

4. Innovation

-
- 4.1 This section discusses the rationale for the inclusion of the Innovation goal and priorities in the RES. The objective for this goal is:

Realising the value of innovation by bringing ideas to market

- 4.2 This section shows how the goal and priorities contribute to the achievement of this objective. It discusses the context for the choices made, and sets out the rationale for intervention.

Rationale for the goal

This goal helps to deliver RES objectives

Innovation is one of the government's productivity drivers

- 4.3 Innovation is one of the productivity drivers identified by the government. It can be simply defined as 'the successful exploitation of new ideas'.⁸⁷ This definition is useful because it emphasises that, for innovation to occur, the generation of a creative idea is not enough: the insight must be operationalised in some way. The objective for this goal is that creative ideas are brought to market.
- 4.4 Research shows that innovation is 'one of the main engines of long-term economic growth and structural change'.⁸⁸ It is one of the two keys to modern growth, according to the historical evidence.⁸⁹
- 4.5 Research makes clear that innovation can raise productivity through the following mechanisms:⁹⁰
- direct productivity gains to the firm which has invested in innovation or research and development (R&D) in terms of efficiencies in production or product improvements
 - spillover productivity gains when a new innovation assists firms to take advantage of other innovations; and
 - spillover productivity gains for other firms or other countries involved in trade who are able to emulate the innovation.
- 4.6 The spillover effects of innovation are particularly important for society as a whole.

Innovation is of growing importance in a globalising economy

- 4.7 The OECD argues that the comparative advantage of high-cost countries is increasingly based on innovative activity.⁹¹ High wages are increasingly incompatible with information-based economic activity, which can be easily transferred to a lower cost location. 'By contrast, the creation of new ideas based on tacit knowledge cannot easily be transferred across distance.'⁹² The spillover of knowledge from the firm or university creating that knowledge to a third-party firm is essential to innovative activity. Such knowledge spillovers tend to be spatially restricted, and so are 'sticky' at a sub-regional or regional level. Research suggests that 'an irony of globalisation is that even as the relevant geographic market for most goods and services becomes increasingly global, the increased importance of innovative activity in the leading developed countries has triggered a resurgence in the importance of innovation as the locomotive for competitiveness and growth'.⁹³

University links have commercial significance

- 4.8 The Lambert Review argues that 'Universities form the cornerstone of many successful clusters by attracting knowledge-intensive businesses around their strong research base and a ready supply of skilled graduates. For companies, the benefits include special access, closer relationships, better information and powerful incentives, as well as the opportunity of networking with other businesses in similar fields'.⁹⁴
- 4.9 Companies which use universities as a source of information or as a partner tend to be significantly more successful than those that do not. Research shows that they are more likely to have increased their market share, improved the quality of their goods and services and lowered their costs.⁹⁵

Innovation creates substantial spillover benefits

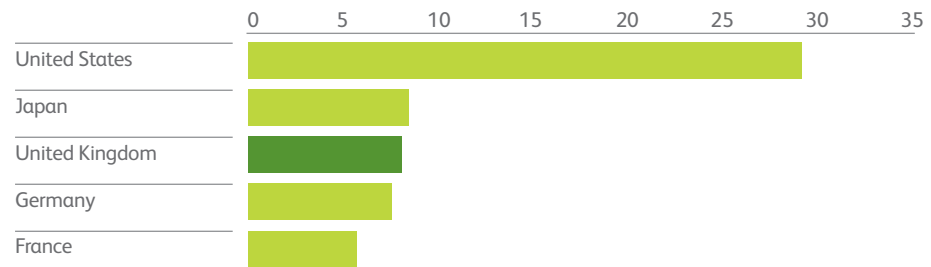
- 4.10 Research has found that the total or social return on innovation (ie the external benefits it generates) is significantly higher than its private return to the innovator. One study suggests that, if these social returns were taken into account, this could raise the value of the innovation by 20 to 50 per cent.⁹⁶

The context

The UK's universities are world class performers

- 4.11 On a multi-national level, the UK has the third highest share of worldwide scientific publications after the United States and Japan.⁹⁷

Figure 4-1:
Science publications by country (percentage of total worldwide publications)



Source: European Union⁹⁸

The region's universities are a very important asset for the region's economy

- 4.12 The University of Cambridge in particular represents a source of exceptional strength for the region. The most commonly used worldwide university ranking system is the Shanghai Jiao Tong University Ranking.⁹⁹ In the 2005 ranking, the University of Cambridge was ranked second to Harvard. Oxford is the only other UK university in the world top 10. All other universities in the world top 10 are located in the US.
- 4.13 The University of Cambridge is exceptionally efficient at generating investment for spin-out firms. Cambridge University spin-out companies managed to attract over half the aggregate investment of Stanford spin-outs.¹⁰⁰ The research goes on to argue that 'given that Stanford is classically seen as the world's most prolific source of innovation-based companies and is located in a state which receives over eight times as much venture capital per head as the UK, this is a significant achievement.'
- 4.14 The Tyndall Centre, linked to the University of East Anglia, puts the region at the edge of research into climate change.

