Technology transfer services – cooperation between science and technology parks and universities.

Dr Malcolm Parry OBE
University of Surrey Research Park

Introduction

One of the strategies that have been put in place to assist in technology transfer has been the creation of science parks. In this presentation I am going to talk about parks and how they can cooperate with universities to assist with technology transfer.

However, a few years ago the title for a talk like this may well have been "technology transfer mechanisms from universities". The implication would have been that the process is largely one way and is principally involved with conveying parcels of protected technological knowledge from university researchers to firms in the private sector.

There is now a more rounded, and perhaps less egocentric, understanding of the roles that universities can play in wealth creation. This is paralleled by many of their senior managers recognising that universities need to have a more positive engagement with their local/regional surroundings – relating to economic, social and political agendas so considering the process of technology transfer misses out on these wider contributions made by universities.

Historically most universities in the UK have carried out research to generate new knowledge and then pass this knowledge on to future generations. However, since 1997 the British government also formally requires all the universities to undertake the additional function of serving the needs of business and the community.

For some, like the University of Surrey, this is not new as it has been part of its role since it was established, first as a Polytechnic, in 1896.

The requirement for this new role has brought into sharper focus those initiatives which are proving to be supporting economic development. Although there are now many new initiatives being established to help in supporting this new role the development of science and research parks has been part of this strategy for over 20 years in the UK. However, in all cases these have been created as local initiatives without any support from central government but it is encouraging that today, although there is still no direct support in the UK by central government for science parks there is a whole new range of government initiatives that are being put in place to support the additional function for universities of taking an active role in economic development. Some of these initiatives have a direct impact on building the link between universities and science and technology parks.

Having noted the evolving role of universities I think it also useful to note the definition of science parks as there is still, in my view substantial level of misunderstanding about these projects.

The definition that has been adopted by the UK Science Park Association is based on three basic requirements for any site. These are:

- Science parks encourage and support start up, incubation and development of innovation led, high growth, knowledge based businesses.
- They may attract larger businesses that want to link to centre of knowledge.
- They must have formal and operational links with centres of knowledge.

Having used this definition the economic imperative of adding value to technology and science has resulted in a number of different real estate initiatives which have been established to support the process. These range from the development of whole cities such as Tsukba in Japan, Novosibirsk in Russia and Daedok in South Korea which are dedicated to science and technology, to much smaller projects.

As an example in France they have created the concept of Technopoles which is where civic authorities invest in the infrastructure with the intention of supporting the development of technology based businesses and in China they pioneered the concept of high technology parks.
My view, although I am unsure how widely this view is shared, is that all these projects focus on "big science" rather than the vital process of dragging science and technology up the value chain. The experience in the UK is that this process is best
In essence science parks are about extracting money from technology which is in contrast to many science and technology parks that are about investing in science and technology: which is about putting money into technology.
This statement reflects a fundamental difference across the divide of universities and business. On the supply side of technology it is about attempting to unravel problems and understand how things work in a culture of gaining kudos from doing this while business uses the solutions to make a profit. Those involved in the science park movement have to understand what happens at this interface.
Based on this definition there are currently over 66 Science Parks in the UK that are represented by the UK Science Park Association: these are shown as dots on this map. In addition there are a further 7 planned. However, the worldwide interest in these parks with possibly over 500 active centres and the number still growing suggests that what existed before by way of infrastructure that linked universities and business was not adequate. Science parks represent a new model that goes beyond property.
Based on these numbers these parks represent a significant pool of companies which operate close to sources of technology, pools of skilled labour and in an environment which has grown up around universities that meet the needs of young entrepreneurs that have ambition.

Commercialising technology

The most visible aspect of any science park is the buildings; however, these are ancillary to the real purpose of parks which is to drive science and technology up the value chain. This diagram (figure 1) attempts to characterise this process although it does not show the range of different individuals, including scientific entrepreneurs, who are involved in each of the different stages.

