalising them and writing them off over the period the firm will benefit from the expenditure.

3.03 Research cannot, by law, be capitalised as an asset, and so must be written off immediately. Under generally accepted accounting principles, development costs may, in some circumstances, be capitalised, and written off over time.

3.04 There is some justification for this limited ability to capitalise. R&D does not create physical assets that can be sold in quite the same way that, for example, investing in machine tools does. As a result, expenditure on R&D (and expenditure on training for example) can be seen to depress profits in the short-term in a way that other investment does not. However, R&D can produce a long-term return for the business, just like any other investment.

3.05 Increasingly, especially in high-tech businesses like biotechnology, but also in many services, the main asset of the company is the 'know-how' it creates through research, and how this is embodied in its staff. The development of an accounting standard for dealing with such intangibles, including goodwill, has been one of the major issues facing the accounting profession in recent years. 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 – for example, if a brand has been purchased by the company, or if they have a readily ascertainable market value.

The practical effect of this is to require the costs of internally generated intangible assets to be charged as expenses as they are incurred, although the Accounting Standards Board has acknowledged that in certain circumstances capitalisation might be the appropriate treatment. However, by its very nature, 'know-how' can be very difficult to measure and identification is liable to a great deal of subjectivity. Evidence suggests that, in any event, relatively few companies appear to capitalise 'know-how', but whether or not the constraints of (FRS)10 will discourage spending on internally generated 'know-how' is clearly an issue that will need to be addressed.

3.06 The Institute of Chartered Accountants of Scotland (ICAS) have suggested revising accounting practice so that there is a standard for innovation expenditure, not just R&D *(Innovating Research and Development Accounting)*. Where permitted, this would involve the capitalisation of innovation and development costs from the point at which an asset is recognised, on the understanding that there is clear disclosure of the method of capitalisation and amortisation used.

3.07 Companies should consider the impact of their accounting treatment and disclosure both on their own internal investment decisions, and on how existing and potential investors will react when reading their accounts. Financial investors should be aware that financial accounts are a record of what has happened in the past, not of what is to come, and not the best guide to long-term innovation policies; and understand the limitations of using them this way.

3.08 Companies should not just leave existing and potential investors to look at their balance sheets and draw their own conclusions. The Hampel Committee on Corporate Governance drew attention to the growing body of good practice in company management and investor communications on longer-term investment and development. In particular the Hampel Committee endorsed the Myners' Group recommendation on best practice for company management, institutions and trustees. The DTI will be considering with Myners and others how this recommendation could be adapted for the benefit of smaller listed companies.

Issues for consideration

3.09 Issues which need to be considered, and on which views are sought are:

- Is it time to review the current accounting treatment of R&D? Are current arrangements leading to a bias against R&D and innovation? If so, are the ICAS proposals a step in the right direction?
- Does the limited ability to capitalise R&D discourage spending on R&D and innovation?
- Does (FRS)10's treatment of intangible assets provide sensible incentives to managers?
- How can 'know-how' best be reflected in company reporting, given the constraints of (FRS)10?

4 The tax treatment of R&D expenditure and intellectual property

Introduction

4.01 This Chapter considers some of the tax issues relating to intellectual property (IP), including expenditure on research and development (R&D), and the treatment of royalties. These issues can affect a wide range of business undertakings, from an individual developing a bright idea, through to a commercial company spun-off by a university science department, or to a major multinational or financial institution seeking a location for its R&D or software development function.

Innovation and taxable profit – the current rules and their effect

4.02 The current tax rules affecting business income and expenditure relating to innovation and intellectual property have grown up over more than 150 years. The underlying principles are derived from decisions of the courts about calculating trading profits. But legislation has been enacted from time to time to override the effect of case-law on specific types of transactions where the principles have been considered to give unsatisfactory results. It may be time to look more fundamentally at those principles.