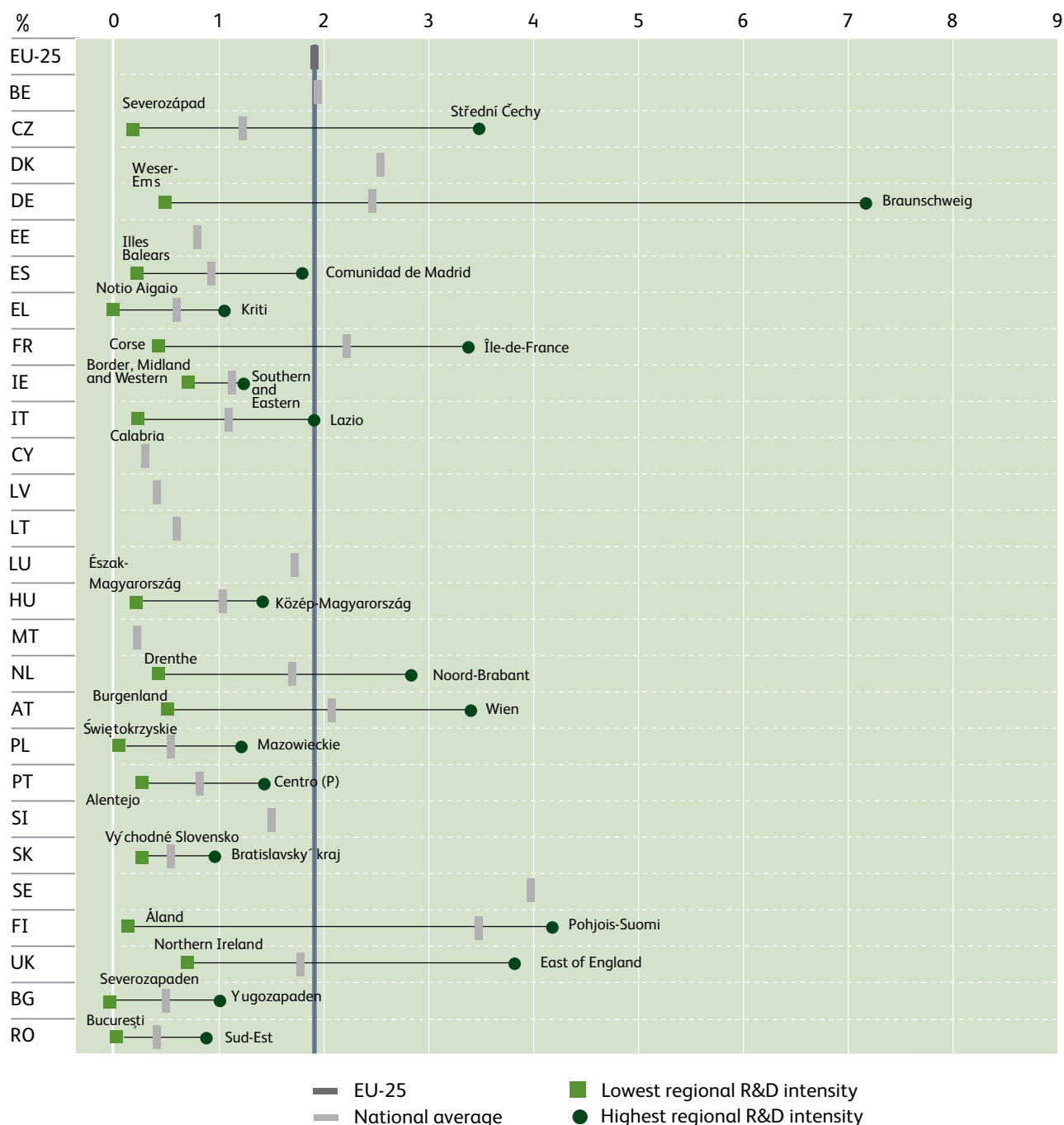
Global competitors are raising their R&D investment rates

- 4.15 A European Commission paper on science and innovation shows that China is just two years away from catching up on Europe's level of spending on research and development.¹⁰¹ Competitors such as China, Japan and South Korea had substantially boosted the share of Gross Domestic Product (GDP) they spend on R&D while the European Union had since the mid-1990s failed to ramp up investment in research.
- 4.16 Finland and Sweden were the two EU member states to spend more than the EU's target of 3 per cent of GDP on research. Germany, Denmark and Austria were also big investors in R&D, while the UK and the Netherlands were hovering around the EU average.

For now, the region performs well on international R&D expenditure comparisons

4.17 The East of England was a strongly performing European region in terms of total R&D expenditure as a percentage of GDP in 2002.

Figure 4-2:
Regional disparities in terms of total R&D expenditure as a percentage of GDP, 2002

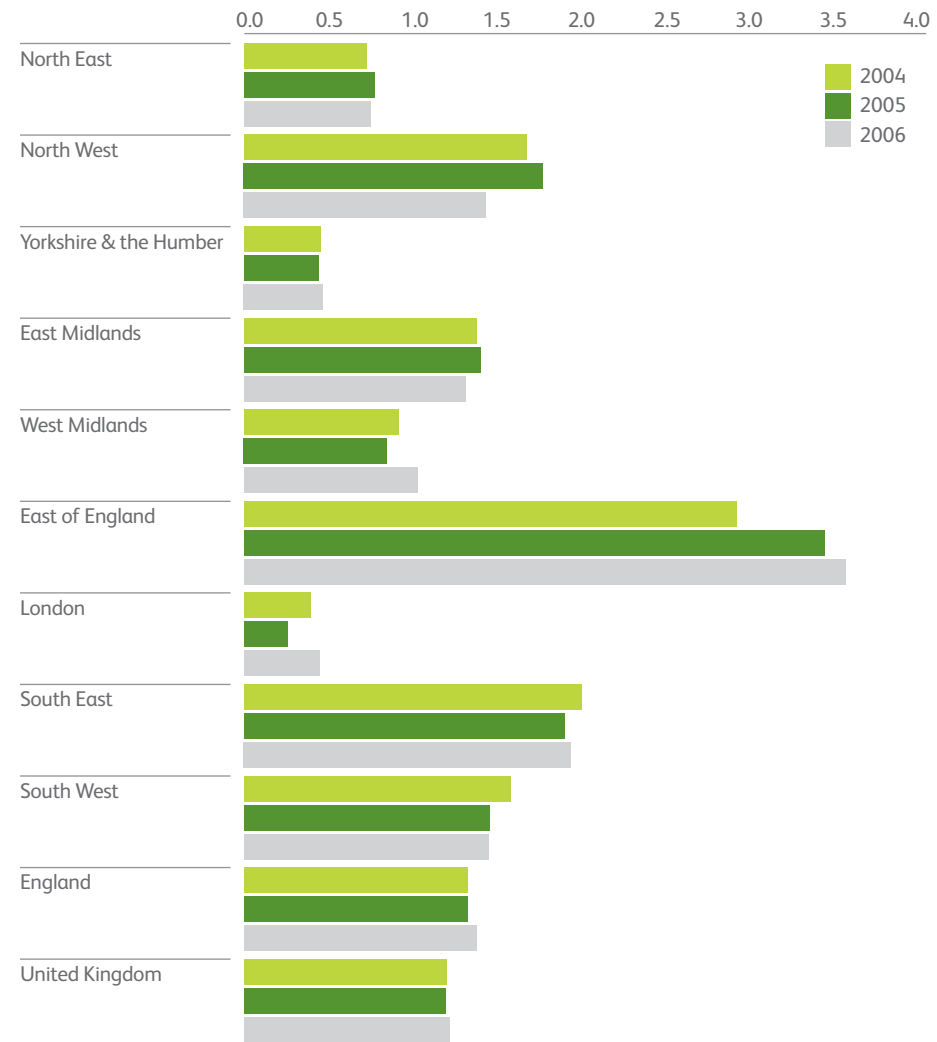


Source: Eurostat Statistical Yearbook for the Regions 2006, Data 2000–2004, Chapter 7, page 95

The East of England performs well when compared to other UK regions on R&D spend

4.18 As discussed earlier, the East of England spends a significantly higher percentage of GVA on business research and development than any other region (3.5 per cent). Figure 2-9 is reproduced overleaf (as Figure 4-3) to highlight, again, the region's distinctive performance on this measure.

