VIEWPOINTSERIES

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CAMBRIDGE PHENOMENON

CHANGING PERSPECTIVES

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SQW

FOREWORD

In the early 1980s, our decision to base SQW in Cambridge reflected our own recognition of the area's distinctive economic character and our wish to be a part of it. In 1985, SQW's first major publication was *The Cambridge Phenomenon: the growth of high technology industry in a university town*[1]. This traced the genealogy of virtually all of the area's high tech firms and identified, in most cases, a direct or indirect link to the University of Cambridge. In 2000 – some 15 years later – we completed a comprehensive revisit of the Phenomenon, to understand what had changed, and why[2]. What we discovered was a far larger and much more diverse cluster of businesses with complicated ownership structures and strong networks of international relationships: whilst the University and the research institutes linked to it remained important, the business community itself was now strongly in the driving seat. Over the last year, we have completed work on economic prospects for the Cambridge area which included as a main focus issues and opportunities concerning the development of the high tech cluster[3]. We therefore have a 30 year perspective on the evolution of the Cambridge Phenomenon and some insights into its future prospects. Despite the unique characteristics of Cambridge, many of these insights have relevance to other high tech clusters.

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THE VIEWPOINT SERIES

The Viewpoint series is a series of 'thought piece' publications produced by SQW and Oxford Innovation, the operating divisions of SQW Group.

The aim of the Viewpoint series is to share our thoughts on key topical issues in the arena of sustainable economic and social development, public policy, innovation and enterprise with our clients, partners and others with an interest in the particular subject area of each paper. In each Viewpoint, we will draw on our policy research and implementation experience to consider key topical issues, and provide suggestions for strategic and practical solutions.

THE EVOLUTION OF THE CAMBRIDGE PHENOMENON

At the end of the first decade of the new century, the Cambridge area (defined here to include Cambridge City and South Cambridgeshire District) has a resident population of around 265,000 people, it is home to around 153,000 employee jobs, and there are well over 10,000 businesses based in the area. Of these, about 900 are high tech businesses, which between them employ 37,000 people – close to a quarter of all jobs. They include some major businesses such as ARM and Autonomy which are global leaders in their respective fields. In Cambridgeshire as a whole, the figures are 1,400 high tech firms employing 48,000 people[4]. Cambridge is regarded as one of the five most competitive cities in the UK[5]. The value of its annual economic output (GVA) is approaching £7.5bn[6] while the value of GVA per job is well above regional and national averages. The economy of the Cambridge area is therefore now substantial, productive and competitive, and it contains institutions and firms of national, and in some cases global, significance.

Table 1 shows the expansion of the high tech sector over the last 25 years.

Table 1 : The growth of the high tech cluster in Cambridgeshire over three decades

	1984	1998	2008
No of high tech firms	300	1,250	1,400
No of high tech employees	15,000	32,500	48,100

Source: Cambridge Phenomenon reports 1985 and 2000, and the Cambridge Cluster report 2011. Note that the figures should be taken as approximate as there is some inconsistency in definitions between years and the figures for 1984 are based on a sample survey.

Sectoral composition and structure

Within this overall growth there has been a substantial shift in sectoral composition. In 1984 approximately two thirds of firms were in the manufacturing sector, with one third services. By 2008 these proportions had reversed, although in the process of change the distinction between manufacturing and services activities has become much less clear cut. In the service sector there has been particular growth in research and development and other consultancy, computer services, and in a range of 'new' sectors such as bioinformatics, computer games, clean tech and web-based new media. In manufacturing electronic engineering, chemicals/biotechnology, instrument engineering and computer hardware all remain important to the economy, and the sector includes some specialist niches in which Cambridge has world-leading expertise, such as ink jet printing.

In terms of employment structure, our 2000 report found that there had been an important shift from a small number of major companies that dominated employment in the 1980s to a far greater number of medium-sized companies. The flow of new starts appears to have continued largely unabated throughout the period.

Throughout the period, concerns have been expressed about Cambridge's apparent inability to grow many large firms, but this should be seen in the context of the size of the economy. Our 2010-11 study identified seven $1bn companies that have been created in Cambridge over the last 15 years, although some of these have since been sold, reduced their presence in Cambridge or changed their name. There are also many smaller but nevertheless substantial firms with international reputations, both well established and more recently formed.

