

The University and the social-economic environment: reflections from Cambridge U.K.

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There are three implicit propositions that may have motivated the seminar organisers to think that a perspective from Cambridge U.K. can help in considering of the situation and potentials in other regions:

- first that Cambridge has been successful in building a recognised ‘cluster’ of knowledge-rich economic activity
- second that the University, as the major ‘supplier’ of knowledge, can be expected to have been causal or influential in the development of various aspects of this ‘cluster’
- third that there may be some useful learning to be gleaned from the Cambridge story.

This paper starts by setting the context; sketching the outlines of Cambridge story. It then considers the role of the university and in doing so emphasises the importance of understanding how this has changed through time. Taking a simple snapshot of the current situation and using the information that it provides as the basis for analysis is likely, for Cambridge at least (and probably more generally), to lead to flawed insights and erroneous conclusions. The third and final section draws out some of the experience from Cambridge that may be of interest to other places.

The Cambridge context

Forty years ago, the Cambridge area was a graceful backwater. It had a world class University but, that aside, the area was relatively inward looking and unexciting. Apart from the specialist instrumentation sector that had previously grown to service the University, the industrial structure was traditional and rural in character with a few large private sector employers; Philips, Pye and Marshalls, a locally-founded advanced engineering business, were the chief exceptions.

Forty years on the area has been transformed. A vastly improved - though now congested - transport infrastructure links Cambridge to the key economic centres. With efficient rail connections to the capital, the southern part of the area is now ensconced within London’s commuter belt. And at the same time, the city itself has become the major regional centre and can now boast a full range of business and consumer service activities – including the headquarters of the regional public authorities. Other factors, such as the UK’s decision to strengthen regional government, have provided opportunities for Cambridge to play a wider regional role, but the visibility gained from the high tech success story helped Cambridge to ‘win’ as the chosen location.

Underpinning - and reinforcing - this transformation has been a prolonged period of population growth. Cambridge saw its population increase by 8% between 1981 and 2001 (the 1996 figure was almost certainly a mis-estimate), while the sub-region as a whole grew by some 17.5% over the same period. In the context of marginal net population growth nationwide, these figures underline the extent of the area’s comparative buoyancy.

Figures for population growth in Cambridge and surrounding districts					
District	1981	1986	1991	1996	2001
South Cambridgeshire	110,200	117,600	122,500	126,500	130,108
Cambridge City	100,500	102,600	106,000	109,400	108,863
East Cambridgeshire	54,700	58,300	61,200	65,000	73,214
TOTAL	265,400	278,500	289,700	300,900	312,185

(Source: Cambridgeshire County Council, derived from the Census of Population)

The greater Cambridge area extends somewhat further than the three administrative districts in the table and is typically considered as bounded by a radius varying between 15 and 20 miles from Cambridge city. It is this area that has benefited chiefly from the dynamism of the high tech cluster – though the area of influence has been widening over time.

To date much of this widening has occurred as a response to congestion and increased costs at the cluster core. However, there are now deliberate policy moves to harness the dynamic of the greater Cambridge area in regional development. The concept is for hub and spoke relationships between Cambridge, Ipswich, Norwich and Peterborough and, looking further afield, to promote a development arc across to Oxford; so that the two leading research centres connect into the development capacities of Milton Keynes (the UK's largest new town development).

These initiatives are being pursued, in part, so as to counterbalance the tendency for development to gravitate to the south of the Cambridge (and Oxford). There are already plans for major new housing developments along the M11 corridor – the motorway linking Cambridge with London – reflecting, inter alia the recent decision that Stansted airport will be expanded through an additional runway. This is the preferred first step in meeting London's need for additional air capacity.

A successful knowledge - rich 'cluster'

The choice here of the word 'cluster' is deliberate and intended to mean that there is more than a simple agglomeration of firms from high tech sectors in Cambridge and the surrounding area. In the recent book 'Cambridge Phenomenon Revisited' and subsequent comparative research looking at clusters in the UK IT and communications sectors, I believe that SQW has established that, albeit to varying degrees, the high tech economy in Cambridge derives a good deal of its strength from cluster activities. There are sufficient firms actively engaged in clustering behaviour to give Cambridge a sense of community, cohesion and ambition. A good proportion of the high tech firms located in and around Cambridge:

- actively seek to share best practice with other local firms
- give a positive judgement concerning locally-based specialist suppliers
- rate other firms in the area as important sources of technology and innovation for their firm
- rate Cambridge University and local Research and Technology Organisations as important sources of technology and innovation for their firm.

Moreover both the firms that engage actively in cluster behaviour and others firms that are more passive in their local networking, benefit from the agglomeration of knowledge-related activities such as are mentioned in the next section – notably including transfer of tacit knowledge between firms as staff move from one to another – achieving involuntary networking between local firms! The proportions of active 'clustering' firms appears to vary between sub-sectors – being notably strongest in the life sciences. This is perhaps both because of the research intensive nature of many firms' current activities and because of their relative youthfulness.