Figure 4-3:
Business R&D expenditure as percentage of headline workplace based GVA,
2004–2006



Source: ONS¹⁰²

A small number of innovation-intensive companies are responsible for the East of England's performance on the above measures

4.19 Like other R&D-intensive regions globally, innovative activity is focused on a small number of geographical areas and R&D-intensive companies. These include GlaxoSmithKline in Stevenage and Harlow, and Unilever near Bedford.

4.20 To these should be added the R&D undertaken by specialist research institutes, whose funding comes from a variety of sources, including the private sector, charitable trusts, government and the research councils. The biggest cluster in the region is in and around Cambridge.

The concentration of innovation activity is a risk

4.21 The concentration of innovation activity in a small number of multi-nationals is a risk. The Lambert review noted that 'The UK's business research base is both narrow and fragile, and is heavily dependent on the investment decisions of a dozen large companies'. These conclusions apply equally to the East of England economy.

4.22 The risk is all the greater given the international profile of these companies. The Lambert Review makes that point that 'companies are now global in character, and all have fewer cultural and intellectual ties with the UK than they did a decade ago. In the past, their decisions about where to invest in R&D were influenced in part by their UK roots. In future, there will be increasing calls on them to consider other parts of the world'.¹⁰³

Broader measures show that the bulk of the region's firms are unsuccessful at effectively exploiting innovation for commercial advantage

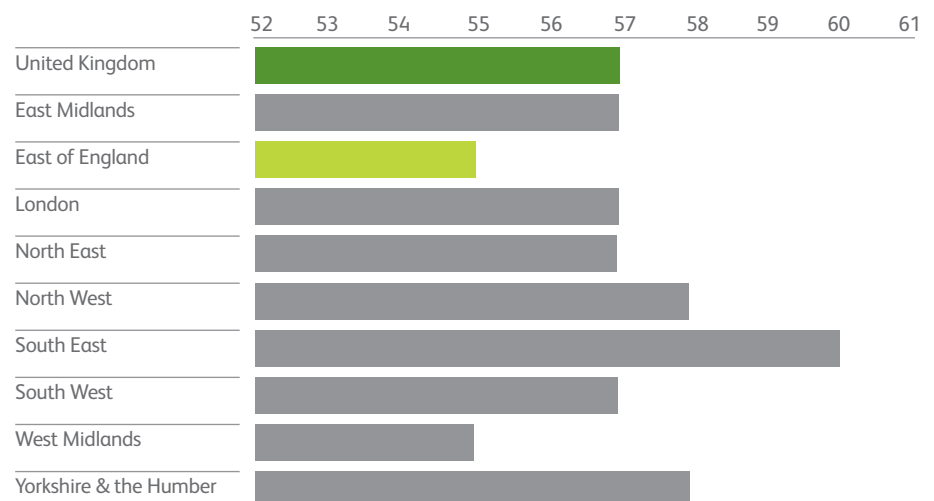
4.23 The UK Innovation Survey is a valuable source of data.¹⁰⁴ It takes an economy-wide view on how firms across the region incorporate 'innovation activity' into their day-to-day business. This measure gives a valuable picture of how embedded innovation is into the general economy – rather than showing the performance of a small number of world-class companies.

4.24 Innovation activity is defined here as enterprises which:

- have introduced a new or significantly improved good, service or process
- were engaged in innovation projects not yet complete or abandoned
- engaged in longer-term innovation activity such as basic R&D or technology watch
- had expenditure in areas such as internal research and development, training, acquisition of external knowledge or machinery and equipment linked to innovation activities
- formally co-operated on innovation activities with other enterprises or institutions.

4.25 Compared to other UK regions and international comparators, the East of England's firms are less likely to introduce a new or significantly improved good, service or process, and less likely to allocate funds to training or make capital investments to support innovation. Between 2002 and 2004, the East of England and the West Midlands had the smallest percentage of enterprises that were active in terms of innovation. The East of England was below the England average.¹⁰⁵

Figure 4-4:
Levels of innovation activity over three years (2002–2004); percentage of all firms



Source: DTI Regional Breakdown of the UK Innovation Survey (2005)

Rationale for intervention

Market failures on information and unrewarded positive externalities provide the rationale for intervention

4.26 In relation to priorities within the Innovation goal, key market failures are set out below:

- **information failures:** Coordination problems are present in the innovation process because there are many agents and heterogeneous groups of potential beneficiaries. For example, many different actors are involved in this process of innovative collaboration between universities, research institutes and businesses. There might therefore be a lack of information on which research body or business it would be useful to collaborate with. There could also be initial costs of coordination that might discourage bonding between research bodies and businesses. There is therefore an argument to justify the role that the RES has to play to support the delivery of this goal
- **positive externalities:** Research shows that significant positive externalities are generated by R&D.¹⁰⁶ Whilst there are mechanisms such as the patent process in place to partly internalise these externalities (and so incentivise innovation), these are limited precisely in order to generate broader social benefit. There is consequently a rationale to ensure that R&D and other forms of innovative behaviour are encouraged.

Rationale for priority 1: Developing a thriving culture of innovation and creativity

This priority helps to deliver the goal objectives

Innovation must be valued by management

- 4.27 The Lambert Review is unequivocal in stating that the key problem for the UK economy is not about how to increase the supply of commercial ideas from the universities into business. Instead, 'the question is about how to raise the overall level of demand by business for research from all sources. Measured against other developed countries, the research intensity of British business is relatively low – and the position has been deteriorating in recent decades. This has had an adverse impact on the overall productivity of the UK economy'.¹⁰⁷
- 4.28 This need is particularly acute given East of England firms' low levels of innovative activity demonstrated in Figure 4-4 on page 73. Essentially, this is a problem of the low value attached to innovation by management.