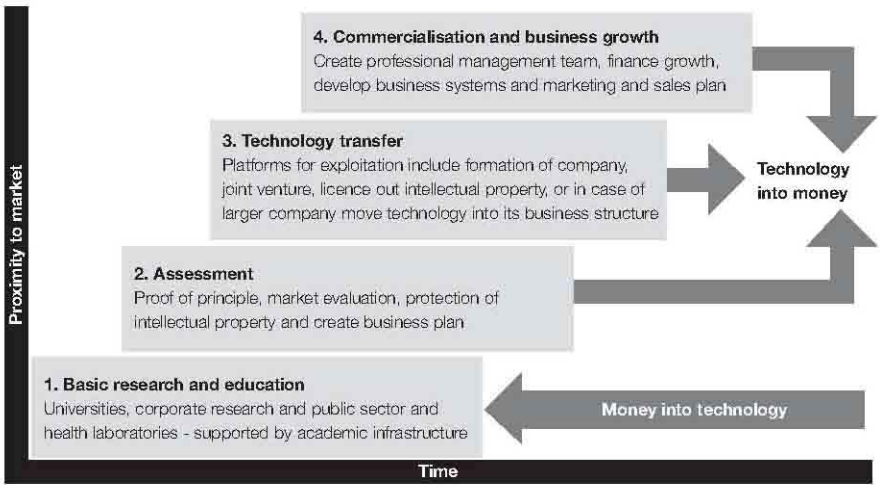

Figure 1 – a characterisation of the value added chain.

This diagram (figure 1) attempts to characterise this process and has as its foundation "research and education", which in a commercial context, is based on converting "money" into technology which is in contrast to the later stages which are about turning technology into money.
Said another way the motive for the managers and investors from business is financial success while experience suggests, that apart from delivering tax revenue, it is usually scientific achievement that drives government or private investment in basic research, and by private I include charitable funding.

The second step is an assessment of the commercial opportunity presented by the technology.
The third step is technology transfer which defines the moment when an exploitation platform is created.
In stage 4 and beyond the activity is wholly commercial.
Explore this process because it helps to illustrate the link between knowledge generation and knowledge utilisation and in my view puts regional science and innovation strategies in context.
Research covers a broad spectrum of activities that range through pure and strategic basic research to applied research and experimental development. This spans the activities of acquiring new knowledge to working on its application to create new uses.
In a commercial context this can done to achieve incremental changes, which is about maintaining a competitive range of products and services, and is generally undertaken by business to stay close to the customer and reduce time to market.
At another level research can be undertaken to look for disruptive changes in technology, processes or service delivery. If found these changes can alter the whole basis of competition in a specific market by lowering costs or offering new capabilities.
And of course these can occur in mature industries as well as in newer high technology sectors and the company does not have to invent the disruptive technology to benefit from it.
However, business does need to recognise the importance of that change at an early stage to gain a competitive edge – this requires good management and commercial judgement.
If companies are to benefit from the reduction of time to market and the exploitation of disruptive technologies they need to invest in research and development which they can do by:

- Direct investment in their own in-house R&D
- Or create partnerships with other companies or institutions.

This means to take advantage of the opportunity there has to both be a scientific base on which to found the process as well as the demand from business to exploit the process.
The next series of steps is shown here as the assessment of opportunity which involves proving a business case by undertaking proof of principle studies, market evaluations, protecting any relevant intellectual property and setting out an effective business plan.
Questions that need to be asked at this stage include:
What is the problem this technology solves?
What is the compelling need for a solution?
Why does the technology solve the problem best?
Who is the customer and can they be accessed?
What is the value proposition to the customer?
How many people will buy it?
What is the price?
Can you make money from it?
What is your unfair advantage?
Of course this series of questions represents a quick and basic assessment of the commercial potential of a technology and the process requires a robust assessment but it does give a flavour of the kinds of questions that need to be asked.
Platform for exploitation include the options of creating a company, the sale of the intellectual property, creating a joint venture or granting a licence, and if the development is in a larger corporation the technology needs to be moved into a commercial structure.
Each of these is a broad topic in its own right but the one that is of most interest to those in the science park movement is company formation.
Experience suggests that this strategy is most likely to be followed where the discovery that is being commercialised may be:

- Too embryonic to be licensed
- There may be no existing players in the market who can be attracted to the opportunity

- The full value has not been added to the technology and additional basic development is required
- Or there is a concern about keeping things local for the sake of economic development.

Of course all are of these strategies are valid and in supporting this process those that are working at the interface between technology and the market need to understand this matter.
Going beyond that the next stage of taking technology to market is about the commercial competence of the team that drives this.
A brief review of this shows that some of the success factors include:

- Whether the innovation is a platform technology,
- The level of experience of management,
- The quality and commitment of the financial backing to the project
- And of course the nature of the business plan.