How did all this happen and what are the key 'facts' today

Outline facts

The phrase 'Cambridge Phenomenon' first appeared early in the 1980's. It was given considerable currency by SQW's book, written by Nick Segal and bearing that title, which appeared in 1985. The book showed the myriad interconnections between Cambridge high tech firms with many originating in University departments and many others spinning out from companies that had had University origins (though there significant numbers of other high tech firms that were not connected in this way). A follow up piece of work we undertook provided further data and estimated that there were 400 high tech firms employing 16,000 people in 1985. These data drew a crucial further distinction in showing that around half of the 16,000 jobs were to be found in eight relatively large companies with activities including electronics, instrumentation, chemicals and research services.

By 1998, which is when our most recent detailed surveys were undertaken, the scale of high tech activity was much greater (and it has increased further since then, despite recent global setbacks to high tech sectors). Total high tech employment had risen to rather more than 32,000 despite the number in the 8 larger firms having fallen to 4-5,000 as against 8,000 hitherto. Indeed if the larger firms are netted out of both the 1986 and 1998 totals then the 'pure' phenomenon shows an annual compound rate of employment increase in the Cambridge area of around 10% over the 12 year period. Moreover, the proportion of firms established as an independent firm in the Cambridge area had increased from 73% in the early period to 86% in 1998. More recent estimates, though varying in the numbers they claim, all point to a continuing dynamic up to the present day.

In terms of the **technology focus** of its firms, Cambridge has remained broadly based. There are still highly successful firms in all the technological areas identified in 1985. Some areas have, however, declined in relative importance – notably electronics/audio and instrument engineering. By contrast, software has continued to be important both within specialised software firms and as a generic resource in many other firms. Biotechnology has increased radically in its importance across most of the greater Cambridge area and there appears to be substantial further potential, especially in biomedicine. Finally, the technology consultancies have grown both in employment scale and in qualitative substance. They add importantly to three vital attributes of the cluster overall: its strong global orientation; its flexible specialist labour market; and continuation of the spin-out dynamic..

The essential dynamic

There have, of course, been recent setbacks, but even these have often had some positive aspects. For instance, AT&T's decision to close its Cambridge research laboratory has released top quality talent into the labour market and led to new company start ups by former employees. This is symptomatic of the dynamic process within the cluster. Most of the growth has been generated from within and come from a combination of the further success of firms that were already well established in 1985 and a continuation of the spin-out process. Whilst this has been at a relatively lower rate than in the earlier period (in relation to the total stock of firms) the 'quality' of the new starts has probably been higher. We are seeing more start ups that involve teams of people rather than sole individuals and more robust funding arrangements.

New firm starts come from a variety of sources:

- many, perhaps as many as 100 in total, have been nurtured by Cambridge's **specialist technology consultancies**. These consultancies are a highly distinctive feature of the Cambridge cluster and have broadened their business models from the provision of contract R&D (with 70% of sales typically to firms outside the UK) to encompass investment in their own Intellectual Property (IP), the incubation of potential spin-outs led by their staff members and financial investment both in these new firms and in other technology-based businesses (the combination of finance, high levels of technical expertise and direct experience of how to incubate companies makes the technology consultancies true 'value added investors')

- others have emerged from **less successful parent companies**; ARM which was a spin out from Acorn is perhaps the example with the highest profile
- **the University** also continues to be a direct source of spin-outs. In recent years they have, most notably, come from life science disciplines (though, in a number of cases these have involved cross-disciplinary collaboration with computing or with the physical sciences). Some of the spin-out companies are founded by young researchers who, perhaps, can see that their research career is unlikely to glitter. But other recent new companies involve academics of high eminence – including Nobel prize winners and the head of the Cavendish Physics laboratory; Professor Friend, has been involved first with Cambridge Display Technology (LEPs) and more recently with Plastic Logic (chips on plastic)
- some people have actually come to Cambridge, with IP developed through research at another university, in order to start a company. They have done so to take advantage of the favourable supporting milieu
- there is at least one instance of an **international company**, Toshiba, that has, from its Cambridge laboratory, founded what is believed to be the first spin out in the parent company's history to date (it is said that this could not have happened within Japan).

Spinning out has meant that, even if they are not always best friends (though many of spin outs have been amicable rather than acrimonious) key individual entrepreneurs often know each other. However, as Cambridge has grown the scale of activity means that this element in the networking glue has become relatively weaker - which is why specific initiatives such as the Cambridge Network (see below) are becoming increasingly important.