It is necessary to change organisational cultures to ensure that innovation is valued

- 4.29 Changing organisational cultures will be important in overcoming this problem. Research carried out at Sheffield University has uncovered a number of key attributes of the most innovative organisations.¹⁰⁸ These include being good at selecting innovative employees at the recruitment stage; providing training for creativity and innovation; developing a learning culture; developing managers to be supportive of innovation; empowering employees to take forward new ideas and rewarding successful innovation.
- 4.30 The Lambert Review suggests that there may be structural changes taking place in the economy. Gradual improvements in the level of higher education of senior managers mean that management may be better able to absorb innovation into their operations.

The context

- 4.31 Compared to other UK regions, the East of England's businesses are on average less innovation-active: they are less likely to introduce new or significantly improved goods, services or processes, and less likely to allocate funds to training or capital equipment linked to innovation activities.
- 4.32 In this context, the detailed findings of the then-DTI (now BERR) innovation survey (which were reported earlier at a headline level) are instructive. DTI defined a business as innovative if it engages in any of the following:
- introduction of a new or significantly improved product, service or process
 - innovation projects, including those not yet complete or abandoned
 - expenditure in areas such as internal research and development, training, acquisition of external knowledge or machinery and equipment linked to innovation activities.
- 4.33 The DTI's 2005 innovation survey found some 57 per cent of UK businesses to be innovation active, according to this definition, with products or process innovations implemented by around 30 per cent of businesses. Businesses in the East of England were found to be below average in terms of levels of innovation activity (see Table 4-1 overleaf). Within this context, the East of England's businesses reported the lowest levels of innovation-related expenditure: a paradoxical finding, given the region's business expenditure on R&D as a proportion of GVA.

Table 4-1:
Business innovation in England and Wales

Category	North East	North West	Yorkshire & the Humber	East Midlands	West Midlands	East	London	South East	South West
Percentage of all businesses that are innovation active	57	58	58	57	55	55	57	60	57
of which:									
– Product innovator	25	24	25	27	24	26	27	28	25
– Goods	16	16	17	19	18	16	14	18	16
– Services	18	15	17	17	14	16	23	19	17
– Process innovator	16	15	15	16	16	17	17	16	16
– Ongoing/ abandoned activities	8	8	10	9	10	11	10	13	11
– Innovation-related expenditure	54	55	56	53	53	52	53	56	55
– Wider innovator	30	33	32	33	30	33	37	36	33
– Broader innovator	60	62	62	60	58	60	61	64	61
– Product or process innovators	30	28	30	32	30	31	33	32	30
– Product and process innovators	12	11	10	11	10	12	11	11	11

Source: Department for Trade and Industry, Innovation Survey (2005)

4.34 Within this context it is however important to recognise the degree of variation across the region. In parts of the region there is a strong culture of innovation and creativity. Cambridge is frequently cited as a ‘low-risk place to do high-risk things’ and the strong culture within the high tech cluster provides much of the explanation. Elsewhere, the situation is clearly different.

Rationale for priority 2: Commercialising R&D and adopting innovation

This priority helps to deliver the goal objectives

- 4.35 This priority is about the central objective of this theme: to ensure that new ideas become genuine innovations – by translating the idea into a commercial reality of new markets, products and business processes.
- 4.36 It is the diffusion of technology across the economy that is driving new markets and products and accelerating changes in business processes. The diffusion of R&D products is enabling more efficient and flexible production in both manufacturing and services.

The government recognises the importance of converting R&D into commercial success

- 4.37 Library House reports that the government has long had an objective of strengthening links between universities and businesses. Government policy seeks to encourage:
- formation of university spin-out companies
 - licensing of university technology to industry
 - academic collaborations with industry and contract research
 - ‘knowledge-transfer’ activities including entrepreneurial teaching, student industry placements, encouragement of student start-up companies and university interaction with local SMEs.¹⁰⁹

The UK should do more to commercialise research

- 4.38 Whilst the UK has a strong pure research record, the evidence seems to suggest more could be done to commercialise the R&D that is done both in this country and abroad. The Lambert Review quotes statistics which suggest that the UK is strong in basic research but less good at bringing ideas to the market. ‘The UK has a citation rate that is 53 per cent higher per capita than Germany, but Germany makes 230 per cent more patent applications per capita than the UK’.¹¹⁰
- 4.39 Similarly, Michael Porter argues along similar lines, suggesting that the UK is poor at commercialising its research.¹¹¹ Porter’s research finds that UK patenting in the US is also characterised by a low representation of universities and other public institutions, which is seen as ‘a danger sign in modern technology development and commercialisation processes’. In comparison, France, a country with a roughly equal level of overall US patenting, registers a significantly larger role for universities and research institutions in patenting. This is consistent with UK universities being less active in commercialisation efforts than their peers in other advanced economies.¹¹²

Technology transfer has improved rapidly in the UK

- 4.40 Somewhat contrary to Porter’s work, research by Library House suggests that, in the last few years, UK universities have quickly developed technology transfer operations to a level of sophistication above that of most other countries.
- 4.41 Looking at university spin-outs, research argues that ‘the size and health of the UK spin-out portfolio suggests that public policy focus on translating research into business has been highly successful in reversing the UK’s historical weakness in this area. UK universities are now producing spin-out companies of equivalent number and quality to some of the US’s top institutions...the best promise to revolutionise key areas of the technology sector’.¹¹³

New approaches to funding innovation could yield important results

- 4.42 Innovation prizes have a long history of stimulating successful technological improvements. Famous examples include the Longitude prize (won by John Harrison for his navigation clocks).

