Spin out companies from UK chemistry departments

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To comment, or for further information about the report, please contact:

Mario Moustras
Royal Society of Chemistry
Burlington House
Piccadilly
London W1J 0BA

Tel: +44 (0)20 7440 3388
Fax: +44 (0)20 7734 1227
Email: moustrasm@rsc.org
www.rsc.org

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SPIN OUT COMPANIES FROM UK CHEMISTRY DEPARTMENTS

This survey was commissioned by the RSC following initial research on the number of spin out companies in UK chemistry departments. This research suggested that sixty-five spin out companies had been set up in the 1997-2002 period from twenty nine UK chemistry departments. All UK chemistry departments (except for one) responded to this initial research.

This survey had three aims.

- To characterise spin out companies from a cross section of UK chemistry departments.
- To compare and benchmark chemistry spin outs with those from other disciplines.
- To identify the factors encouraging or inhibiting spin out activity.

The universities selected as the cross section were: Bristol, Cambridge, Cardiff, Durham, Imperial College, Kings College London, Leeds, Oxford, Sheffield, Strathclyde and University of Manchester Institute of Science and Technology (UMIST).

At each university three groups of people were asked to complete a spin out questionnaire.

- University technology transfer officers – to provide numbers of spin outs from chemistry and other disciplines and to comment on support mechanisms and other factors that encouraged or inhibited spin outs.
- Heads of chemistry departments – to give their views on departmental policy on spin outs and any incentives/disincentives.
- Individuals involved in spin outs – to give their first hand experience on issues such as incentives, disincentives and lessons learned.

Individuals from each category were interviewed either face-to-face or over the telephone. Summaries with common themes and recommendations are presented below.

The survey was completed in September 2002.

Contents

1. Summary

1.1 Company characteristics

The 21 companies surveyed here are 'typical' high technology start ups. Sixty per cent of them were formed within the past two years. At the time this survey was conducted, they collectively employ around 360 people, including over 110 chemists and individuals from a range of other disciplines, mainly bio-scientists. From the figures given, the number of employees is expected to grow by 50% per annum.

Three quarters of these companies are involved in research, a quarter of them provide services, with only five per cent in manufacturing. Over half (57%) of companies are in the bio/pharma sector; a third are in functional materials and optoelectronics; while only 10% are in the conventional (fine) chemicals sector.

Over a quarter of them are in the very early stages of development with funding from their founders and/or universities; 21% have progressed to funding from business angels; and over 53% are funded by venture capital.

1.2 Links to Research Council funded research

Fifty-five per cent of spin outs are based on technology that relied heavily on past Engineering and Physical Sciences Research Council (EPSRC) funded research; 30% of these reported equal reliance on EPSRC and Biotechnology and Biological Sciences Research Council (BBSRC) research projects, including projects funded by the Biomolecular Sciences Committee (BMS). A further 30% reported some reliance on EPSRC projects with the majority of funding coming from other sources.

The 15% of companies not directly founded on EPSRC funded research acknowledged the importance of other EPSRC funded projects in developing expertise (via CASE awards and postdoctoral scientists) for them to collaborate with and for training students whom they have subsequently hired.

Of the 85% of spin outs based on outputs from Research Council (RC) funded research, 65% reported responsive mode programmes as the most important, the majority of these (41%) being in chemistry.

EPSRC materials programme projects were key to 24% of spin outs. Most of these cited 'managed' materials programmes such as 'Electronic Materials for Displays' and 'Smart Materials'. BBSRC projects were cited by 18% of spin outs, mainly from BMS.

Eighteen per cent of spin outs cited chemistry 'Realising our Potential Awards' (ROPAs) as the funding that provided the starting point for the technology underpinning the company.

Only 10% of spin outs are currently 'supported' by Research Council projects; 32% are involved in LINK, SMART and TCS projects; while the majority (58%) are now funded independently.

1.3 Collaborations

Eighty-five per cent of spin outs cited strong collaborations with both industry and academe, with 45% collaborating with the pharmaceutical industry and academic groups in chemistry and the life sciences. The remainder are all involved with industry and fund academic groups in the UK, Europe and the USA (physics, material sciences, electronics, and electrochemistry).

The intensity of collaboration with industry and academe is very significant. The multidisciplinarity of the collaborations is also significant, with all 85% working with one or more disciplines in addition to chemistry.

If this is repeated throughout the whole of the spin out sector, spin outs could be a key, and under-estimated, source of 'industrial' funding for UK academe.

1.4 Recruitment and training issues

Not surprisingly, chemists are the spin outs' main recruits, though the proportion of staff from other technical disciplines is surprisingly high. Biologists and physicists were cited by 40% of those respondents specifying disciplines, with 15% citing electronic engineers or engineers.