4.03 One way of analysing the position is to compare the tax treatment of the various types of innovation-related transactions with modern accountancy treatment. Innovation-related expenditure and receipts are summarised at the back of this chapter in tables 4.1 and 4.2, respectively. The tables show that while the accounting treatment of analogous transactions for different types of IP is fairly consistent, the tax treatment can vary considerably with the type of IP involved. The tax treatment is sometimes the same as the accounting treatment, sometimes more favourable, and sometimes less. In the case of expenditure on IP, for example, sums may be written off faster or slower for tax than in business accounts, or sometimes not at all. However, the comparison with accounting treatment does not always indicate whether a particular treatment is generous in economic terms.

4.04 In some cases, such as capital expenditure on R&D or British films, the difference between tax and accounting treatment has a clear rationale. This is to be found in Parliament's intention to encourage such expenditure through the tax system. In other cases the rationale has no clear origin, and may be worth a closer look against the Government's economic objectives.

4.05 For example, there is the absence of any tax deduction for expenditure on the acquisition of trade-marks, some franchises and some types of 'know-how', even though the benefit to be derived by a business from these assets may be used up over a relatively short period. And expenditure on developing computer software may occasionally be classified as capital for tax, even where it is written off immediately in the accounts.

4.06 Conversely, receipts from the outright disposal of IP may sometimes count as capital for tax (in practice taxed more lightly than income) even though the expenditure in building up the value of the asset has been written off against taxable income.

4.07 The variety of current tax treatment can lead to frequent consideration of the various borderlines. Some involve the application of concepts derived from tax case-law, such as the distinction between capital and revenue items, in circumstances where there is no immediately clear answer. This complexity is likely to add to the tax compliance costs.

Modernisation

4.08 In place of the current diverse treatment of IP-related transactions in the computation of trading profit (Tables 4.1 and 4.2), it may be worth considering whether a more cohesive regime for computing taxable profit could be devised which would benefit the economy at affordable Exchequer cost. One approach may be to extend the scope of the existing statutory schemes, like those for patents or industrial know-how, to cover other types of IP. Another may be a more radical scheme on the following lines:

- all IPR-related incomings and outgoings to be taken into account in computing taxable profits (thus the capital gains code - including reliefs such as indexation — would not apply to these transactions);

- their recognition to be aligned with a business's own accounting treatment so long as that was consistent with UK generally accepted accounting principles (thus expenditure would be deductible when it is written off against profits in the accounts).

4.09 The basic rules for income and expenditure on the production, acquisition and exploitation of films, enacted in 1982, are already on these lines. And such a regime would be consistent with the recent, widely welcomed reforms of the tax rules governing the treatment of foreign exchange transactions, financial instruments and corporate debt. But, the design of this kind of regime would not be without its difficulties.

4.10 Considerations of wider policy may require this general regime to function alongside special tax rules intended to encourage particular types of activity, such as those for R&D (see below). But the existence of too many special cases could undermine the rationale on which a regime of this kind would depend.

The tax treatment of R&D

4.11 The treatment of expenditure on R&D raises particular issues. The existing tax rules provide for the deduction of such expenditure as soon as it is incurred. Though doubts have been expressed in some quarters, it is the Inland Revenue's view that all expenditure within the generally accepted OECD 'Frascati' definition (apart from that in the social sciences and the humanities) qualifies for this immediate write-off (by way of Scientific Research Allowances (SRA)). Further guidance on the scope of SRA is planned in order to provide greater clarity to business.

4.12 The treatment of the fairly small proportion of R&D expenditure incurred on buildings and equipment is clearly favourable because these assets have a useful life of some years. But a less obvious point is that the treatment is also favourable for other expenditure on R&D. R&D is a capital asset which should produce an income stream over time; yet it receives an immediate tax write-off. And as noted in Chapter 3, there is a growing body of opinion in the accountancy world that it should be mandatory to capitalise development expenditure giving rise to an intangible asset.

4.13 In addition to the rewards it can generate for private sector investors, R&D can also produce spin-off benefits to the wider economy. And new theories of economic growth have shown how R&D has the potential to increase innovation and the long-term growth rate of the economy. Thus, it can be argued that business R&D has certain characteristics which merit favourable treatment compared to other investments.