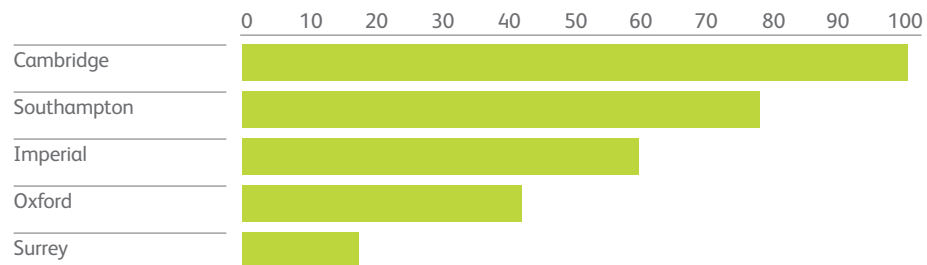
- 4.43 Research by the US National Academy of Engineering, the leading engineering advisory body to the US Federal Government, recommends that the ‘US Congress encourage federal agencies to experiment more extensively with inducement prize contests in science and technology’.¹¹⁴ The work suggests that the potential advantages of prize systems are:
- their potential for reducing the cost and bureaucratic/regulatory obstacles that might prevent the government and researchers from finding each other and working together effectively
 - they effectively shift more of the risk involved in pursuing a particular technical objective from the administering agency to the contestants, who are likely to be in a better position to evaluate the risk associated with different approaches to the contest’s objective
 - they have the possibility of leveraging the financial resources of a contest sponsor by free advertising generated by the contest
 - they have the potential to inspire and educate the public. For example, recent space prize contests are focused on achieving specific technical objectives but ‘are also serving to inspire the American public and build popular support’ for research in general.

The context

Cambridge University is a particularly strong performer in technology transfer

- 4.44 Library House has devised a method of measuring a university’s ability to convert research into ventures. The external investment received by the spin-out companies of twenty of the UK’s top universities was compared to the number of publications generated by that university. The ratio obtained was expressed as a percentage of Cambridge University’s performance. Cambridge University therefore functioned as a benchmark against which other universities’ performance was measured. The research shows that Cambridge University is substantially in the lead.

Figure 4-5:
Transfer efficiency of universities (as a percentage of the Cambridge performance)



Source: Library House

Venture capital markets are developed in the UK – to the advantage of UK spinouts

- 4.45 Research suggests that the UK is Europe’s most active venture capital market and so university spin-out companies here should benefit from a strong funding advantage over their continental counterparts.¹¹⁵ Within this context, there is evidence to suggest that the East of England has particular strengths: data from Library House, for example, suggest that, in 2007, the East of England accounted for almost 20 per cent of UK venture capital investment.

Proof of concept funding represents a significant gap

- 4.46 However, there is also ‘anecdotal evidence’ which suggests that there is a more serious funding gap for university spin-out companies at the ‘proof of concept’ stage (developing ideas to determine their commercial potential) before equity finance becomes appropriate. This is seen as ‘a major bottle neck’ for company development.¹¹⁶ US experience suggests that these grants are ‘absolutely crucial’ for the development of successful spin-out companies.¹¹⁷

Rationale for priority 3: Strengthening clusters around leading private sector R&D companies and research intensive universities

This priority helps to deliver the goal objectives

4.47 The challenge addressed by this priority is to ensure that the region makes the most of its R&D activity – both in the private sector and linked to universities – by strengthening the clusters linked to it. Key to this is the need to attract and retain more R&D businesses, and ensure that the region maximises the economic benefits brought by these companies for the wider economy.

Flexible networks of firms and universities are becoming more important in the wealth generation process

4.48 The Lambert Review argues that ‘it is critical to build dynamic networks between academic researchers and their business counterparts’ stating that the quality of collaboration among universities, research institutes and businesses is of growing importance.¹¹⁸ The previous innovation model – which emphasised the centrality of companies’ own research units – is being supplanted by an innovation process which is based on cooperation between firms and universities.

The reasons that the Lambert Review gives for the change are:

- firms are being forced to conduct research into a wider portfolio of technologies due to the increased complexity of products. It has become necessary to bring together a range of different disciplines in order to make technological breakthroughs
- increasing global competition and technological change have forced companies to move away from vertical integration, to focus on their core strengths and to outsource a growing proportion of their activities
- the big research laboratories that used to be run by quasi-monopolies (such as AT&T, Xerox, BT or IBM) have had to change their role
- people have grown more mobile. Researchers have become much more willing to move from one laboratory to another, depending on where they see the most exciting opportunities
- capital is more mobile. Venture capitalists have made it possible for research projects that once could only be financed by big companies to be spun out and developed in new start-up companies
- unlike corporate or publicly owned research facilities, university laboratories are constantly being refreshed by the arrival of clever new researchers in the form of students, postgraduates and teachers.

Universities are an important component in economic development networks

4.49 Studies show that universities are playing significant roles in local and regional economic development.¹¹⁹

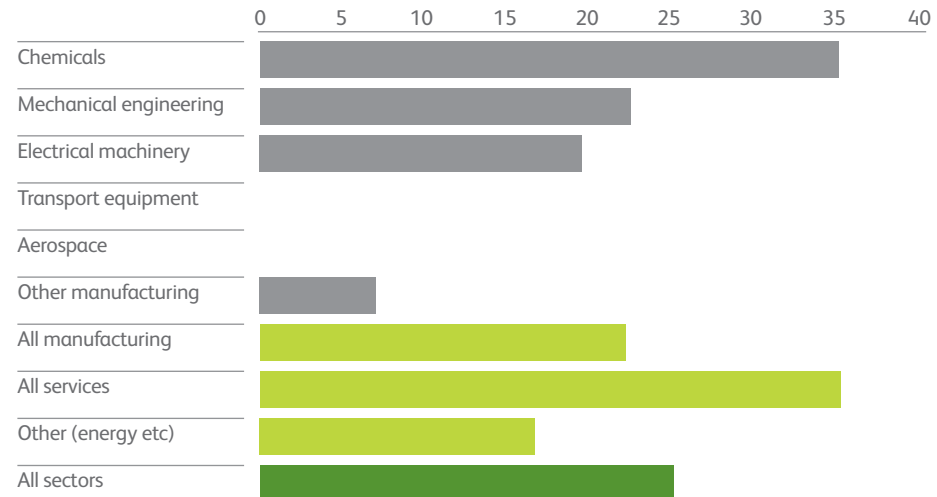
4.50 The higher education-business interaction survey demonstrates that universities play a key role in research collaboration with industry and technology transfer. Universities also contribute to support SMEs and to encourage spin-off activity.¹²⁰

Role of the private sector

4.51 Alongside the growing role of universities, the evidence suggests that delivering this priority will require that the region also encourages the growth of both private sector R&D activities, and R&D in the private sector. This will include, inter alia, delivering the right employment space for R&D intensive companies. There is also a requirement to ensure that the broader labour market and social networks both embed R&D intensive companies in the region, and ensure that the spillover benefits for the wider economy are maximised.