Seventy-five per cent of spin outs cited PhD or postdoctoral scientists as their preferred recruits. Energy, adaptability and good communication skills are considered the most important non-technical attributes.

Over 80% of the spin outs interviewed have no problems in attracting high quality applicants, although there are specific shortages of molecular biologists, industrially experienced medicinal chemists and solid state physicists/device physicists within the UK.

1.5 Comparison with other disciplines

From the 10 universities supplying data, spin outs from chemistry accounts for 34 of a total 225 spin outs from within these universities (15%).

There universities surveyed appear to fall into three groups.

- Those with a large number of spin outs including chemistry.
- Those with a large number of spin outs and a relatively small number from chemistry departments.
- Those with low numbers of spin outs generally.

From the detailed comments from university technology transfer officers and heads of departments, it is clear that some universities and departments have, for various reasons, only recently switched on to the value of spin out companies. Not surprisingly, these universities/departments have few spin outs. In some cases, their past approach has been to license technology. In all cases mechanisms are now in place to encourage and support academic staff in commercialising their research via spin outs.

Eight of the universities surveyed provided data on spin outs from other disciplines. These are summarised in the table below. Medicine includes a range of sub-disciplines (including pharmacology, virology and pathology) as does engineering. Figure in brackets indicate collaborations between departments.

University	Chemistry	Bioscience	Medicine	Engineering	Physics	IT/CS	Total
Cambridge	**8(5+others)**	**5(3+Chem)**	**9(1+Chem)**	**8**	**6(1+Chem)**	**1**	**37**
Cardiff	**3**	**3**	**0**	**5**	**0**	**1**	**12**
Oxford	**6(2+Eng)**	**4**	**11**	**7(2+Chem)**	**0**	**3**	**31**
Bristol	**0**	**1**	**7**	**5**	**2**	**2**	**17**
King's	**1**	**7**	**4**	**3**	**0**	**3**	**18**
Liverpool	**4**	**3**	**3**	**0**	**2**	**4**	**16**
Strathclyde	**5**	**9**	**0**	**12**	**2**	**1**	**29**
Durham	**2**	**2**	**0**	**3**	**2**	**1**	**10**
Total	**29**	**34**	**34**	**43**	**14**	**16**	**170**

From this limited survey, chemistry appears to be as productive as any other discipline. It is also noticeable that forty-eight per cent of chemistry spin outs are joint with other disciplines.

1.6 University support mechanisms

All 10 universities interviewed have mechanisms to encourage, support and fund spin outs. Members of staff receive royalties and equity.

All have dedicated central staff to assist academics in the process of setting up a company. Some, including the most successful, have dedicated training schemes for staff and in, one case, for undergraduates, postgraduates and short-term contract researchers

1.7 Factors influencing numbers of spin outs

Apart from the individual researcher's enthusiasm to form a spin out company and a strong science base, there was agreement among those in the technology transfer offices, heads of department and the individuals involved that the main factors influencing the numbers of spin outs were:

- Encouragement and funding from the university
- Support from the head of department
- Flexible working arrangements and financial support in the early stages to allow academics to take time out and
- Precedents of success, role models, and mentors within their working environment.

Inhibiting factors included pressure of work in 'the day job', lack of experience and lack of an entrepreneurial culture in the department. Many individuals commented on the amount of time spin outs require and the potentially negative impact on the department's teaching and research. Clear arrangements to support the department in the very early stages of forming

the spin out and mechanisms to reward the department when the university realises value from the company are critical.

1.8 Availability of key staff

Most of the successful universities have schemes to attract experienced management via local/regional mentoring networks or venture capital (VC) contacts. Many still find it difficult to identify and attract the right people. Equity stakes are essential to attract and retain the best candidates.

1.9 Priorities for change

Both universities and individuals involved in spin outs considered more early stage seed funding and departmental support as a priority with the following proposals.

- Extend the University Challenge Funds; change the rules of TCS and SMART to allow small companies with universities as major stakeholders to participate (raising the current 25% equity limit). Reduce the paperwork on these schemes.

- Create Regional Venture Capital Funds of £1-2m with a remit for growing university spin-outs.

- Universities and departments should have clear policies, mechanisms and incentives for forming spin out companies and supporting their early stage development.

- Departments should have access to funding for secondments to allow academics to found and grow their spin out companies.

- As these companies grow, there will be a need for more and affordable incubators for small high tech companies. Allowing local authorities to give SMEs longer rent and rate rebates would be one mechanism to support their growth.

- Research Councils should not dilute their support for high quality research by funding technology transfer.