4.14 Though the UK's tax treatment of capital expenditure on building and equipment for R&D is not often matched elsewhere, a number of countries (see Table 4.3) have responded to the case for particularly encouraging R&D with incentives for current expenditure on R&D which are more generous than those in the UK. These may take various forms, such as the US tax credit, but essentially the effect is to subsidise qualifying expenditure or additional expenditure by giving tax relief for more than 100 per cent of it: this is equivalent to giving grants towards the cost.

4.15 Clearly any policy changes in this area need to be considered on their merits and on the basis of judgements about feasibility and cost-effectiveness, taking account of their wider impact on the UK economy. In the case of ideas for R&D tax credits, the key issue is whether the benefits, including those which go to private investors, exceed the costs of a higher tax burden (including compliance and distortionary costs). This is a difficult judgement to make because while there are clearly costs, the wider benefits are uncertain. Nevertheless, the importance of R&D means that it is vital to look actively at what has been done elsewhere to see what lessons we might learn.

Deduction of income tax payments from royalties

4.16 Table 4.4 summarises the UK tax rules governing the deduction of income tax from royalty payments. These rules present an inconsistent picture. It is not always easy for the payer of a royalty to know whether tax should be deducted, nor do the rules provide a consistent means of ensuring that the tax due on income from the exploitation of UK IP reaches the Exchequer. This leads to a funnelling of the tax benefits available away from genuine innovators and towards the users of aggressive tax planning arrangements, and also handicaps the UK in its efforts to negotiate double tax agreements with other countries that seek to minimise foreign tax on UK based innovators.

Issues for consideration

4.17 Views are invited on the issues raised in this Chapter, relating to the tax treatment of IP and R&D, in particular:

- How desirable is reform of the tax treatment of IP-related transactions?
- What form and degree of detail should further guidance take on the scope of existing tax allowances for R&D?
- What changes could be made to the tax rules governing the deduction of income tax from royalty payments, so that they better achieve the two objectives of supporting UK innovation while not encouraging tax avoidance?
- 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?

Table 4.1 – Expenditure on innovation in computing taxable business profits

Category	Accounting treatment	Tax Treatment	Comparison with accounting
R&D			
R&D expenditure on buildings and equipment	Amortised over period of use	100% immediate write-off	Very favourable
Expenditure on all research and development expenditure with insufficiently certain pay-back	100% immediate write-off	100% immediate write-off	Similar
Expenditure on development expenditure with sufficiently certain pay-back	Free choice between 100% immediate write-off or amortisation over period of exploitation	100% immediate write-off	Similar if write-off chosen: otherwise favourable
Other expenditure on internal generation of IPR			
British films costing less than £15m	Amortised over period of exploitation	100% immediate write-off	Favourable
Other British films	Amortised over period of exploitation	Choice between 3 year write-off or costs matched with receipts £ for £	Favourable
Computer software development expenditure which counts as capital for tax	Usually 100% immediate write-off but sometimes amortised over period of exploitation	25% reducing balance capital allowances	Usually unfavourable
Expenditure on developing in-house patents, know-how, trademarks, magazine titles, copyrights	Usually 100% immediate write-off	Follow accounting treatment	Similar
Expenditure on buying in IPR			
Patents, industrial know-how, computer software	Amortised over period of exploitation	25% reducing balance capital allowances	Varies with useful life of item in question
Trade marks, magazine titles, lump sum payments for many franchises, plant breeding rights, quotas	Amortised over period of exploitation	Usually no tax deduction	Very unfavourable
Copyrights	Normally amortised over period of exploitation	Follow accounting treatment	Similar
British films	As for expenditure on films made in-house (see above)		

Table 4.2 - Receipts derived from IPR in computing taxable business profits

Category	Accounting treatment	Tax Treatment	Comparison with accounting
Royalties from licencing all IPR (including lump-sums for grant of non-exclusive rights)	Recognise as sums accrue	Follow accounting treatment	Similar
All sums from the exploitation of films and audio rights whether by way of outright disposal of rights or as royalties	Recognise as sums accrue	Follow accounting treatment	Similar
Lump-sums for outright disposal of copyright	Recognise as sums accrue	Follow accounting treatment (but capital where seller holds copyright as investment)	Normally similar but favourable if capital
Lump-sums for outright disposal of trade marks, magazine titles, plant breeding rights, quotas (whether bought in or developed in-house)	Recognise as sums accrue	Normally capital	Favourable
Lump-sums for outright disposal of patents	Recognise as sums accrue	Tax as income in six annual instalments	Favourable
Lump-sums for outright disposal of know-how (industrial or non-industrial)	Recognise as sums accrue	Follow accounts (but can be capital if know-how disposed of along with the business)	Normally similar but favourable if capital