4.52 The profile of expenditure on R&D performed in businesses within the East of England by industrial sector is shown in Figure 4-6. This shows that the East of England contributed 25 per cent of the total UK expenditure on business R&D in 2006. However the share of expenditure on R&D in services was a very high 35 per cent. Within manufacturing, the East of England accounted for 35 per cent of UK R&D spend on chemicals. The overall share of manufacturing R&D expenditure was 22 per cent. In the UK as a whole expenditure on services R&D amounts to 23 per cent of the total; in the East of England the share is significantly higher, at 33 per cent.

Figure 4-6:
East of England's share of UK business R&D expenditure by selected industry sectors, 2006



Source: ONS MA14 Research & Development in UK Businesses (2006)

- 4.53 The focus on R&D and the role of the private sector in R&D can be justified on various grounds:
- investment in R&D is positively linked to business performance measures such as sales growth, efficiency and market capitalisation¹²¹
 - R&D is a key input into the innovation process
 - private sector R&D is more directly linked to industry needs and is more directly applicable for commercial processes or products
 - with private sector R&D, costs and risks are borne by the private sector.
- 4.54 Against this backdrop, a survey of science-based innovative businesses was undertaken for the Oxford to Cambridge Arc organisation O2C.¹²² It highlighted a range of difficulties which the region will have to address in order to remain attractive to such businesses:
- poor connectivity and traffic congestion
 - lack of 'grow-on' space
 - inadequate provision of affordable housing
 - increasing red tape
 - inadequate targeting of financial support
 - unclear skills policies (management, IP experience, lack of science graduates).

Science parks have a potentially important role to play in retaining and attracting R&D companies – but the benefits are not axiomatic

- 4.55 Within this overall context, it is important to consider the significance of science parks as a key part of the physical infrastructure linked to this priority.
- 4.56 The central justification for science parks is that they reserve land for particular economic uses which are deemed particularly valuable to economic development. This appears, on the face of it, to be unequivocally good. However this choice is, de facto:
- denying access to that same land for other industries undertaking perfectly legitimate activity
 - corrupting market mechanisms – and in a market economy, these market mechanisms are ordinarily assumed to generate optimal economic outcomes.
- 4.57 Science park designations are therefore not without potential costs in terms of economic opportunities foregone. To make a proper case for intervention, there is a need to show that the value of the site as a science park, including the unpriced benefits (positive externalities) it creates, is likely to exceed that generated by other planning designations. Without this, the costs of science park developments are borne by society as a whole, whilst gains are realised by the shareholders of the science park's tenant companies.
- 4.58 The exact balance of costs and benefits cannot be resolved precisely in this evidence base. It is however possible to provide evidence on whether there are general arguments for science parks that suggest that they have important economic development effects, and to review the evidence on how the economic benefits of science park designation can be maximised.

Science parks can generate clusters – which can generate positive spillovers for the broader economy

- 4.59 One of the justifications for science park development is that the co-location of science and technology companies fosters the creation of economic 'clusters'. The desirability of cluster development has become almost axiomatic in recent years. Porter's stress on the importance of interconnections was followed by the then-DTI's definition of clusters, which stated that clusters are 'a concentration of competing, collaborating and interdependent companies and institutions, which are connected by a system of market and non-market links'.^{123 124} This definition rather complicates attempts to identify clusters on the ground. Clusters are no longer defined as simply sectors which are over-represented, but are instead defined by two factors: firstly, there must be a concentration; and secondly, companies must act in a certain way – they must be part of a network of firms that collaborate and compete. Positive externalities created could be around the embedding of technological development in dense networks of competing and collaborating firms; or there might be more general benefits in the fostering of high-value, high-technology companies.
- 4.60 In both instances, these outcomes would go on to stimulate further growth in the rest of the economy. As shown above, research has found that the total or social return on innovation is significantly higher than its private return to the innovator. One study suggests that taking these social returns into account would raise the value of innovation by 20–50 per cent.¹²⁵ These findings imply that there are important external benefits to innovation, suggesting that science park developments are justifiably included in economic development policies. This argument is premised on the view that science parks necessarily foster innovation. Evidence suggests that this assertion is correct.¹²⁶

Research shows that science park tenant companies:

- have higher growth rates than similar companies at other locations (measured both in terms of jobs and turnover growth)
- launch significantly more new services than their off-park counterparts
- employ a higher proportion of qualified scientists and engineers (although this finding should be seen as an indication of economic value rather than a good thing in itself).

Evidence suggests that new ‘third-generation’ science park models should be explored in order to maximise spillover benefits

4.61 The evidence in favour of science parks is not unequivocal, particularly with regard to the extent that science park companies go on to stimulate further growth. For example, research shows that off-park firms launched nearly twice as many products on average than their on-park competitors.¹²⁷ Nor does all research show particular evidence for science parks’ role in fostering clusters of competing or collaborating firms.

Research shows that the majority of on-park firms do not feel that a science park location provides them with any perceived benefits in relation to access to

- new markets
- technological development, research linkages
- capital networks/finance
- competitors located off science parks
- access to technology transfer opportunities
- business networks, distribution channels, supply chains
- on-park business interactions.¹²⁸

4.62 Given that they represent some of the central rationales for science park development, these are very significant findings. If the imputed spillover benefits are not being generated by science park provision, then this cuts at the fundamental rationale for using the planning system to defend this type of development. Evidence suggests that some science parks are to some extent underperforming, and that (in the words of one paper) there is ‘still considerable unrealised potential in the science park concept and its implementation’.¹²⁹

4.63 Work on ‘next-generation’ or ‘third-generation’ science parks seeks to realise this potential. It stresses the importance of facilitating the social interaction between tenant firms which is so central to Porter’s concepts of cluster development. It also emphasises the technology transfer concepts which sit at the heart of the definition of the science park concept.¹³⁰ This approach suggests that, rather than being seen as a property product aimed at atomised independent companies, science parks need to develop built environments that generate a more collegiate approach that aid to the process of creativity, interaction and innovation. These parks have high-quality management teams that work to create an overall ambience, service provision package for incubator companies and networking opportunities that ‘optimise serendipity’ – the happy accidents which generate the economic spillovers. The work also suggests that these parks need to be closely embedded in university, company and other networks; establish an understanding of each tenant’s needs and provide access to networks and services to help meet them, especially services offering commercial advice and support; and offer incubation facilities either directly or indirectly, ensuring that ‘graduation’ from the incubator is a smooth and positive process.¹³¹

Workforce technical skills are important in attracting R&D investment

4.64 Evidence indicates that the availability of a pool of skilled labour is the most important factor in attracting companies.¹³² Given the centrality of highly skilled individuals to the R&D process, this is likely to be even more important aspect anchoring R&D and innovation-based firms. Support for skills development to meet economic needs is provided for under the Skills for Productivity goal of the RES.