The experience of most science park managers is that the quality of the team that is involved in managing new ventures is a key to commercial success.
A conclusion that can be drawn from looking at this diagram is that science parks serve a much wider role than simply providing property. However, to achieve the added level of support requires involving a number of specialist providers from the local business community.
Many science parks attract support from local service providers that believe that supporting new companies as they become established helps build their own customer base in the future.

Supporting the process of commercialising technology.

In addition to these commercial organisations that support this process there is great interest by government in this and what has emerged over the last 20 years is an understanding by government of what science parks can do to help build a regional economy. What government has done is try to put in place programmes that fill gaps in the support process that runs alongside the events that are characterises in this diagram.
In making this investment the government has favoured those locations and universities that have either demonstrated a commercial edge to the services they offer such as creating science or technology parks or they have invested in sites where they have previously invested heavily. These sites include those sites adjacent to where defence research (Porton Down and Malvern Science Parks) is conducted or next to sites such the Atomic Energy Authorities sites near Oxford and in the north of the UK. They have done this on the basis that advanced scientific and technical knowledge (and artistic content) will be incorporated into new products and, even if some of these are produced in lower cost countries, the knowledge-rich companies that develop them will earn continuing returns from other links in the manufacturing chain. Some high value manufacturing will naturally choose to locate near to the research base so that scientific, engineering and technological expertise can be harnessed effectively for incremental innovation in production processes. Science and technology parks can help to encourage this, if their entry requirements allow certain types of manufacturing.
The European Commission has emphasised that the Seventh Research Framework Programme will focus on Europe's development as a knowledge-based economy. It will have an increased regional dimension through a specific programme, 'Capacities', which will "strengthen the research potential of European regions by supporting the development of 'research-driven clusters' of universities, research centres, enterprises and regional authorities"1. Over the same period (2007-2013) the new 'Structural Funds' programme will have "a particular emphasis on networks linking firms (and SMEs in particular) to local universities, training and research centres, and other companies"[1].
The UK government has demonstrated its acceptance of the importance of research-based innovation through major increases in the funds allocated to public research budgets and through a tax credit for R&D undertaken, or commissioned, by firms. Specific funding streams now help universities bring their research premises and equipment up to date. Government, through the Higher Education Innovation Fund (HEIF), has also stated a commitment to a third funding stream (in addition to

teaching and research) that will help universities 'reach out' and increase the contributions that their new research and accumulated expertise make to wealth creation and other facets of a well-functioning society.

Many universities have used such resources to strengthen their commercialisation/outreach offices' capacities. Some have gone on to identify promising research, protect the IP and seek to exploit it through licensing or new company formation. In the latter activity many have been able to deploy seed funding made available through the University Challenge Fund.

The range of outreach programmes that have been put in place in many places include:

- Venturing teams: these groups are concerned with identifying technology in universities that have commercial potential and then helping to fund a proof of concept study and market evaluation while protecting the IP that has value. This group also then would be responsible for taking the technology to a point where its IP can either be licensed or a team is created for exploitation. These groups now work with other agencies to achieve this process. Some universities have subcontracted the latter stages of this to companies that specialise in supporting this process. This includes either establishing links with funds that support early stage technology or creating their own.
- Outreach teams: these groups are concerned with delivering government programmes for linking with the technology transfer process. The range of involvement includes not only creating and running pre-incubation programmes but also in creating the networks that deliver, as an example knowledge transfer programmes.
- The Association of University Technology Transfer Officers has also created a training programme that supports these activities because it was recognised that their activities needed further to be professionalised.

Alongside these programmes there has been a significant increase in funding for this process by the UK Government and in 2003 Richard Lambert[2] who is now the Director General of the Council for British Industry was asked to chair a review of the Business- University Collaboration. The final report confirmed the importance of effective collaboration and made a number of helpful suggestions, noting that "the most effective forms of knowledge transfer involve human interaction". Of greater surprise to some, though many in universities were gratified rather than surprised, was the conclusion that:

"The main challenge for the UK 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 effect on the overall productivity of the UK economy".

Senior managers at most universities in the UK have accepted that links to the business community need to be taken seriously. In devising structures and systems to do so, a good deal of attention has been paid to examples from US universities, particularly the Massachusetts Institute of Technology.