In addition, over the last 10 or so years Cambridge has attracted investment in research facilities by various multinationals, increasingly as a result of active courting by the University of Cambridge. The highest profile example is Microsoft, but there are many others, including BP, Rolls Royce, Schlumberger and Toshiba.

Increasing scale and complexity

One of the most distinctive contributions of our first Cambridge Phenomenon report was to trace the genealogy of virtually all high tech firms, and in doing so to illustrate the very extensive inter-relationships and, in particular, the ability to trace the origin of many firms back, directly or (more often) indirectly, to the University of Cambridge and its Colleges (Figure 1).

Figure 1 : Cambridge Phenomenon diagram, 1985[7]

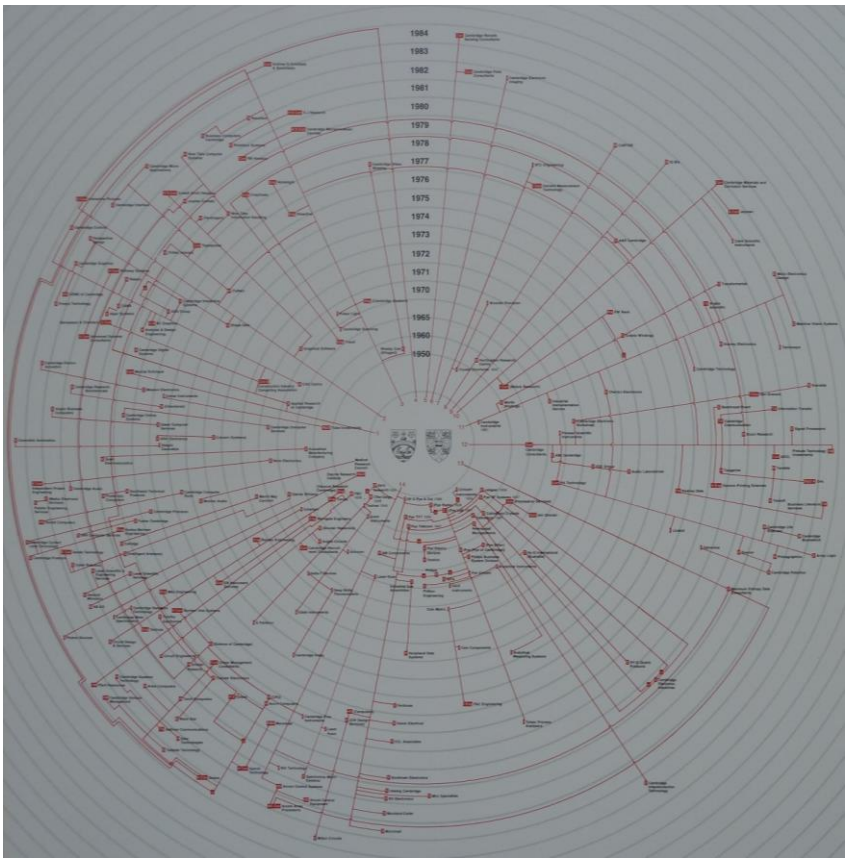
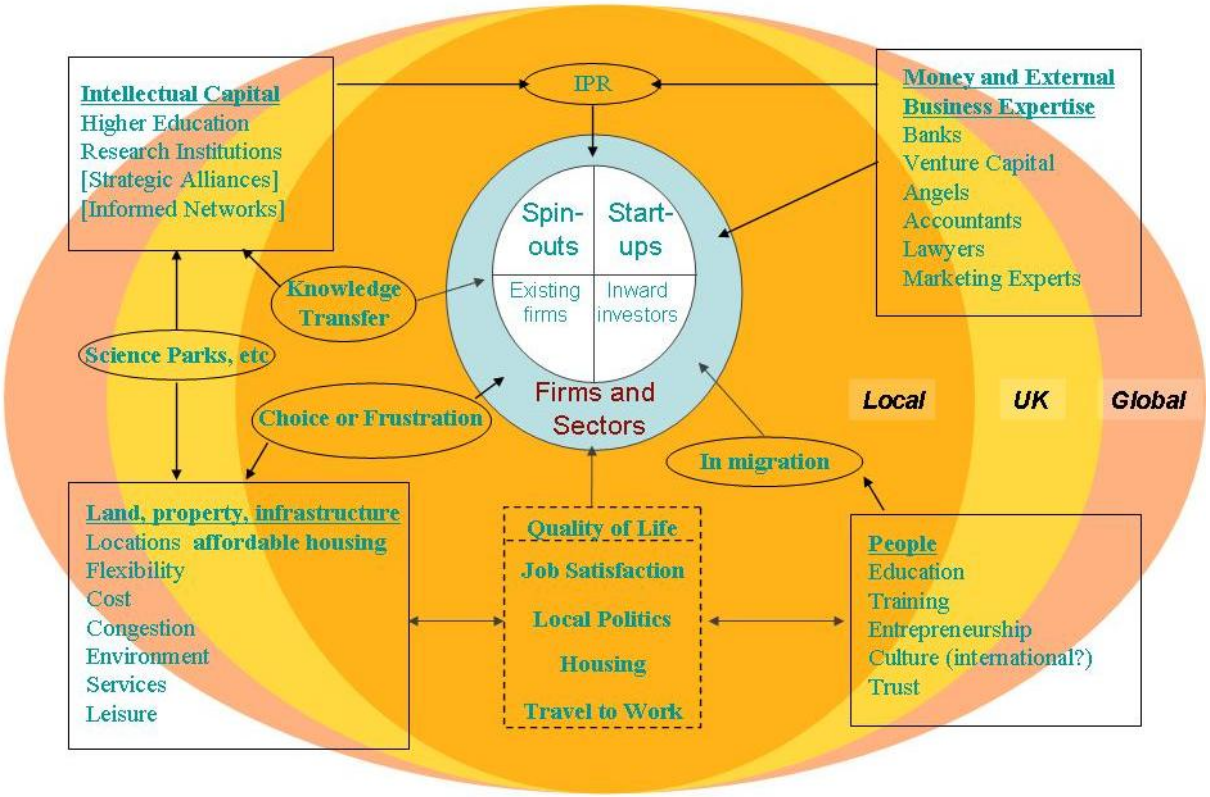