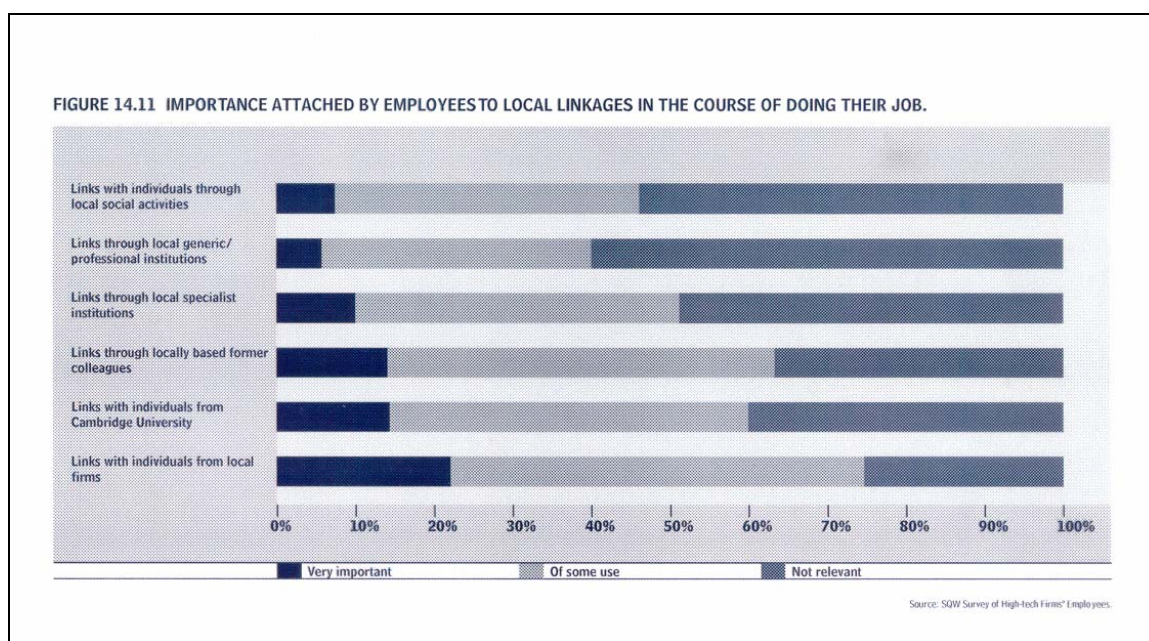
To give some idea of the scale of activity, data SQW's most recent book¹ had responses from around 25% of the cluster's firms and identified 104 spin out firms established between 1985 and 2003.

Sector Name	Univ/Res founder	% of firms	Company Founder	% of firms
Biotechnology	4	16.7%	8	10.0%
Chemicals/pharmaceuticals	2	8.3%	4	5.0%
Computer hardware	2	8.3%	5	6.3%
Electronics and audio	1	4.2%	10	12.5%
Instrument engineering	1	4.2%	9	11.3%
Other	0	0.0%	1	1.3%
Other engineering	1	4.2%	4	5.0%
R&D consultancy	3	12.5%	8	10.0%
Software	7	29.2%	15	18.8%
Specialist business and management services	0	0.0%	4	5.0%
Specialist technical services	2	8.3%	6	7.5%
Technical author	0	0.0%	1	1.3%
Telecommunications services	1	4.2%	5	6.3%
Total	24	100.0%	80	100.0%

¹ The Cambridge Phenomenon Revisited 2000 ISBN 0-95 10202-2-6

In terms of the ‘culture of the cluster, indications of the position reached towards the end of the 1990s is given by two survey findings from our book. The first reports the importance that firms attached to local sources of expertise and it shows a clear distinction between start ups with a founder from the University and other firms. The second, from a survey of individual employees in a number of firms, shows how they rated different types of person to person networking.

	Spin-outs with a University founder	Spin-outs with a founder from another ‘Cams’ high tech firm	Other firms
Important/crucially important links with Cambridge University/local RTOs	79%	33%	37%
Average turnover devoted to R&D	49%	28%	33%
Science /engineering /IT graduates as a proportion of total employment	61%	51%	38%



In addition to the increased scale of the cluster’s endogenous growth, recent years have seen the cluster being strengthened by a number of firms moving into the area; typically through an established company setting up an outpost in the Cambridge area – typically with a strong research dimension.

Newcomers to the area have been important in many ways – Microsoft is the name that springs most readily to mind in terms of underlining the City’s international standing - but they are not dominant in labour market terms. As an interesting aside, when in-movers were asked what the most important reasons were for their choice of a Cambridge location, the most frequently mentioned were personal connections (25%), location (22%) and image (18%).

Factors of production

In understanding why this dynamism has been stimulated and sustained one needs to look at the factors of production. I shall consider each of them in turn but, bearing in mind the focus of this seminar, comment chiefly on Intellectual Capital and 'People'.