Wicksteed in his contribution to a recently published book on science parks noted that: MIT undertook a radical re-organisation of its commercialisation activities in 1986 and keeps them under active review. There have been significant changes in major companies' attitudes following the break up of big company research laboratories. They now want proper value for money from universities and as part of their supply chain reforms are looking for strategic relationships with fewer universities. MIT's business relationships with major firms are of vital importance, but knowledge transfer also includes such varied activities as:

- An entrepreneurship course (which includes selling and other practical topics which are anathema to business schools).
- A $50K competition to encourage start-ups by students.

- Close links to several Venture Capital companies that are genuine providers of 'seed finance'. These are active in assisting start-up companies and their involvement reduces the efforts that the Technology Licensing Office has to devote to spin-outs and start-ups.
- An Industrial Liaison Programme that has some 200 company members - half from the US and half from overseas - that pay fees ranging from $50-175K depending on the level of tailored service envisaged. Academics who help with the programme are rewarded through a discretionary expenses fund. Companies are free to approach faculty directly but a third or so - including the majority of larger firms that seek a relationship with MIT - choose the ILP route because of the expert guidance provided by a personal Liaison Officer based on understanding the company's needs/objectives and a systematic understanding of MIT's resources
- Direct consultancy undertaken by faculty members, who are only contracted to MIT for 4 days per week (other staff have less leeway or none at all). There are reported to be around 100 consultancy groupings that sell their services direct. The MIT ethos is not that faculty are allowed to do consultancy work but that they are expected to do so, though they are not allowed to use student help. Much consultancy work is for firms but public sector involvement is also important. Some years ago work was undertaken for the State Governor on how to accelerate the growth of emerging clusters (e.g. of medical instrumentation companies where there was a good concentration of firms but poor cohesion between them)
- Sponsored research, which usually involves students and bears a standard overhead rate (established by Government) except, on occasions, when work is for Foundations.

Wicksteed has noted that this positive encouragement of outside engagement is not wholly untrammelled. There are strict conflict of interest rules against an academic team accepting research sponsorship from a company in which one of them has an interest. Academics are, additionally, required to report any consultancy for a company that is a research sponsor. The IPR conditions for research are that MIT retains ownership of any invention and will file patents at MIT's expense or, if requested by the research sponsor, MIT will file at the sponsor's expense. In terms of licensing, the sponsor automatically gets a free internal research license and, after notification of patent filing, has 6 months to choose between a non-exclusive royalty-free license (with payment of patent costs) or a royalty-bearing, exclusive license.

Based on an extensive study of the experience in the US, Wicksteed also reported that at the institutional level the, path-breaking, Media Laboratory provides a prime example of a specialised centre that encourages collaborative research. Notably the Media Lab has IP arrangements that are unique for MIT in that those who support the Lab at the sponsor level and higher have the opportunity to share in the Laboratory's intellectual property, license-fee free and royalty free. Non-sponsors are precluded from making use of the Laboratory's developments for at least two years after the filing of a patent or copyright.

As a result, the Laboratory is an intellectually open environment where ideas are readily exchanged, and is a community in which sponsors are entitled to acquire non-exclusive licensing rights to all intellectual property that is conceived, developed, or reduced to practice. Over the years, this policy has fostered a large number of unexpected and highly successful solutions that have led to new technologies and products, greatly benefiting both sponsors and the world community.

This right of access does not come cheaply. Consortium sponsorship is the most frequently selected option. A consortium connects a group of sponsors with a group of Laboratory faculty and research staff focused on a common agenda. The cost of joining a consortium is $200,000 per year, for a minimum of three years. For an additional $200,000 per year, a consortium sponsor may also have an employee-in-residence at the Laboratory. Affiliate sponsorship, at $100,000 per year for a minimum of three years, introduces sponsors to the overall work of the Laboratory, or allows attendance at a consortium's semi-annual research meetings. Sponsors may move on from this basic level (which includes limited access to intellectual property) to a higher level of sponsorship at any time. Graduate fellows provide the sponsor an opportunity to connect with specific students and research groups, in areas of particular interest. The cost of supporting each fellow is $75,000 per year. Student fellows can

carry the sponsor's name, and can rotate annually. The highest level of expendable support is the corporate or strategic research partner, at $750,000 or more per year. Such partners fund larger agendas at the Laboratory, including fellows programs or special Laboratory facilities. Corporate or strategic research partners automatically become members of all consortia and Special Interest Groups, and have the right to an employee-in-residence at the Laboratory.