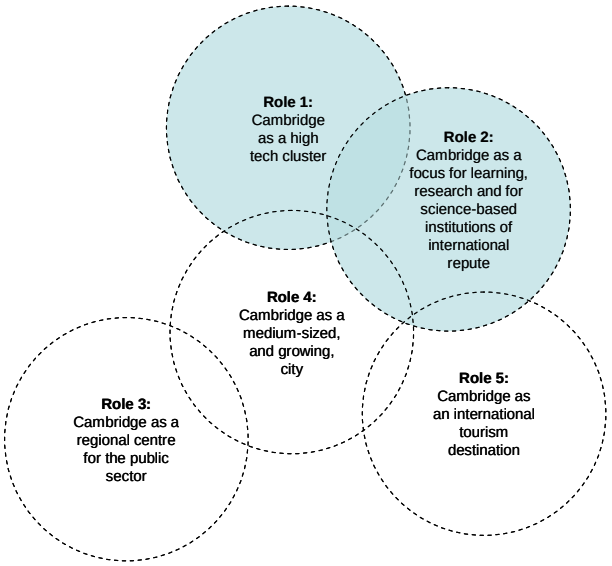
Figure 2 : Cambridge Cluster diagram, 1998



By 2000, the four-fold increase in the number of firms made this an impossibly complex task to repeat. However, of more significance was the contrast in the approach taken. The diagram of the 1985 genealogy placed the University of Cambridge firmly at the centre of the high tech cluster. In contrast, the cluster diagram in our 2000 report placed high tech firms at the centre and the University and other research institutes as one of the four main supporting elements. The others were financial and business support, the labour market, and land property and infrastructure (Figure 2).