The Cambridge area is strong in terms of **intellectual capital**. The University rates highly in most league tables and there are many research institutes in and around Cambridge that have international reputations. The Laboratory for Molecular Biology is one such and has recently been strengthened by links to the Hinxton Genome campus. In addition to institutes funded by the research councils, the University has encouraged major companies with strong science and technology resources to base some of their research efforts alongside University departments (Microsoft paid for, and is located next door to, the computer department's new building).

Up until recently these have chiefly been 'embedded laboratories' often sharing space within the same building as an appropriate Department. However, plans for new University development show that buildings offering space for commercial research teams will intermingle (on the same campus) with those for University Department and research centres. In both case the aim is to have nearby commercial research that enhance the overall research effort and also help University researchers to understand industry priorities.

The policy towards intellectual property ownership and exploitation has been a liberal one and the collegial structure is reckoned to facilitate dialogue and collaboration across disciplinary boundaries. There is, however, at the time of writing this, an energetic debate about University proposals to manage intellectual property more closely.

Concerning the **land and property infrastructure** Cambridge now has an enviable range of science and technology parks. At the last count, there were 10 such parks either established or under development – with half of them privately developed and managed.

Knowledge-based development means people-based development and many of the **people** who now work in the Cambridge cluster have moved into the area to do so (perhaps as many as 60%). Housing, physical and social infrastructure and the overall quality of life are vitally important in attracting people with choices who are internationally mobile. So far, the Cambridge area remains competitive in attracting scientists and technologists but is seemingly less so for managers and certainly not for technical support staff. In any event, there is no cause for complacency.

Our recent work did some novel research amongst employees of several firms in the high tech cluster and by exploring their job histories we have reached the view that the area's specialist labour market is just about large enough (though not in all areas of expertise) to provide ambitious younger people with sufficient variety in job opportunities for them to develop their careers without uprooting hearth and home. This, together with the favourable connotation that Cambridge has on individuals' CVs, is a genuine source of advantage for individuals and firms alike. The positive labour market context may also increase the willingness to take entrepreneurial risks.

Finance and Advanced Business Services have also been vital for the development of the high tech cluster. Cambridge benefits from being home to: the technology consultancies that can undertake due diligence and in some cases provide seed and venture capital; a number of other venture funds plus business angel networks; the major international accounting firms; ambitious legal firms that have deliberately invested in specialist expertise (IPR protection and exploitation, specialist labour law etc).

Key facts about the University of Cambridge

In terms of scale, the University is relatively small. It has:

- 11,500 undergraduates
- 5,000 postgraduates
- 1,800 Faculty
- 2,000 short term academics and research staff.

The University has about 100 departments and an annual income of about £460 million. Within this, research income amounts to £160 million.

Staff are expected to give priority to formal academic duties, but there is flexibility as to the time that they may spend on external activities. They can undertake consultancy, either as private individuals or through a company wholly owned by the University (CUTS – which provides indemnity cover). Since 2001 all IP generated by staff is owned by the University if external research grant funding was involved in its creation.

So far as collaborative grants for research (e.g. from industry) are concerned it is deemed essential that results can be published; though limited delays are permitted in order to assist patenting. The University seeks to own the IP from collaborative research and to offer licences to collaborators.

Where revenue accrues to an invention for which the University holds the IP, then it is shared according to the following formula:

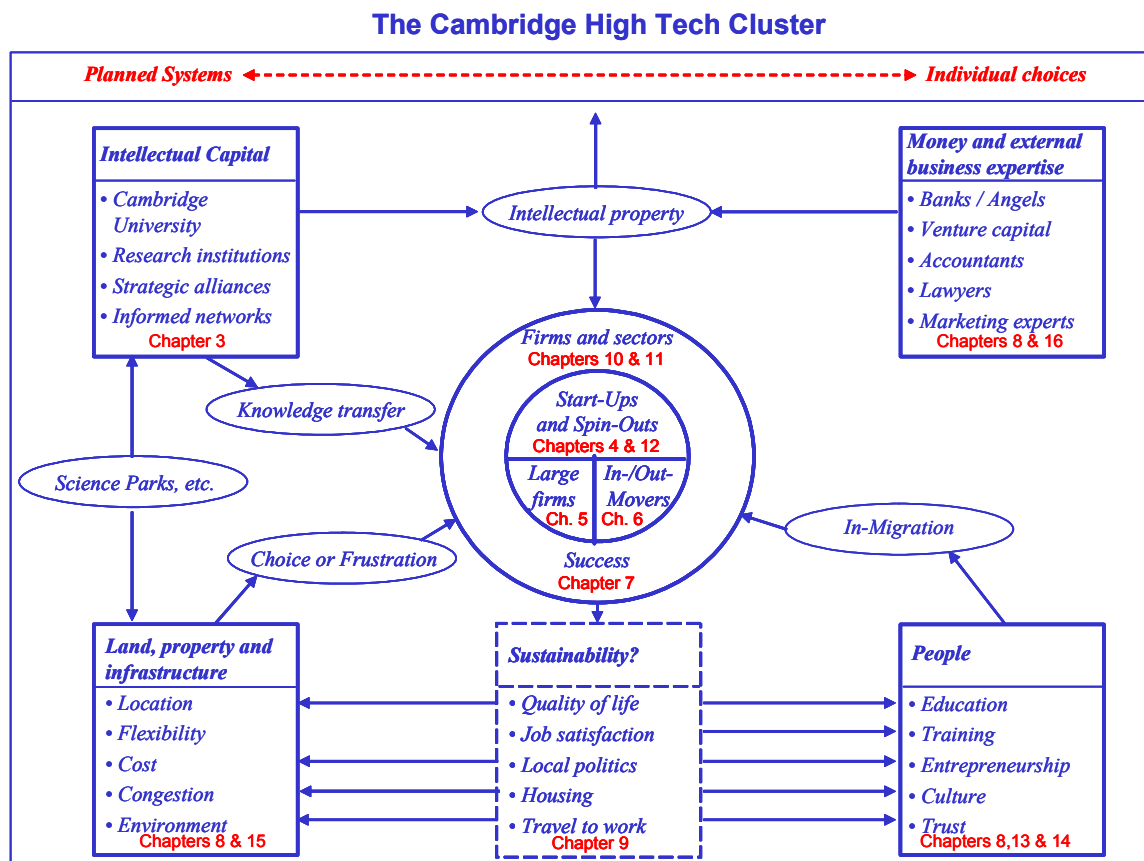
Net Income	Inventor(s)	Department	University
First £20K	90%	5%	5%
Next £40K	70%	15%	15%
Next £40K	50%	25%	25%
Over £100 K	One third	One third	One third

In terms of University commercialization activity in 2002/3, the picture was as follows:

- 16 staff employed
- a patent budget of about £0.5 million
- 143 inventions disclosures
- 67 patent filings
- 31 licences and options
- 3 spin-out companies, 23 start-ups assisted
- £1.8 million licensing income
- £1.5 million consultancy income.

Factors behind the facts and the role of the University

All the preceding discussion can be drawn together in one picture



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The picture is complicated but it is, of course, a lot less complicated than the reality of the innovation system. Because of the local focus, it gives quite insufficient recognition to the importance of accessing resources and ideas from outside the Cambridge area. This point is clearly made in Sir Alec Broers' (Vice Chancellor of the University of Cambridge) introduction to SQW's latest book in which he says:

“In earlier years one of the city's great strengths was its local networking and this remains vitally important. What we see today is an equally vital and complementary enthusiasm for international links. I am sure that the years ahead will see us collaborating – and competing successfully – with the other centres of excellence around the world. “

Before going on to consider what role the University has played (and plays today) it is essential to re-emphasize the importance of the interdependencies between the elements that comprise the innovation system. In consequence, the inherent artificiality of seeking to unpick a single contribution has to be borne firmly in mind. A key strength underpinning the Cambridge cluster's performance has been that each of the key factors has been present in one way or another; sometimes through lucky chance but often through the **vision and energy of key people**.

So far as **intellectual capital** is concerned, an early opportunity for entrepreneurial initiative arose from the strengths that were present in computer-aided design (CAD). When the market was opening up, Cambridge

had the strengths in applied mathematics, computing and engineering but it also benefited from the liberal management attitudes and then privatisation of the government-funded/ICL-managed research centre.

Subsequently, advances in materials science have offered considerable scope and now biomedicine gives an exciting new arena for entrepreneurial endeavour. By having broadly based excellence in science, together with a number of entrepreneurially-attuned academic leaders in key positions, Cambridge has tended to share in (though not always dominate) successive waves of innovation. The appointment as Vice Chancellor of Sir Alec Broers - a leading academic engineer, with strong transatlantic credentials and experience of the private sector - gave further impetus both to the University's positive involvement with local development issues and to the area's international profile. During his, recently completed, 7 year term he led from the front in stressing the importance of attracting research teams from the cream of leading research-rich global companies to work alongside the University's departments and institutes.

Nor has dissemination of knowledge been forgotten. To give a single instance, Professor Mike Gregory founded (1998), within the engineering department, an Institute for Manufacturing that is deliberately geared to meeting the needs of manufacturing firms (broadly defined) – and encouraging them to raise their sights. The relevance of his initiative is clearly seen through the Institute's rapid growth and the funding support it has been able to attract.

In **land and property**, the Cambridge Science Park played a crucial pioneering role. One key individual academic administrator, Dr John Bradfield of Trinity College was responsible for driving the CSP forward (from 1970). In a similar way, Dr Christopher Johnson from St John's College drove forward the nearby Innovation Centre (from 1985). Their efforts created the market in which private sector initiatives have since come strongly to the fore.