By UK standards these are impressive levels of fees and an even more impressive picture emerges from the list of firms involved with the Media Lab. Motorola and Samsung are amongst the six corporate and strategic research partners. There are seven corporate research sponsors including BT, Canon and Hitachi. A further 50 or so companies are involved in consortium sponsorship and 10 are affiliate sponsors. Their fees together with specific research contracts and other support finance an annual research programme totalling some $35 million.

Wicksteed believes that the Media Lab project is an exceptional success story and attempts to replicate the model in Ireland proved unsustainable in terms of the critical mass of activity required. There are, however, other examples of collaborative research centres at a number of other universities (usually on a smaller scale) and the model may well become increasingly popular over the next decade – albeit largely restricted to institutions that have global standing in the specific research disciplines.

The Media Lab's list of benefits to sponsors can probably be generalised to indicate what make collaborative research centres attractive to their sponsors:

- Knowledge transfer**:** ranked by the Lab's current sponsors as the most important benefit, this includes the transfer of creative ideas for the use of a single, new technology, or the convergence of several technologies.
- Demonstrations: coming to the Lab to see research projects firsthand—and to engage in impromptu discussions with faculty and students—gives valuable insight into new approaches for research agendas.
- Brainstorming, technology, and product-review sessions: lab input can help sponsors create a new product concept, provide critical feedback for product development, or help reframe an existing product line.
- Student recruitment**:** one of the Lab's greatest strengths is the quality of its students, who may be recruited as interns for term breaks or as full-time employees after graduation.

MIT exploits the IP it has chosen to protect through licenses. The experience of MIT reported by Wicksteed, is that About 20% of licenses are to start-up firms (often with a small team of founders rather than single individual) and the Technology Licensing Office (TLO) will typically have helped to put the start-ups in touch with a suitable VC firm. MIT will not invest itself, but may take a small equity stake (usually with some protection against dilution) in partial lieu of royalties. The license agreement defines the intellectual property to be transferred, the development milestones to be met by the company (often including minimum amounts of capital to be raised) and the royalty terms. As with all licenses, if the company does not perform it may lose exclusivity or may lose the license altogether.

MIT generates substantial revenues from its IP – in the financial year to April 2005 $35.3 million was earned from royalties, $6 million came from patent reimbursement and $4.7 million from equity realisations. However, outlays are also substantial and inventors take a share of the rewards. Expenditures on patents in financial year 2005 were $10.3 million and the TLO had a staff of 33 (Isis Innovation at the University of Oxford has a similar sized staff despite a rather smaller research budget and fewer spin-outs, which probably reflects the greater effort that spin-out generation requires in the UK). Overall MIT takes the view that the primary aim of licensing is ensure that the technology is used for the benefit of society not to maximise its own revenues. There are very few instances of 'blockbuster' licenses; for most licenses revenue is quite low.

The TLO offers the following advice based on MIT experience:

- Strong patent protection is crucial – MIT has established a strong credibility for its patents through performance over time.

- An offer of license exclusivity makes it easier to interest good companies or investors in early stage technology where the risk is high.
- Publishing lists of available technologies is likely to lead to a lot of wasted time for early stage technology– the appropriate licensee usually needs to be found and convinced and offered a fair deal.
- Involvement of the inventor is usually vital for successful exploitation of technology and for the identification of good leads to potentially interested companies.
- An equitable and consistent policy on royalty-sharing is essential.

From the perspective of the Institute as a whole, the effort being put into technology transfer is justified in terms of its mission to serve society at regional and national levels. The cash generated is, of course, most welcome, but by no means the measure of success.
In contrast to this institutional approach in the US, the experience in the UK is that there is much greater leaning towards a bottom up strategy. The UK university sector is quite varied and the culture very often does not encourage links with business; however, where science parks are in place a number of programmes have evolved.
The government Higher Education Innovation Fund (HEIF) has also provided much needed investment that has helped those universities that were given awards to create programmes to encourage links for technology transfer.

Pre-incubation –a park based process

For universities with science parks some of this funding has been invested in pre-incubation services which is focussed on laying the foundation to businesses that have the potential for global reach, are technology based, and are likely to be high growth.
An example of a programme focus on this strategy is operating on the Surrey Research Park. This combines pre incubation, incubation and "grow on opportunities" in one location.
This process has three spheres of influence and responsibility: the first is the performance of the entrepreneur: the second the physical environment (service provision) in which the pre-incubation takes place; and the third is the nature of the specialist "nurturing" business environment that is aimed at influencing the entrepreneur and how this is managed (Management of Members). This part of the paper draws on the experience of the SET Squared Pre-Incubators that are run as a consortium at the Universities of Bristol, Bath, Surrey and Southampton.
Pre-Incubation aims to assist entrepreneurs in the development of an idea that appears to have the potential of being developed into a sustainable business. This support should include the provision of office space, mentoring, short training courses, professional services advice, events and regional resource identification.