The approach for our 2011 report provides a further interesting contrast. The high tech business and research communities were two of five distinct roles whose contribution to the economy of the Cambridge area were analysed. The others were Cambridge as a service centre, as a centre for public sector functions, and as an international tourism destination (Figure 3). This typology was determined partly by the fact that the focus of the work was the future of the Cambridge economy, not specifically the high tech cluster. However, the fact that other roles were considered to be important in this context demonstrates the extent of change in the Cambridge area economy over the last 30 years.

Figure 3 : Cambridge Roles diagram, 2010



The fact is, Cambridge has become a bigger and more diverse economy. The high tech cluster has made a huge contribution to this change, but so too has the growth of population and wider business activity related to Cambridge's location and improved connectivity. Over the last 50 years, population growth in the Cambridge area (including the City and South Cambridgeshire) has been greater than the population of the City at the start of the period: an increase of 100,000 people to around 250,000 currently. Add to this the fact that Cambridge now attracts over 4m visitors a year spending around £350m, and it is evident that there have been huge increases in demand for services and facilities, in a wide range of business activities, and in traffic throughout the area – including commuting to London.

Returning more specifically to the high tech cluster, by 2010, there was a wide range of business models at play, some of which rely on angel and venture funding to develop cutting edge science, while others are more likely to finance their growth internally and incrementally. Overall, and despite the recent severe recession, the high tech community continues to grow and to innovate.

The research base

The University of Cambridge and the wider research community continue to play crucial roles in supporting the high tech cluster. For example, by 2005, 250 companies had been started on the basis of knowledge transfer from the University, including 175 located in the Cambridge area[8]. On virtually all global rankings, the University of Cambridge is consistently among the top five universities in the world. Over recent years, there has been substantial investment in facilities linked to the University and many of the research institutes – including development of the West Cambridge site, Addenbrooke's Biomedical Campus (including new buildings for Cancer Research UK and the Laboratory for Molecular Biology) and expansion of the Genome Campus at Hinxton and the Babraham Institute. Further development of these assets is planned, including the expansion of the University into North West Cambridge.

Internal and external linkages

The hard and soft infrastructure to support technology-based businesses is generally well developed, with networks playing a particularly important role in business growth. The "culture" of Cambridge is really important in explaining the cluster's growth – in undertaking interviews for our recent study we heard repeatedly that *"people go out of their way to be helpful"*.

The networks are very varied in scale, focus and longevity, and are almost exclusively private sector led. They are often developed at three crucially important scales: locally, with London, and globally. Cambridge has always benefitted from strong networks, both formal (such as the Cambridge Network, which has been operating successfully since 1998) and informal. There are various pubs, and now coffee shops, in the city which are well known informal meeting places for the high tech community, but social networking using the internet is increasingly important. Interest groups form and reform around tricky technical and business issues which morph into new areas of inquiry and engage different people.

As the high tech cluster has grown it has spread geographically, but the vast majority of firms and employment remain within a five-to-ten mile radius of Cambridge. The surrounding market towns vary in the extent to which they have attracted high tech employment, but the significance of physical proximity seems to have survived despite the growing importance of virtual networks.

Much more significant than the outward spread has been the increasing links with London, which are on various dimensions and have been facilitated by rail improvements in the last 10 years. The links are two way. There has been a steady increase in commuting to London from the Cambridge area, and the local housing market - particularly in the city and to the south – is distorted by the London effect. This has undoubtedly exacerbated the perennial problem of addressing local housing shortages. Whilst better paid workers, including London commuters, choose to live in the city, many lower-income households are forced to live to the north and commute back into the city, hence increasing congestion on routes like the A14 and A10.

Cambridge firms also draw on London's large specialist labour market to recruit managers, particularly in non technical areas. The improved links to London make it easier now to recruit to Cambridge, because the risks of moving to the area are less if you remain part of a much larger labour market.

In the financial sector, growth in Cambridge between 1985 and 2000 has been replaced (with one or two notable exceptions) by a retreat back to London following the financial crisis and recession. This may have exacerbated the difficulties faced by some Cambridge firms in accessing appropriate funding, and it has also increased the importance of links between the technology community in Cambridge and the finance community in London.