Table 4.3 - Expenditure on R&D: international comparison of special rules for current expenditure, equipment and buildings and other tax-related incentives

Country	Current Expenditure	Equipment	Buildings	Other related incentives
UK	Written-off as incurred	Written-off as incurred	Written-off as incurred	Tax exemption for Scientific Research Associations
Australia	Written-off as incurred	Written-off over three years		Deductible expenditure (both current and on equipment) increased by 25%
Canada	Written-off as incurred	Written-off as incurred		Variable tax credit. Higher rate for small companies which may be paid credits on non tax effective expenditure up to C$2m
France	Written-off as incurred			Tax credit of 50% of increase over previous two year average expenditure. 50% of any subsequent fall offset against future credits. Credit (up to Ff40m) payable where company has no tax liability for the year
Germany	Written-off as incurred			
Italy	Written-off as incurred	Normal depreciation allowances doubled for first three years details		30% credit for SMEs
Japan	Written-off as incurred			Tax credit equal to 20% of increase in expenditure over since 1966. Limited to 10% of corporation tax liability. Small companies may claim 6% of expenditure up to 15% of the corporation tax liability
USA	Written-off as incurred			Tax credit of 20% (subject to minimum tax rules) of expenditure in excess of a base figure indexed to turnover. Base amount is average annual R&D 1984-1988. Credit reduces R&D expenditure otherwise tax deductible. But option to avoid restriction by taking credit at a lower rate. Alternative base for start-ups.

Table 4.4 - Deduction of income tax from royalties

Type of royalty	Deduction of tax
Royalties in respect of a UK patent paid to UK recipients	Income tax at basic rate (currently 23%) must always be deducted
Royalties in respect of a UK patent paid to foreign recipients	Basic rate income tax must be deducted unless authority to deduct at nil or a lower rate under the royalties article in one of the UK's tax treaties has been obtained
Copyright and design right royalties (including computer software royalties but excluding film royalties) to foreign recipients unless within professional exemption	As above
Royalties in respect of other IPR (including those in respect of a foreign patent) paid to UK recipients	Income tax to be deducted only if royalties 'pure income profit' in recipient's hands
Royalties in respect of other IPR (including those in respect of a foreign patent) paid to foreign recipients	Income tax has to be deducted only if royalty 'pure income profit' in recipient's hands and no reduction authorised under a tax treaty

NB The tables are concerned with the *usual* tax treatment; the treatment may be different on the facts of a particular case.

5 Management Issues

The challenge of innovation

5.01 Innovation poses some difficult management challenges. Numerous case studies, benchmarking exercises and surveys have shown that successful technological innovation requires firms simultaneously to:

- promote an innovative culture and attitudes within the company, which motivate employees and managers to embrace change, and take those risks which are in the wider interests of the business;
- introduce an achievable, but challenging, innovation strategy which is clearly explained to employees, shareholders and to potential suppliers of new external funds. Existing shareholders need to be assured that the investments needed to support the strategy are in their long-term financial interest. New investors will need to be convinced that they can expect a good return on their money;
- work closely with suppliers and customers. Successful innovation, above all, is driven by customer and market needs;
- bring the various parts of the business together to work in an effective fashion to develop new products, processes and systems;
- identify, access and absorb relevant external sources of technology (see Chapter 6);

The need to promote an innovative culture

5.02 Research shows that a strategic commitment to innovation is important for many firms. Such a commitment provides the best means of achieving long term value for shareholders, employees and the wider economy. Innovative firms will have a clear vision and a set of goals and objectives which set the broad areas in which they aim to develop new products and processes. They will engender a climate in which new ideas flourish; where there is a tolerance of failure, and the scope to learn from failure; and where there is a widespread desire to succeed in serving customer needs better. They will also attach great importance to learning from those outside the firm, and will be constantly dissatisfied with how well they are doing.