Who is it for?

The SET Squared model for pre-Incubation is designed to create a supportive environment for its Entrepreneurs (known as Members) to develop the commercial elements of their business opportunity away from the distractions of home, office, laboratory or research department.
The term Member has been adopted to describe those on the programme as the term tenant infers a physical landlord/tenant relationship – and pre-incubation is considerably more than just a property initiative.

Service Provision

Office space in the pre-incubation centre.

Research on the tenant requirements of science parks gives a strong impression that the two key benefits that these projects give tenant companies is image and reputation, and flexible contracts for occupation. These two factors need to be taken into account when considering the space that forms the pre-incubator. Whilst the layout of office space will very much depends on the space available,

there is considerable advantage for work-stations to be in a predominantly open plan style as this assists in creating a peer support ethos. The minimum requirement for each workstation is provision for a PC, telephone line, fast internet access, lockable storage, power supply, and desk and office chair.

In addition common services should include photocopying, fax, document preparation, printing and scanning, voicemail and presentation facilities which ideally should also be available together with access to video conferencing. Meeting and seminar rooms should portray a very professional image and be equipped with presentation facilities. Members can also be encouraged to interact with each other through the provision of shared break-out and kitchen facilities.

A professional reception and client meeting area which is manned for at least 8 hours a day, Monday to Friday (office hours), should be provided, together with a call answering service, and rapid ICT support should also be available during these hours. Members will need to have 24-hour access to the Pre-Incubator via electronic swipe cards or similar security systems. Where possible, car parking should be made available for Members.

Pre-Incubators (or Centres) may also wish to offer virtual office services including telephone answering, mail forwarding and meeting room space for those entrepreneurs who desire the professional image associated with the centre, but do not require work station space. This helps to capture potential entrepreneurs that are gestating an idea but are not ready to commit to their project on a full time basis.

Mentoring

An essential component of pre-incubation is the support that is provided for the Members. A tried and tested arrangement for providing this is through mentoring which offers to Members commercial counselling through a group of Centre endorsed mentors. These individuals should have experience and skills in the commercial development of early-stage high-growth-potential business. Typical mentor profiles include: entrepreneurs who have set up successful businesses themselves, professional services consultants or bankers who have in-depth experience of advising start-ups, the professional non-executive or experienced venture capitalist, or those involved in management education such as an entrepreneurial professor.

It is appropriate that Centres should take a role in facilitating the introduction of mentors to the Centre Members; however, mentoring is a highly skilled process, and part of the role is to create a panel of mentors that are able to offer Members this service. The accepted role for Mentors is to act as 'sounding boards' and counsellors, rather than leaders, when supporting Centre Members in the development of their commercial ideas. How much time Mentors put into each business is down to availability and need, however, a day over a month is not unreasonable. This support should be available to Centre Members, either by telephone, email or face to face.

Once the Centre Member and mentor feel comfortable with the relationship it is the norm that a mentor will work alongside a Centre Member for the duration of their time in the Centre, ensuring continuity.

Potential mentors should receive training (approximately 1 day) before being brought into the mentor pool and being introduced to Members seeking such services. The training should include a thorough understanding of all the Centre's services. Having taken the course, mentors will be endorsed on a rolling basis, undergoing review and attending regular mentoring workshops.

Experience at SET Squared has meant that many mentors can not just be used for mentoring but can also be involved with helping in the delivery of short courses, assessment of business and marketing plans, and involvement in Centre Member reviews which are an important part of the operation of these Centres.

Professional service advice

The Centre's management team should have relationships with a number of professional service providers. These will include accountants, lawyers, bankers, IP attorneys, HR specialists, recruitment

agents and early stage development specialists. These professional Service Providers should be encouraged to provide surgeries and workshops at the Centres on a regular basis. Centre Members should be able to book a limited amount of time at a surgery to ask for advice. Surgeries should be provided free of charge.
These Service Providers can also be a good source for training. They should be encouraged to lead workshops on generic issues (e.g. accountants on R & D Tax Credits or Schedule 22 regulations); however, it should be stressed that these sessions should not be overt marketing pitches for specific Service Providers. If after a session through networking and discussion some business is forthcoming that is all to the benefit, but for those responsible for arranging these sessions it is important to emphasise that the Service Providers should see this work as a "Seedcorn" for the future i.e., developing contacts with future potential valuable customers.