There are also growing research and business links, illustrated by the decision to transform the Eastern Region Biotechnology Initiative into One Nucleus based in London as well as Cambridge, with members across the whole geography.

The role of public policy

The public policy context for the growth of the Cambridge Phenomenon has become more positive over the last 30 years. The first Phenomenon report noted the significance of the Mott Report[9] in establishing a supportive stance towards the growth of high tech firms linked to the University, which led directly to the creation of the Cambridge Science Park and indirectly to a more positive if highly selective attitude towards business growth in Cambridge. It is also true to say that public funding for research at both Anglia Ruskin University and the University of Cambridge and the many research institutes in Cambridge, has been fundamental to maintaining their excellence and the potential for commercial exploitation.

However, it took many years for the planning policy framework to change, from a stance of strong resistance to growth, to its reluctant

accommodation in a dispersed pattern around the county, to positive management of growth in and around the city. For the last five or more years there has been a strong, but historically unusual coincidence of national, regional and local planning policies for Cambridge, although there has been a continued disjuncture between strategic plans and the delivery of infrastructure to accommodate the growth in a timely manner. The latter – best illustrated by the continued delays to upgrading the A14, which is affecting most of the major development opportunities to the north of Cambridge - combined with the strong localism agenda of the new Coalition Government, have raised questions about the continuing local commitment to the scale of housing growth which is essential to support expansion of the high tech cluster.

What of the future?

The impacts of the recession mean the latest economic forecasts for the Cambridge area are disappointing: they suggest that over the next 20 years, employment and GVA will grow at little more than half the rate of the last 20 years[10]. This may well be unduly pessimistic: certainly the forecasts do not – and cannot – factor in the possibility of 'disruptive change', which Cambridge has proved good at generating (for example, the biotech boom of the late 1990s and early 2000s). Nevertheless, even if growth is faster than current forecasts suggest, there are some serious constraints to be overcome at national and local scales to realise the opportunities. The most recent report identified four main national policy issues which were perceived by consultees to be adversely affecting the high tech cluster:

- Migration policy, which is becoming increasingly restrictive and is of concern to high tech firms, the universities and research institutes, who argue that they have to be free to recruit internationally to get the best talent
- Healthcare regulation, which is regarded as a lot tougher in UK than in the rest of Europe
- Access to finance, in particular venture capital which is in a low volume, low risk phase and consequently wary of investment in general, and technology investments in particular
- The need for research funding to recognise the imperative of inter-disciplinary endeavour.

At a more local level, the main concerns include:

- Carrying through the growth agenda which has been clearly articulated in spatial plans, including the scale of housing development and infrastructure investment needed to enable economic opportunities to be realised
- Improving the design of Cambridge's new business developments to make them function better as 'social spaces' and to be better connected with each other and the city centre by fast and reliable public transport
- Removing existing planning restrictions on HQ functions in the city and on large scale manufacturing in the surrounding area, because Cambridge should be capturing the diversification of activities of high tech firms as they grow rather than forcing them to locate these activities elsewhere
- Managing the tensions between growing the city centre to enable it to continue to meet the increasing demands of residents, firms and visitors, and the need to retain the essential qualities that make Cambridge the special place it is.

Wider implications

There is huge interest in the Cambridge Phenomenon, nationally and internationally, partly because it is simply an interesting and ever changing story, but also because other areas would like to emulate the scale and quality of economic growth that has occurred in the Cambridge area. In some respects replication is impossible: Cambridge has some unique advantages, including one of the best universities in the world, some outstanding research institutes, and easy accessibility to a genuine world city.

However, there are lessons to be learnt from the Cambridge experience – good and bad – which have application elsewhere. These include:

- the changing ways in which businesses operate and people work, involving an increasingly complex mesh of physical and virtual networks locally and globally
- the importance of creating lively places where the boundaries between work and leisure are permeable, and the continuing role for city centres in this context
- the benefits to a high tech cluster of proximity (in time more than distance) to a world city, particularly its large and specialist labour market and financial and business services. In the absence of physical proximity, strong functional and virtual links become absolutely critical
- the imperatives and limitations of the public sector role at national and local scales, including: the need to understand and adapt public policies to the changing needs of high tech clusters over time; the perennial problem in the UK of under-investment in facilitating infrastructure; and the need to avoid unintended consequences of policies which appear rational in one context but which have damaging effects in another.