5.03 Innovative firms will have appraisal procedures and financial controls to ensure that the most promising new ideas are selected and resources made available for their further development. They will provide scope for the expertise, energy and initiative of their employees, and make due allowance for all the technological and financial uncertainties which innovation involves. They will also keep the process of innovation under reasonable control, but be very careful not to inhibit it unduly.

The management of the innovation process

5.04 Successful technological innovation requires the close coupling of market needs (including the needs of which customers or potential customers may not yet be fully aware) with technological opportunities. This will start with the effective monitoring and anticipation of customer needs followed by the seeking out of the science and technology which may be able to meet them. Typically the latter will involve a combination of new technology developed within the firm with technology from outside.

5.05 Internally, firms need to co-ordinate effectively the various functions involved in innovation – R&D, production, marketing, after sales service etc. – so that decisions at one stage take full account of problems and opportunities arising in others. This may involve a variety of mechanisms including cross-functional teams and the posting of individuals trained in one function into another. Successful innovation is not a sequential process but will allow a free flow of information and ideas, in both directions, and between all the various stages.

5.06 Benchmarking exercises demonstrate considerable disparities between the ability of UK firms to manage the innovation process. This suggests that there is scope for many firms to improve their management of the R&D and innovation processes. There is also evidence that UK firms are less good than their foreign competitors at managing innovation. There are however signs that many UK firms are aware of their need to improve. This is in part due to the work of the DTI Innovation Unit, and in the case of small firms, that of Business Links.

The role of government

5.07 It is not for government to tell companies how to manage their businesses. However, government can try to encourage firms to develop a culture of long term thinking about market and technological opportunities: the Government is doing this through its Foresight programme. It can also encourage the spread of best practice in managing innovation and draw attention to the financial and commercial benefits which successful technological innovation can bring to companies, and their employees and shareholders.

5.08 The Innovation Competitiveness Working Party whose membership is drawn from a variety of UK businesses is currently considering how government and business can work together in order to improve UK innovation performance.

Issues for consideration

5.09 Views are sought on the following:

- How can the message about the need to innovate be broadcast more effectively?
- How can we develop better ways to measure the benefits of R&D and innovation?
- What lessons can be learnt from other countries on innovation?
- How can businesses anticipate customer needs better?
- How can businesses be encouraged to identify and exploit future technological and marketing opportunities?
- How can we encourage wider participation in the Foresight process?

6 Access To Technology

The use of technology

6.01 The use of external technology, including knowledge and know-how, is an essential complement to a firm's R&D programme and a vital component of successful innovation.

6.02 Three conditions need to be met before a firm can successfully introduce external technology into its operations.

- The firm needs to identify and access external technological sources. These can be equipment suppliers, scientific labour markets, technological intermediaries (e.g. research and technology organisations (RTOs)) and the science and engineering base (which includes universities and research councils).
- The firm needs to have the internal capacity, including the right mix of managerial and technical skills, to absorb the technology and adapt it to its own circumstances.
- A market or network must exist which effectively brings together the users and sources of technology.

6.03 Crucial to this process are people who understand and are comfortable with the relationship between the firm and the institutions that generate trained people, greater understanding, new scientific concepts, and new technology. This will often depend on the barriers and incentives which individuals face, for example, whether academics are adequately rewarded for exploiting their research.

Access to external sources of technology

6.04 Different companies have different needs which are served by a wide range of commercial and non-commercial technology providers. These technology providers include suppliers of equipment, research consultancies, RTOs, universities, and research councils.

6.05 Some firms, particularly working in scientifically intensive areas will develop their technology directly from close connections with the science and engineering base. These firms benefit from the research carried out in universities, from employing the highly qualified people who carry out this research and from accessing the latest techniques used by these researchers. By funding collaborative projects, these firms gain further access to these benefits; for example, pharmaceutical companies fund basic and applied research projects and support research centres. Encouraging universities to share best practice in the management of intellectual property (IP) may help facilitate more of these collaborations (see Chapter 7).