Events

To gain critical mass in the locality many Centres run events to meet the needs of nascent entrepreneurs and facilitate valuable networking opportunities. These are most effective if they complement and support the existing networking activities of other organizations within the region, rather than competing. This supporting role also avoids confusing nascent entrepreneurs that are looking for support. Experience has also shown that Centres that actively support and develop synergies with existing local events through sponsorship and co-branding gain a higher profile much more quickly than those that try to operate in isolation.
Larger events may include industry focused conferences and exhibitions, bringing together researchers, early stage companies, and investors and corporates involved in particular areas of business, e.g. life sciences, new materials or information and communication technologies.
Smaller events might include investor forums to bring venture capitalists, business angels and corporate venturing units together with the best of the early stage investment seeking businesses; or researcher focussed events where the region's leading edge technology researchers would be able to meet entrepreneurial innovators.
Local events (or internal events) are also just as important as larger external events. The key ethos of any Centre should be that of a community. It is therefore extremely important for interaction between members to take place at regular intervals in order that relationships may be developed.

Entry Criteria

Experience of business incubation across the European Union has clearly indicated that those centres that are most effective are where there are entry criteria. Clearly these criteria very much depend on the aims and objectives set for an individual centre. For example a pre-incubator that is attached to a university may only wish to help entrepreneurs who are working on business ideas that have a synergy with the host university's research strengths. However, there is much to be said for having a spread of companies involved in a range of technologies, as a broader mix often brings a richer blend of experience and skills to the Centre.
To formalise the entry procedure it is normal to set these out in the written application required when a potential member would like to be considered for a place in any centre. In this application, applicants should be asked to give the following details:

- Business description - the nature of and ambitions for the business.
- Product - a description of the product or service and its stage of development.
- Market - who is the customer? The benefits of the product or service and what problems do the product or service address, the market size – market segments identified and proposed routes to market.
- Resource – who is currently involved and who else needs to be engaged.
- Finance – how has the business been financed to date and how is it intended to be financed in the immediate future?
- Business Plan – what are currently the most critical elements to develop the business?

The centre management should, having first reviewed the application for compliance with the centre's entry criteria, interview the applicants to satisfy themselves as to the potential viability of not just the proposed business idea – but also the capability of the entrepreneur and how they would fit into the community within the "pre-incubator".
However at the "pre-incubator" stage – any business plans are likely to be in the development stage – so during the interview, whilst the Centre Management should ask the entrepreneur to talk through their business idea while also looking to find out more details about the Entrepreneur's:

- Drive and determination
- Experience
- Technical skills
- Motivation for starting up their own business
- Interpersonal skills
- Willingness to accept ideas and advice
- Vision

For the protection of the Centre and its members – it is important that the Centre Management somehow check the integrity and legality of new members and businesses coming into the Centre. The simplest way to do this is by taking references of the entrepreneur.

Exit Criteria

A "pre-incubator" can be looked on as a "nursery" for new companies. Just as a child needs to grow and develop into a mature adult – new start-up companies need to be able to develop into mature companies. There must come a time when a new company should move on from the incubation phase of its development. Some companies would like to stay indefinitely in the sheltered environment of an incubator where most of their day to day operational needs are catered for and where they feel comfortable. However, if these companies are to meet their full potential they must move on. Some companies do this naturally as they out-grow the Centre but others that have been slower to grow can, if left alone develop as life-style businesses that wish to stay longer. It is clear that if these life style businesses are allowed to remain in these centres they can not only block "work stations" and limit the capacity of the Centre but also introduce in inappropriate culture into the Centre and undermine the "hot-house" ethos of pushing companies to grow.
It is therefore important that the Centre has a laid down exit ethos and that the spirit of this ethos is followed. This does not mean that after say 12 months to the day companies should move from pre-incubation to incubation and after 3 years they should be evicted. It means that the Centre's management should work with the Member companies towards these guidelines – and exit be achieved in a well planned and orderly way – so as not to harm the company.