[1] 'The Cambridge Phenomenon', produced and published by SQW, 1985 http://www.sqw.co.uk/special-feature/cambridge-phenomenon
[2] 'The Cambridge Phenomenon Revisited', produced and published by SQW in 2000 http://www.sqw.co.uk/special-feature/cambridge-phenomenon
[3] 'Cambridge Cluster at 50: the Cambridge economy, retrospect and prospect', produced by SQW for a consortium of public sector organisations led by the East of England Development Agency, 2011 http://www.sqw.co.uk/file_download/284
[4] Based on data for 2008 collated by Cambridgeshire County Council Research Group
[5] UK Competitiveness Index, 2010, Robert Huggins and Piers Thompson, Centre for International Competitiveness, Cardiff School of Management, University of Wales Institute
[6] On the basis of data from the East of England Forecasting Model(. In simple terms, GVA is the difference between the value of inputs (materials and labour) and output (goods and services)
[7] The full image may be accessed here: http://www.sqw.co.uk/file_download/369.
[8] "The Impact of the University of Cambridge on the UK Economy and Society", Library House, 2006
[9] 'Relationship between the University and science-based industry', The Mott Committee, led by Sir Neville Mott, Cambridge University reporter, October 1969
[10] Forecasts produced by Oxford Economics in March 2010.

Table 2 : SQW project examples

Client	Project
Royal Society	**Study on the Role of Science, Technology, Engineering and Mathematics Disciplines in Service Industry Innovation** SQW was commissioned by the Royal Society to support them in undertaking a major review of the role that Science, Technology, Engineering and Mathematics disciplines (STEM) play in innovation in the UK service industry sectors.
Department for Innovation, Universities & Skills, UK	**Economic and Scientific Impact of Large Scale Scientific Facilities** The Review assessed economic and social effects resulting from five main scientific facilities: ISIS and Diamond at the Rutherford Appleton Laboratory; Joint European Torus; Synchrotron Radiation Source at Daresbury; and the European Bio-Informatics Institute. This included impacts associated with the flow-on enhancements to the UK research base.
European Commission and Ministry of Economy and Energy, Bulgaria	**Support to the Implementation of the Bulgarian National Innovation Strategy** SQW worked with Oxford Innovation on a project to support the Bulgarian Small and Medium Enterprise Promotion Agency in playing an active part in the Bulgarian National Innovation Strategy.
European Commission	**Feasibility study of a technopolis in Panama** SQW worked jointly with the Spanish Consultancy Idom on a feasibility study of a technopolis in Panama.
Tianhe District Government, Guangzhou, China	**Feasibility Assessment and Business Plan for a Science District in Guangzhou** SQW prepared a detailed concept plan for a 6 sq km area of Guangzhou, close to the new business centre of Guangzhou and to the city's main universities, to be developed as a as a software development zone, with attractions for inward investors and local companies. The area has now been successfully developed.
Norfolk County Council, UK	**Knowledge Economy Strategy for Norwich city region** SQW was commissioned to prepare a strategy and action plan for further development of the knowledge economy in Norwich and the surrounding area, building on existing assets such at the University of East Anglia, major food and plant science research centres, and the growing creative, financial and precision engineering sectors.

Source: SQW

About us

SQW and Oxford Innovation are part of SQW Group.
For more information: www.sqwgroup.com

SQW is a leading provider of research, analysis and advice on sustainable economic and social development for public, private and voluntary sector organisations across the UK and internationally. Core services include appraisal, economic impact assessment, and evaluation; demand assessment, feasibility and business planning; economic, social and environmental research and analysis; organisation and partnership development; policy development, strategy, and action planning.
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Oxford Innovation is a leading operator of business and innovation centres that provide office and laboratory space to companies throughout the UK. The company also provides innovation services to entrepreneurs, including business planning advice, coaching and mentoring. Oxford Innovation also manages three highly successful investment networks that link investors with entrepreneurs seeking funding from £20,000 to £2m.
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