6.06 The majority of firms access technology through recruiting trained people, making purchases of equipment, components and software or entering research collaborations with other firms or other technology providers outside the science and engineering base.

The ability of companies to absorb external technology

6.07 Firms generally consider their internal resources to be the most important source of technological innovation and R&D. There is a positive relationship between a firm's human capital, the extent of collaboration with the science base and the firm's overall performance. This suggests that if a firm wishes to introduce new technology, it requires skills in internal organisation in order to integrate the new technologies effectively into production and the market place. The act of doing R&D is one way to generate these skills.

6.08 The best way to generate the in-house capability to adapt or exploit complex technologies is by recruiting skilled people, particularly graduates. The UK has an advantage over other countries, because our science and engineering base — the training ground for these graduates – is world class in a number of important areas, for example, mathematics. However, the UK is unable fully to exploit this advantage because many graduates lack basic business skills and about half of all manufacturing firms employ no qualified scientists or engineers at all.

The market for knowledge and know-how

6.10 Generally, firms can meet their technological needs through day-to-day commercial transactions which require little government involvement. For example, firms recruit graduates on the labour market and buy new equipment through purchases from other firms; and firms are able to increase the quality of external technology available to them by demanding higher standards from suppliers. However, the market may not always work effectively, such as when firms have insufficient knowledge of the opportunities available to them. The Government supports, mainly through the DTI, a number of programmes aimed at improving access to external technology and increasing the efficiency with which this external technology is used. These include the Teaching Company Scheme, the LINK programmes and Business Links (and its equivalents in Scotland, Wales, and Northern Ireland).

6.11 The Government also has an important role to play in ensuring that schools and universities produce people with the skills needed by business. It also provides funds for important parts of the UK's knowledge infrastructure, such as universities. Universities support science parks and incubators which provide a favourable environment for the development of new firms and also provide a network where firms can find suppliers or business services. In addition, the research councils have established collaborative centres between the science & engineering base and industry; and collaboration between universities and industry is supported through funding from the Government's LINK programmes. The Foresight programme has also established widespread networking between the science and engineering base and business, including in some service sectors which have hitherto had few links with the academic scientific community.

Issues for consideration

6.12 However, the Government believes there is more to be done to reduce the barriers to collaboration between universities, research councils and business if the UK is to better exploit its science and engineering base and if the diffusion of technology between firms is to be improved. Views are invited on the most important barriers to the take-up of external technology by firms, and to the commercial exploitation of technology by technology providers (e.g. research and technology organisations, universities, research councils). In particular:

- How can we increase the attractiveness of science and engineering students to employers, for instance through greater emphasis on basic management training and other relevant skills in undergraduate science and engineering courses?

- How can we encourage smaller firms to take on more graduate scientists and engineers?

- How do we make university researchers more aware of employment opportunities in firms?

- How can we encourage universities to make it easier for staff to set up in businesses to exploit their ideas?

- How do we ensure that more recognition is given to those academics who choose to work with business? Should they be on a par with those who conduct basic research, or teach?

- How can we encourage universities to share best practice in the management of intellectual property rights, so that university research can be better exploited?

- How can we promote more effective networks and infrastructure for the transfer of knowledge in the UK? How can DTI's innovation efforts ensure that such an infrastructure works effectively, connecting both firms and the relevant parts of the science and engineering base?

- How can we encourage larger firms and supply chains to lead by example by being more demanding customers?

7 Intellectual Property

Intellectual Property (IP) and its protection

7.01 A good deal of R&D, and innovation in general, results in concepts and processes that can be copied and developed by others. To ensure that firms are not discouraged from undertaking innovation, by fear of being undercut by imitators, the law allows for various forms of intellectual property (IP) to be protected. Whether through patents, copyright, trade-marks, design right or other means, the law grants the owner of intellectual property, monopoly rights, usually for a specific period (e.g. 20 years for patents, 70 years for copyright).