Business incubation

For those companies that are successful at the pre-incubation level it is essential that there is programme in place that enables further growth to occur while maintaining continuity with the work force, customer base and any links into the technology base. The concept of incubators are now well understood and an explanation of this is not appropriate here. However, some lessons that have been learnt from operating science parks for over 20 years in the UK is that in addition to continuity in contact with the technology transfer process there has to be continuity with the funding programme and it this that has been a constraint on the process.
To overcome this in the region in which the Surrey Research Park operates a special proof of concept programme has been put in place.

Proof of concept funding (PoC)

The UK has recently seen the establishment of a number of PoC schemes. These have, in part, been inspired by the success of the major scheme managed in Scotland by Scottish Enterprise which has now been running for several years. That scheme involved making major grants, typically of £100K plus, which funded projects up to two years long. The more recent schemes established in England usually operate at a more modest scale. One such is the PoCKeT fund, established very recently in the prosperous and dynamic South East region.

PoCKeT is financed jointly by SEEDA (the regional development agency) and the European Social Fund with a total fund of £1.5 million (£500K of which is earmarked for companies involved in a specific nano-technology project). Repayable awards of between £5K and £30K are made to SMEs that want to buy help for a PoC assessment from a Higher Education Institute or Public Sector Research Establishment (including technological validation and/or commercial assessment). Companies have to be in the South East region but the universities can be anywhere in the UK or in Europe.

This is not a grant. "A PoCKeT award is repaid upon commercialisation through a royalty of 5% on revenue generated. Typically, repayment of 150% is sought over a capped period of 5 years. If the company is unsuccessful in bringing the idea to market the award is not repaid." Despite these terms there has been a good level of interest over the first 6 months with a total of 25 applications. Ten of these have been approved (with total committed funds of about £250K) and 8 rejected. A further 7 are still under review. Applications have come from a wide variety of sectors.

Highly positive feedback has so far is reported from both academics and business communities. PoCKeT helps meet a problematic gap in the availability of early stage risk finance whilst, at the same, time giving an incentive for SMEs and universities to collaborate on projects that are reasonably funded and have been vetted as realistically 'do-able' by the fund manager[11].

IP and related issues have, for most projects, been dealt with through use of the model agreements for university - industry collaboration which were drawn up following a recommendation in the Lambert Review - a simple and straightforward approach with which both companies and academics are comfortable. It is far too early to reach an independent judgment on overall success of the PoCKeT scheme but the experience to date on university involvement is intriguing. Although the firms are all in the south east, universities they have chosen to work with come from across the UK including Edinburgh, York, Leeds Essex, Kingston, Cranfield and Portsmouth.

Is there a role for science parks?

In view of the importance of locally based intermediation between universities and firms then an obvious question is whether this is a role that science park managers should seek to fill. In certain exceptional instances, and when their involvement is urged by the parent university/ies, the answer may be "yes", but for the most part they will be better advised to leave intermediation to others. Rather, science park managers should focus on understanding the various ways in which effective intermediation is being achieved by different university departments and groups (universities seldom behave as homogenous entities) and on getting to know the key individuals who are involved. This is an important aspect of 'knowing' the local scene.

Where science park managers can make a distinctive contribution is through having a detailed knowledge of their tenant companies. More often than not the companies will be better equipped than the science park manager to identify where to find the research expertise relevant to their specific fields (though the science park may be able to offer an understanding of administrative procedures if the expertise is within a nearby university). The positive roles for science park managers are in identifying where there are opportunities for companies to build relationships with the university through joint events, student placements and acting as a distinctive node in regional, national and international networking.

Summary

Governments do not create wealth and jobs. It is businesses that does this.
However what has been learnt over the last 25 years is that for economic prosperity there has to be a partnership between business and government.
One element of this partnership is to create business out of the technology that is being developed at the cost of the tax payer.
Science parks have taken an active role in this process and the success that they have achieved has encouraged many governments to give added support to this process.
This involves driving technology up the value chain; however, where there are high risks it is not always business that supports the process and it is at this level that science parks and university technology transfer offices have to work together to effect technology transfer.

---

[1] Wicksteed, B., 2006 Universities and knowledge transfer, in The planning, development and operation of science parks Ed Malcolm Parry, Chapter 12 p 235 – 250 UKSPA 2006.

[2] Lambert Review of Business-University Collaboration Final Report December 2003 Published with the permission of HM Treasury on behalf of the Controller of Her Majesty's Stationery Office.