The pioneering work in providing **finance** for high tech firms came from Barclays Bank (in the late 1970s), through the efforts of Mathew Bullock (whose father had been Vice Chancellor of Oxford University) and Walter Herriot. They sought to act positively to make their investments succeed rather than concentrating solely on securing the bank's position in case of failure. 3i followed on from them and individual investors, such as Herman Hauser (one of Acorn's founders and a former Cambridge PhD student), have since helped stimulate the venture funding provision in the area. The University and a number of Colleges were also investors in a successful seed capital fund (CRIL)

Finally, in relation to **people**, the University, in the earlier years, took a relatively relaxed view on how academics used their time, provided that they fulfilled their University obligations in terms of outputs. The current climate for academics is perhaps less relaxed but still relatively generous. Alongside the tenured academics it has employed (and still does) a large number of excellent researchers who stay in Cambridge only through a series of 2-3 years contracts that are often poorly paid and offer no job security. This may well make them susceptible to offers from high tech firms that allow them to stay based in Cambridge.

The University makes very major contributions that are less direct but are vitally important to the cluster as a whole in so far as they improve the capacity to recruit and retain top quality people in Cambridge. For instance:

- there is a wide range of lectures and seminars that are open to people from outside the academic community. Some may be relevant to firms' scientific priorities, others will provide sustained stimulus and interest for the bright scientists and engineers they employ
- thanks to the prestige and facilities of the University, many international symposia and conferences are attracted to the city which, together with a rich seam of visiting academics, further enhances the possibilities for fruitful international networking
- the University is also at the hub of Cambridge cultural life, most notably through the range (and quality) of musical events and there is public access to many of its research collections – both in the arts and the sciences
- by dint of its sustained reputation for excellence the University is positioned at the core of the **Cambridge brand** the positive overall sense of a go-ahead, exiting environment of a place geared to getting things done; “a low risk place to do a high risk thing”

- and, if all else fails, London is not so far away – whether as a source of temporary employment or to attend a grand opera.

Those who read closely may be perplexed that this paper refers sometimes to the University and sometimes to specific Colleges. Cambridge University has a complex structure of governance and roles that is more a function of history than current logic. The 31 colleges that comprise the University are responsible for selecting which students to admit and then for ensuring that each fulfils their potential. Whilst teaching is delivered through the University's departmental structure, the College Fellows are responsible for individual pastoral and academic supervision.

Each of the Colleges, some of which are quite small, covers most if not all disciplines. Moreover the Colleges are the basis of social life; including formal dinners. So both students and academics gain stimulus from being members of a, quite intimate, inter-disciplinary community.

The Colleges also add two important dimensions to the University's networking and permeability:

- first, former students often have a strong sense of loyalty to their particular college and there has been a long tradition of the Colleges trying to keep in touch with them (even before it became so vital to raise funds!)
- second, the Colleges can, without going through complex administrative procedures, invite individuals from the local community to become members or, less often, Fellows. This means that people working in high tech firms, for example, can be drawn into the life of the University; enriching their enjoyment of Cambridge as a place and increasing the opportunities for fruitful networks to develop.

Networking

Networking is crucially important and there are aspects of the University that make it well-suited to the formation of personal relationships and to sustaining them through time:

- Cambridge University is an elite institution and first-degree students have to compete hard for a place. They are often loyal to the place that recognized their abilities
- the city is not large (nor is the University) and there is, therefore, a good deal of serendipitous interaction from chance meetings
- by the same token there is fairly ready institutional interaction between, for instance, the City's major hospital and the science faculties in the city centre (the Laboratory for Molecular Biology and other leading research institutes are, in fact, on the same campus as the hospital).

This type of networking is, however, naturally exclusive rather than inclusive and as the area has grown, so has the need for efforts to broaden the possibilities for interaction. Owing to the relative 'newness' of much of the business activity, Cambridge does not have long established business institutions that represent firm's interests and provide fora for interaction. There is a Chamber of Commerce, but in the U.K. chambers play a far less central role than is the case in many European countries. So the Cambridge cluster has had, in practice, to evolve its own networking infrastructure.

It was the academic rather than the business sphere that had a developed infrastructure for networking and this included the Society for Applied Research – open to all with an interest in research whether from the business community or academia. The SAR, though it brought people together, operated essentially through public lectures. An early initiative (1979) was the formation of the Cambridge Computer Group, to:

encourage greater cooperation and mutual support amongst young and small computer-related companies in and around Cambridge, and to work towards using their group strength to improve the purchasing and marketing power.

In practice there was little in the way of specific benefits for companies but this was an important step towards building a business community: sharing topics of interest; learning from each others' experience; raising the profile of business in Cambridge with the business services community in London; and engaging in dialogue with local government on matter of importance to firms.