7.02 The protection of IP involves a trade-off between encouraging innovation and allowing the exploiting of monopoly rights. If protection is too weak then there may be too little innovation. If protection is too strong then this will limit the diffusion of innovation.

The role of formal protection

7.03 The formal protection of IP needs to be placed in the wider context of the management of intellectual assets. The management of intellectual assets is a strategic issue for the prosperity and growth of firms, and needs to be integrated with their business and marketing strategies, rather than treated as a separate, specialist issue.

7.04 In many cases, formal protection will not be the appropriate solution because:

- the best strategy for a particular enabling technology may be to allow other firms to adopt it freely, allowing the originator to make money from related products and services;
- firms may choose to adopt a "find and exploit" strategy – i.e. rapidly picking up and exploiting the right technology for the job in hand – rather than one of "discover and patent";
- confidentiality agreements enable firms to protect their intellectual assets throughout some or all of their life, without requiring formal protection (though this can cause difficulties when companies wish to collaborate – see Annex).

7.05 However, formal protection is likely to be appropriate where:

- R&D investment is long-term and costly, such as in pharmaceuticals;
- the fruits of research are central to the firm's raison d'être, as in a university spin-out; or
- a firm is planning to enter into collaboration or licensing agreements.

Problems with formal protection of IP

7.06 Even where formal protection of IP is the appropriate solution, its potential may not be fully realised, due to a number of problems, the most important of which are:

- a lack of understanding of the way the system operates and a consequent failure to use it strategically;
- an inability or unwillingness to meet the costs of protection, particularly in the early years of start-up;
- a lack of confidence that any IP secured can successfully be defended; and
- difficulties encountered in collaborations between organisations with different cultures and priorities, and delays in addressing IP issues until projects are well underway or even complete.

7.07 These problems particularly affect SMEs. The costs to SMEs' of obtaining advice about the existing IP system, and of applying for formal protection, compared to large companies, can discourage them from seeking formal protection. In addition, the resources needed to pursue an infringement of IP through the courts can act as a disincentive to SMEs from collaborating with larger companies. These problems are more fully discussed in the Annex to this Chapter.

7.08 One approach to improving this situation might be to make available a greater number of options for protection of IP, possibly including trading-off fees, ease of issue, strength of protection, and duration. To some extent, more sophisticated firms already achieve this by shopping around between different countries' IP regimes and mixing the types and levels of protection they take out. Although cost is not primarily the main driver for firms of this kind, they may welcome greater flexibility within the UK. However, many less sophisticated firms find the current regime difficult to understand, and so a more flexible, but more complex system, might fail to encourage them.

Issues for consideration

7.09 This chapter has outlined the need for and extent of protection of IP. There are a number of issues which need to be considered, and on which views are sought:

- How much do problems with IP matter to the innovation process as a whole, particularly to the availability of finance and ease of collaboration?
- Do we have the right balance between protecting IP and allowing the diffusion of innovation?
- Should there be a greater number of options for the formal protection of IP, so allowing greater flexibility; or would this, by adding to complexity, make matters worse?
- How can the protection of IP be made more easily understandable, particularly for SMEs?
- How can the acquisition and defence of IP be made more affordable, particularly for SMEs and universities?
- 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?
- What more can be done to spread best practice in the use and role of IP?

7 Annex To Chapter 7: Protecting Intellectual Property

Problems with protecting intellectual property

A.01 Although the basic types of protection for intellectual property (IP) appear to be reasonably well understood, anecdotal evidence suggests that many firms, and particularly SMEs, feel that they lack easy access to advice on the appropriate means for protecting their IP. Delegates at a seminar on IP management at Cranfield University in January 1998 cited the following problems with the present system: a lack of basic knowledge of what can or should be protected and under what regime; the cost and availability of basic advice on the right type of IP protection; and the cost of protection and defensibility.

A.02 While these problems appear to be particularly acute in firms in which IP is considered to be peripheral to the main business (for example, the IP associated with a restaurant chain), there is evidence that a lack of understanding of the basic rules can create problems even in sectors strongly associated with new knowledge. For example, a 1996 CBI report on the biotechnology sector found that only two-fifths of companies in the UK kept laboratory notebooks sufficient to prove date of conception — a vital element in protecting intellectual property under US law.