The context

Private sector business R&D in East of England is strong

4.65 It was demonstrated above that business expenditure on research and development accounts for a far higher proportion of GVA in the East of England than in any other region. Research and development undertaken by businesses in the East of England accounts for a higher share of output than in any other region: in 2003, business research and development accounted for 80 per cent of all research and development in the region. (Note that post-2005 data is only available at a regional level for business R&D expenditure.)

There is an existing network of science parks in the region

4.66 The region has a number of existing science parks. These include Colworth Park, Suffolk Innovation Park, Norwich Research Park, Cambridge Science Park and BRE Innovation Park. These provide space for technology and innovation-based businesses. There are also a number of parks specialising in bio-technology.

Strong performance in some areas must be broadened out

4.67 The importance of further exploiting the strong performance of a small number leading companies has also been demonstrated above. Existing heavy R&D investors need to be further embedded in the region's economy; and the long 'tail' of companies which do not undertake innovation activity in the East of England needs to be persuaded of the value of investment and innovation in order to secure both their and the region's economic future.

The Lambert Review makes suggestions regarding the types of interventions to be pursued

4.68 In this overall context, the Lambert Review has a number of suggestions for RDAs, the main ones being that:

- RDAs should act as facilitators of business-university relationships by actively seeking out companies in their region which could benefit from working with universities. This applies in particular to SMEs which have not previously collaborated with universities but which have the potential to gain significant benefits from such partnerships¹³³
- the government should market the R&D tax credits better in order to increase their take-up by business. There may be a role for RDAs here.¹³⁴

Rationale for priority 4: Positioning the East of England and Greater South East as global innovation regions

This priority helps to deliver the goal objectives

The region needs to be promoted as part of the Greater South East

- 4.69 To feature strongly on an international map, the region – and its knowledge-based assets – need greater scale and visibility and, in this context, the region’s position within the Greater South East (GSE) is critical.
- 4.70 Evidence suggests that
- the GSE is home to 71 of the UK’s 131 higher education institutions, including seven of the 19 world-leading ‘Russell Group’ universities
 - the universities of the GSE generate one in three of the annual UK total of graduates
 - the GSE hosts the HQs of major global ICT, pharmaceutical, aviation and other companies including GSK, Microsoft, HSBC, BAE Systems and Unilever
 - 40 per cent of the government’s and 60 per cent of private R&D is carried out in the GSE, generating opportunities for technologies exploited elsewhere in the UK too
 - as an advanced industrial region, the GSE often deals today with the issues that other regions face tomorrow. The GSE is a test bed to pilot initiatives, approaches and solutions which will then be valuable elsewhere.
- 4.71 Hence the GSE can provide the East of England with scale and visibility, and in terms of global positioning – and global competition for skills and resources – this is crucial.
- 4.72 Although difficult to demonstrate empirically and quantitatively, there are also important and substantive knowledge-based links across the Greater South East and these need to be nurtured for the benefit of the East of England. One of the key observations from a recent report on the Cambridge Cluster was – paradoxically – just how dominant London is in terms of knowledge-intensive activities. Library House argued that ‘Cambridge could improve its already strong connections to London and the rest of South East England. Combining the commercial and soft innovation expertise of London with Cambridge’s hard technology pedigree, the wider region would be a leader in all aspects of technology innovation’.¹³⁵
- 4.73 In terms therefore of both profile, and its internal dynamics, the role of the GSE is critical and it needs to be recognised in pursuing the objectives linked to this goal.

The context

- 4.74 The issue this priority focuses on is the fact that competition in innovation is increasingly global, with countries such as China, India and Korea joining or about to join the list of more established competitors such as the US. As a result global positioning is important:
- the most talented individuals and firms tend to be highly mobile, meaning they will come from many different countries and locate where their interest takes them. Being able to express their talent and benefit from it will be their key drivers
 - emerging technologies are increasingly at the interface of traditional disciplines, professions and businesses. The increasingly vast and complex skills and knowledge required to develop new inventions and their business application means that one place, one company, one country is unlikely to have all the necessary expertise at their disposal.
- 4.75 This is why collaboration between innovation ‘hotspots’ around the globe is accelerating¹³⁶ and the imperative to market the East of England and the Greater South East as a leading global innovation region is acute.
- 4.76 It also means that, to remain at the forefront of innovation and benefit from the added-value it brings, it is crucial to interact with the best players and to be accepted as one; to play on the same field in effect. At the same time, it will important to establish strong relationships with large emerging countries such as China and India to hope to benefit from their mass market in the future.