A subsequent initiative Cambridge University Local Industry Links (1989), seeks to balance the learning and social dimensions of networking. CULIL runs a series of dinner seminars on topics of interest to business and academics alike – with three 20 presentations before dinner, followed by dinner and a general discussion. Topics covered have been diverse: new approaches to seed finance, international experience in fostering innovation; and doing business with China. There is usually a speaker from the University, from the local business community and from a non-Cambridge expert. The events are open to all (who pay!) and attendances are often in the 100-120 range.

It was at one of these CULIL events that the concept of the Cambridge Network was formed. Three of the attendees, the University Vice Chancellor (**Sir Alec Broers**), the serial entrepreneur/venture capitalist (**Herman Hauser**) and the ICT specialist (**David Clevely** from Analysys) pondered together how networking in the Cambridge cluster could acquire a sharper business focus and greater inclusiveness. Their thinking was to:

'create and support a community of like-minded people from business and academia in the Cambridge region and link this community to the global high-tech network for the benefit of the Cambridge region'

Cambridge Network Limited (www.cambridgenetwork.co.uk) was formally established in 1998 and has an inner circle of founder members who guide its forward development (and pay £5,000 per year) – these include major local firms, finance and other business services providers, Cambridge City Council and the University of Cambridge. But there are important 'outsiders' too, such as the London Stock Exchange, BTextact and Cranfield University.

The Cambridge Network undertakes a variety of activities aimed at encouraging both local business processes and global business processes. They involve both physical networking and activities in virtual space. Interestingly, specific efforts are made to involve younger entrepreneurs and a number of companies make a point of encouraging their younger, middle management, colleagues to attend CN meetings in Cambridge.

The emphasis on delivery is essential, because CN is funded by its membership (fees from £100 to £1,000 per annum) and sponsorship – so if it doesn't deliver it dies. SQW pay £500 per year and each year I consider whether it's worth it! Recent headline statistics are impressive with 1,300 members, 500 cvs and 1,100 jobs on the website, 2,500 visitors to the site each weekday and 50 press releases per week.

In the context of this workshop, it is worth drawing particular attention to the links that have been developed with CN's sister organization in Munich. Munichnetwork.com uses compatible infrastructure and shares in initiatives such as cross-regional investor tours, events and introductions. Moreover the hope is that this will be first of several such entente cordiale. In France there have been discussions with Sophia Antipolis and further afield there is also dialogue with a Chinese partner.

The Cambridge Network is particularly noteworthy because of its international orientation and the considerable importance ICT plays in the functionality offered to members and in the connectivity to others outside Cambridge. However, two other networking initiatives merit a brief mention: the Eastern Region Biotechnology Initiative (ERBI); and a relatively new venture - Library House.

Until recently Cambridge, aside from its research activities, was largely ignored by Government. This is no longer the case and central Government has, in recent years, made strenuous efforts to promote a framework within which the overall cluster will flourish – the dual interest being to foster the success of the immediate location and, as mentioned above, to spread its dynamism to the wider surrounding region.

An early step in doing so was to provide seed funding for the formation of ERBI, a specialist network for the biosciences (which SQW was contracted to manage during its launch year). Whilst there is a strong concentration of new biomedical companies in Cambridge, the rest of the Eastern Region has significant complementary strengths: with major pharmaceutical businesses in Harlow and Stevenage; and plant biology (John Innes) focused on Norwich. ERBI has drawn these and other elements of the sectors together into an active, membership based network which has considerably raised the region's international profile and increased mutual awareness of strengths and collaborative potential across the region.

Library House is, by contrast, very much a private sector initiative to establish a profit focused company that maintains active intelligence on high tech firms. This company provides for its members – in return for quite hefty membership fees – detailed, independent (LH does not represent, or accept money from, entrepreneurial companies) verified, information on 'investable' businesses. The members are companies engaged in:

- investment – VC, banking and M&A
- advisory work around transactions
- technology transfer
- executive search and other specialist services.

Library House thereby acts as an active interface between Cambridge companies and the wider investor community that is keen to maintain a watching brief on Cambridge companies. It does so through a combination of face to face meeting and member access to a rich database on companies.

What are some of the key lessons?

Referring back to the diagram, there are two key phrases: right at the top; 'Planned Systems' and 'Individual Choices'. The Cambridge experience suggests that there are some elements that must be planned but that others depend on the choices exercised by individuals. In the latter case the challenge is to create: the right incentive system; allow appropriate freedoms; and encourage risk-taking (based on rational assessment rather than blind faith). Flexible terms of employment and positive encouragement from the top – are both vital ingredients.

At the beginning of this high tech 'phenomenon' the Cambridge University played the central role. **As an institution**, it had generally permissive policies to wealth creation and gave considerable freedom to its, often very bright, academics. The entrepreneurial enthusiasms and energy of a number of **key individuals** led to both substantial numbers of new start companies whose founders included academics and to the creation of favourable framework conditions to encourage their growth.