A.03 The Patent Office is currently pursuing a number of initiatives aimed at improving the flow of information. As well as providing a comprehensive range of literature and a web-site, it is running a series of training sessions on the different types of intellectual property rights (IPR) and the value they can add to a company's business.

A.04 Business Links and other intermediary organisations are also working in this area. For example, as well as providing fact packs for its clients, Business Link London Central operates an IPR panel of experts advising on the business plans of firms which have IP as a prime asset. It also offers an IP Business Review, which seeks to link a firm's IP strategy and assets to its business plan and marketing strategy.

Costs associated with protecting IP

A.05 Even when the type of protection has been identified, its cost can often act as a disincentive to further action. The 1997 CBI report "Tech Stars", which looked at barriers to the growth of technology-based SMEs, said that *"the costs associated with taking legal advice, registering patents, drawing up legal contracts and taking a dispute to court are more onerous on small firms, especially Tech Stars, because they have restricted cashflow and resources in the early years. As a result, IP in many Tech Stars is often inadequately protected"* (Page 19).

A.06 At the Cranfield University seminar, SMEs said that they often made use of confidentiality agreements to protect new pieces of knowledge, and on occasions would not take any legal protection at all, because of high cost and low perceived defensibility. However, lack of formal protection, or lack of confidence in the protection available, can limit the options available to a firm for the exploitation of its ideas. For example, as cited in "Tech Stars", small firms will not consider corporate alliances with larger partners, which can bring benefits to both sides, if they feel that by doing so they risk losing their IP.

Defensibility

A.07 This is seen as a major problem in protecting IP. Smaller firms are reluctant to discuss any collaboration involving IP with larger ones, since they fear that they would not have the resources to pursue an infringement through the courts. Insurance cover to allow firms to claim for the legal costs of IPR is becoming increasingly difficult, since insurers believe that there would be little demand at the increased level of premium necessary to cover current risks, and are therefore withdrawing from the market.

A.08 There is anecdotal evidence that the availability of contingency fee arrangements for court action in the US is having a major influence on where companies choose to protect their IP. These make it possible for a company to mount a defence of its IP, and by effectively making the balance of resources between large and small firms more even, there is perceived to be a reduced risk of infringement. The introduction of contingency fee arrangements in the UK for cases involving IPR would go a considerable way towards making firms believe that their IP is defensible. This would have the effect both of making investment in it appear more worthwhile, and of removing a major obstruction to collaboration.

Problems arising from collaboration

A.09 These typically occur in collaborations between firms and universities. The academic culture tends to encourage the publication and free circulation of ideas. Firms, however, need to keep the key elements of potential IP confidential until they can be protected. Although some academic institutions are well-versed in the issues surrounding IP, and have efficient central units for handling issues of this kind, in others the central function is weak or absent. The high degree of academic and departmental freedom in many universities, and the multiple routes by which firms and researchers can come into contact, also makes this issue difficult. Problems in confidentiality or record-keeping, for example, can therefore occur even where the university has a well set-up central industrial liaison function. There are also frequent examples of partners proceeding on mutually contradictory assumptions about ownership of, and rights over, IP produced from the collaboration, simply because these issues were not established clearly at the outset of the programme.

A.10 Several initiatives are underway to improve the situation. The Patent Office is working with AURIL — the organisation representing university industrial liaison officers — to produce material on IPR for their members, and to develop a web site. AURIL, the CBI and the DTI Innovation Unit have produced a basic guide to research partnerships for universities and firms. This does not specify that the university or firm should invariably or normally own the IP, but does make clear that each side should negotiate from an informed position and be clear at the outset what has been agreed.

A.11 Without confidence that any IP from a collaboration with academia can be protected and exploited, firms will be reluctant to work in this way. Equally, without the possibility that their work can be recognised in academic as well as financial circles, the best academics will be reluctant to work with firms or to expose leading-edge research to them. Some universities and larger companies, have model arrangements which allow for the parties to agree on publication of research results (often after a set period). It is essential that best practice is shared in this field.

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