Footnotes

- 87 <http://www.dti.gov.uk/innovation/index.html>
- 88 HM Treasury/DTI (March 2006) Productivity in the UK 6: Progress and new evidence
- 89 Reviewing the literature, Coyle notes that there are two keys to modern growth, according to the evidence: technical innovation which improves productivity in certain industries, and increasing specialisation through trade. See Coyle (2007) *The Soulful Science*
- 90 *ibid*
- 91 Audretsch, D. B. and R. Thurik (2001), 'Linking Entrepreneurship to Growth', OECD Science, Technology and Industry Working Papers, 2001/2, OECD
- 92 *ibid*
- 93 *ibid*
- 94 HM Treasury (2003) Lambert Review of Business University Collaboration http://www.hm-treasury.gov.uk/consultations_and_legislation/lambert/consult_lambert_index.cfm
- 95 Source: Community Innovation Survey, (UK), DTI/ONS, 2001 quoted p18 HM Treasury (2003) Lambert Review of Business University Collaboration http://www.hm-treasury.gov.uk/consultations_and_legislation/lambert/consult_lambert_index.cfm
- 96 HM Treasury (2006) Productivity in the UK 6: Progress and new evidence quotes Griliches Z (1992) *The Search for R&D spillovers* Scandinavian Journal of Economics 94 (supplement) 29-47 and Cameron, Gatwick (1998) *Innovation and Growth: A survey of the empirical literature* mimeo
- 97 European Union quoted Library House (2007) *Spinning out quality: University spin-out companies in the UK*
- 98 Quoted Library House (2007) *Spinning out quality: University spin-out companies in the UK*
- 99 <http://ed.sjtu.edu.cn/rank/2005/ARWU2005Main.htm>
- 100 Library House (2007) *Spinning out quality: University spin-out companies in the UK*
- 101 EU (2007) Key figures 2007 on science, Technology and innovation – Towards a European knowledge area http://ec.europa.eu/invest-in-research/pdf/kf_2007_prepub_en.pdf
- 102 ONS (Feb 2007) Economic and Labour Market Review Vol 1 No 2
- 103 HM Treasury (2003) Lambert Review of Business University Collaboration P18 http://www.hm-treasury.gov.uk/consultations_and_legislation/lambert/consult_lambert_index.cfm
- 104 The UK Innovation Survey is part of a wider Community Innovation Survey (CIS) covering the EU. The survey is based on a core questionnaire developed by the European Commission (Eurostat) and Member States. Results form part of various EU benchmarking exercises (see www.cordis.lu/innovation-smes/scoreboard/home.htm).
- 105 *ibid* p.32
- 106 HM Treasury (2006) Productivity in the UK 6: Progress and new evidence quotes Griliches Z (1992) *The Search for R&D spillovers* Scandinavian Journal of Economics 94 (supplement) 29-47 and Cameron, Gatwick (1998) *Innovation and Growth: A survey of the empirical literature* mimeo
- 107 HM Treasury (2003) Lambert Review of Business University Collaboration http://www.hm-treasury.gov.uk/media/9/0/lambert_review_final_450.pdf P4
- 108 Developing an innovation culture: implications from research (Institute of Work Psychology / ESRC Centre for Organisation and Innovation, University of Sheffield, 2003)
- 109 *ibid*
- 110 *ibid*
- 111 Porter for DTI (2003) UK Competitiveness – Moving to the next stage Institute Of Strategy And Competitiveness, Harvard Business School
- 112 Porter and Ketels (2003) UK Competitiveness: Moving to the Next Stage Institute Of Strategy And Competitiveness, Harvard Business School http://www.esrcsocietytoday.ac.uk/ESRCInfoCentre/Images/Paper%203_Porter_and_Ketels_Published_tcm6-5508.pdf
- 113 *ibid*
- 114 Steering Committee for the Workshop to Assess the Potential for Promoting Technological Advance through Government-Sponsored Prizes and Contests, National Academy of Engineering (1999) Concerning Federally Sponsored Inducement Prizes in Engineering and Science <http://www.nap.edu/catalog/9724.html>
- 115 *ibid* P14
- 116 *ibid* P14
- 117 *ibid*
- 118 P12
- 119 Regional Economic Development: Comparative Case Studies in the US and Finland, Alok K. Chakrabarti, Richard K.Lester, MIT, Industrial Performance Centre, Special Working Paper on Local Innovation Systems
- 120 Higher Education-business Interaction Survey 2001–02, p.10.
- 121 A Flourishing Region – RES for the East Midlands 2006–2020, p.76 and DTI R&D Scoreboard 2005
- 122 O2C, The state of the innovation economy in the UK, May 2007
- 123 Porter (1998) defines clusters as, 'Geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked activities and other entities important to competition'. Porter, M (1998) *Clusters and the New Economics of Competition*, Harvard Business Review, November-December 1998
- 124 Department for Trade and Industry (1998) <http://www.dti.gov.uk/clusters/>

- 125 HM Treasury (2006) Productivity in the UK 6: Progress and new evidence quotes Griliches Z (1992) The Search for R&D spillovers Scandinavian Journal of Economics 94 (supplement) 29-47 and Cameron, Gatwick (1998) Innovation and Growth: A survey of the empirical literature mimeo
- 126 Evaluation of the Past and Future Economic Contribution of the UK Science Park Movement
http://www.ukspa.org.uk/?t=1&channel_id=2376&editorial_id=13679
- 127 Evaluation of the Past and Future Economic Contribution of the UK Science Park Movement
http://www.ukspa.org.uk/?t=1&channel_id=2376&editorial_id=13679
- 128 Evaluation of the Past and Future Economic Contribution of the UK science park Movement
http://www.ukspa.org.uk/?t=1&channel_id=2376&editorial_id=13679
- 129 Allen, et al (undated) Third Generation Science Parks Manchester Science Park
http://www.manchestersciencepark.co.uk/cms_image_depository/Full_size_images/MSP_Third_Generation_Brochure.pdf
- 130 United Kingdom Science Park Association (UKSPA) stress the importance of technology transfer services. Both organisations highlight the importance of wealth creation through innovation and links with research centres as being more important to the concept of a science park than the actual property offering. IASP defines a science park as follows: 'An organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and competitiveness of its associated businesses and knowledge based institutions. To enable these goals to be met, a science park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services, together with high quality space and facilities.' (www.iasp.ws). UKSPA defines a science park as follows: 'A business support and technology transfer initiative that:
- encourages and supports the start up and growth of innovation-led, high-growth, knowledge-based businesses
 - provides an environment where larger and international businesses can develop specific and close interactions with a particular centre of knowledge creation for their mutual benefit
 - has formal and operational links with centres of knowledge creation such as universities, higher education institutes and research organisations.'
- (UKSPA, 2006 – 'UK science park Directory Fourteenth Edition)
- 131 *ibid*
- 132 See evidence presented in section 3.3.1 DfT (undated) The Importance of Transport in Business' Location Decisions
- 133 HM Treasury (2003) Lambert Review of Business University Collaboration P26
- 134 HM Treasury (2003) Lambert Review of Business University Collaboration P29
- 135 Looking Inwards, Reaching Outwards – The Cambridge Cluster Report – 2007, Library House, November 2007
- 136 O2C, The state of the innovation economy in the UK, May 2007