1.10 Actions for the RSC

Almost all respondents recommended that the RSC should support spin outs through networking to share best practice and should introduce individuals to potential partners, Chief Executive Officers (CEOs), non-executive directors and sources of funding. Specific actions include:

- Publicising spin outs by providing information to relevant Government agencies and Research Councils;

- Publicising success stories and role models more widely;

- Running seminars for potential start-up participants and disseminating best-practice;

- Setting up a network of RSC members that have successfully started small companies who would be willing to give some time to meeting and advising potential entrepreneurs;

- Building local/regional clusters of people running companies, by arranging informal networking sessions with a speaker;

- Establishing an RSC entrepreneurial prize with VC funding and a prize that includes VC consultancy time for the best business model; and

- Exploiting the RSC's extensive industrial links to identify people who would be prepared to act as mentors and non-executives in spin outs.

2. Characteristics of spin outs from UK chemistry departments

Twenty-one companies responded to the survey.

2.1 Date formed

Forty per cent of companies were formed prior to 2000, with 60% formed within the past two years.

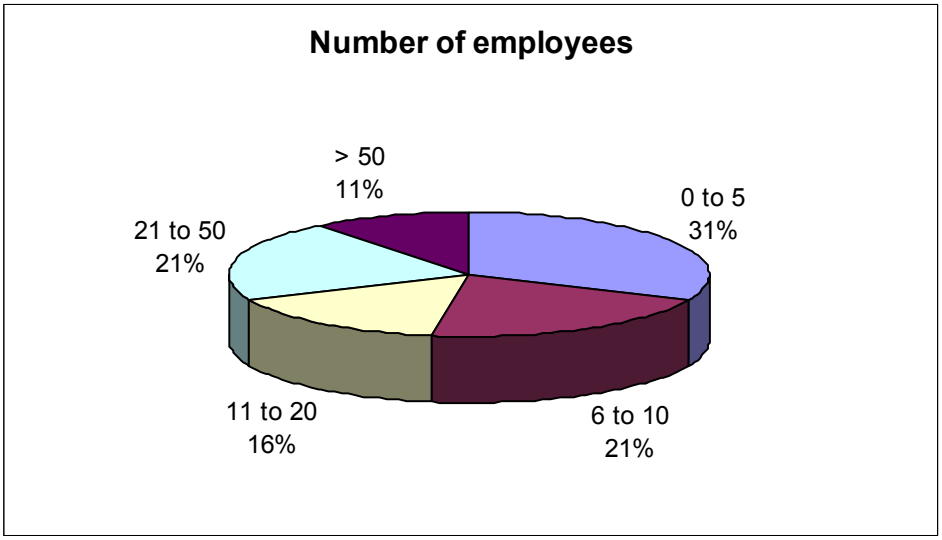
2.2 Nature of business

Three quarters of these companies are involved in research, a quarter of them provide services with only five per cent in manufacturing. Over half (57%) of companies are in the bio/pharma sector, a third are in functional materials and optoelectronics, while only 10% are in the conventional (fine) chemicals sector.

2.3 Number of employees

Seventeen companies provided information on employees. Collectively, these companies employ around 360 people, including more than 110 chemists. The distribution in the number of employees is shown in Figure 1.

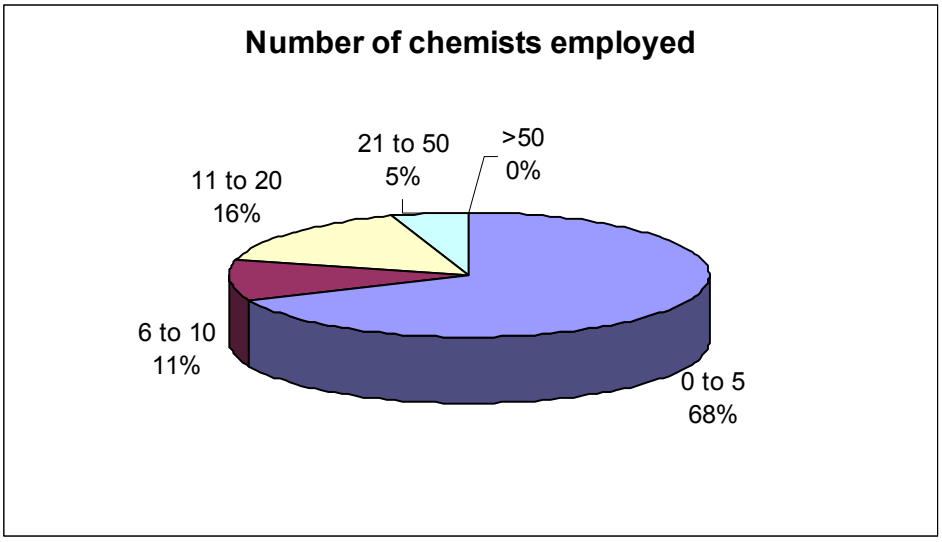
Figure 1



Those companies employing over 50 staff were formed three to five years ago.