In more recent years there has been a strong impetus from **central government** to encourage commercialization from the science base and the greater engagement of universities with the local communities (for which a specific funding stream has been provided). Favourable market conditions (temporarily in abeyance) meant that a reasonable number of Cambridge people made serious amounts of money in the late 1990s (including academic researchers). This has sustained attitudes that are positive to entrepreneurship amongst academics and the university has established an **entrepreneurship centre** to ensure that students gain an understanding of the possibilities offered by a career in enterprise. The University's role is, perhaps, less central to the pace of economic growth, but it is still vitally important.

Returning **networking**, much of what has been related above is, inevitably, very context specific. Cambridge is a rather special place with a very distinctive history and structure, but three observations can be highlighted for wider consideration:

- first, it is essential to recognize the importance of key individuals who act as networking 'nodes' or 'animators'

- second, people-to-people interchanges are vital for effective networking (see, smell, touch and then trust)
- third, modern communications technologies can play a rich complementary role that reinforces and extends the contribution that networking makes to competitiveness.

For most normal people, the potential to enhance competitiveness is not, in itself, a sufficient motivation for active networking – but stimulating social events may be. Cambridge is a good place for parties and many of them are hosted by the major firms of accountants and lawyers that are now in the city. The value of chance exchanges that occur at such gatherings should not be under-rated. Through providing unstructured opportunities to see and touch they are vital ingredients in building trust (and, equally important, alloying business duties with a little fun).

Summing up

So, one way or another, a good deal of effort is put into trying to ensure that Cambridge is a well-networked place and that strong links are developed with other hubs of the knowledge economy. The University has moved from being flexible and permissive to giving positive encouragement to dissemination of its expertise and to working alongside leading scientists and engineers from industry.

Nor has the University been averse to learning from others. Some four years ago, I had the good fortune to act as rapporteur for a high level group from U.K. universities that reviewed how leading universities in the USA were approaching the various aspects of technology transfer. In Cambridge, as in many other universities, this and other visits to the USA stimulated a good deal of soul searching. Indeed the Cambridge Network drew inspiration from San Diego's **Connect** initiative.

More recently, central government funding has been made available for partnership working with the **Massachusetts Institute of Technology**. This has contributed in many respects but notably includes successful encouragement of entrepreneurial understanding amongst students and a widely admired training programme for university administrators (from across the UK) who are responsible for the identification, protection and exploitation of IP.

All this is strongly positive, but it is important to be aware that the benefits of Universities working with industry are sometimes overstated. In particular the dividends from commercialization seem closely correlated with the level of research activity. Only a small number of UK universities can expect to produce the scale of impact seen in Cambridge. And, even in the research-rich universities a substantial net income return cannot be taken for granted. Return is neither easy or quick. Looking at the global picture, only a very few patents have produced major streams of income and some highly prestigious universities have not yet secured a 'big hit'. In many regions, the major contributions from their university will come from consultancy, secondments of young people into firms on project assignments, providing firms with access to the university's specialist facilities and above all providing a steady supply of well-educated and well-motivated young people.

The Cambridge successes are considerable but they have not been achieved overnight: and the voyage has had rough passages. As mentioned previously, the University is moving towards claiming further **ownership of IP** so that it can be exploited more effectively and has expanded considerably the office responsible for commercialization. This has provoked strong dissent from a number of academics. They claim that the freedom given to individual academic endeavour has been fundamental to the emergence of the high tech cluster.

The issues are complex and in, different guises, will be faced by most universities and centres of research before too long. The fundamental public interest question is how well will the university discharge the rights it is claiming and how quickly can the new office win the confidence of academics that their interests and the interests of society at large are being properly served? There are reasonable grounds for taking a strategic grip on the protection and exploitation of IP across the university, but it is essential that this does

not discourage the efforts and enthusiasms of entrepreneurial academics – who often have strong individualistic traits.

For Cambridge, this underlines the importance of making sure that outmoded rules and structures that still govern some aspects of university life and derive (in certain cases) from mediaeval concerns and values, are not replaced by a new set of rigid structures that will soon be overtaken by the pace of scientific and economic change. Flexibility and a certain amount of organization untidiness may prove helpful in relating to a fast-changing external environment.

Finally, it is crucial that the understandable emphasis on wealth creation is not allowed to crowd out the **other contributions** that universities make to civilized life in their host cities. By helping to increase the sense of ‘pride in place’ and making their host cities vibrant communities in which to live and bring up children, universities will be helping to ensure that they (and the surrounding cluster of knowledge-based firms) will be able to attract the globally mobile individuals whose talents are fundamental to a dynamic university and to an innovative firm.

The liveliness of the place – its sense of buzz and energy – will help to nurture, draw out and intermingle the varied strands of creativity, innovation and entrepreneurship that together make for long term competitiveness.

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