Not surprisingly 80% of the spin out companies employ less than 10 chemists. The distribution in numbers of chemists employed is shown in Figure 2.

Figure 2



2.4 Growth rates

When quoted, projected growth rates varied from 0 to 100% per annum, with an overall projected growth rate in numbers of employees averaging 50% per annum.

2.5 Other disciplines employed

Sixty-nine per cent of these spin outs employ bioscientists, 38% engineers (the majority in electronics and device engineering), with 15% employing materials scientists and IT specialists.

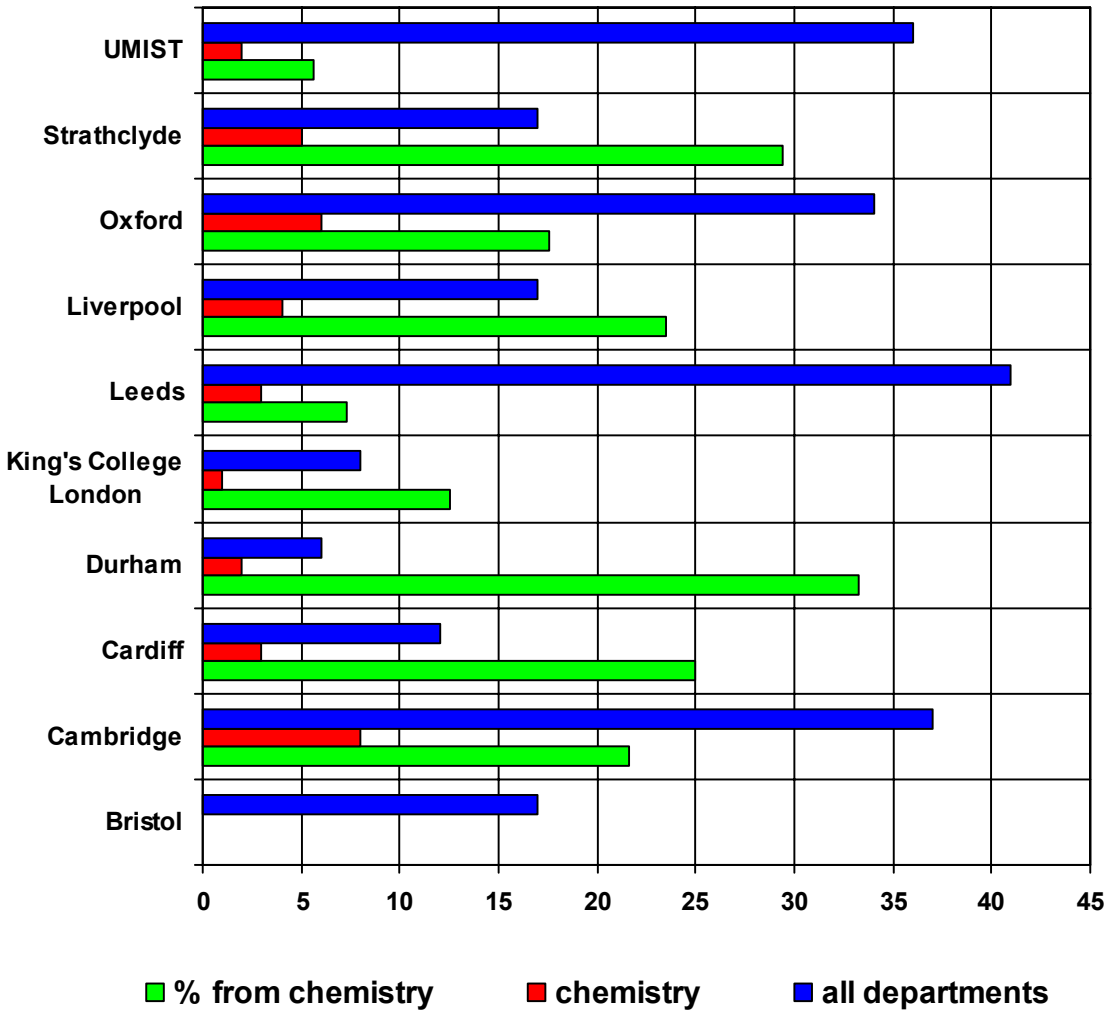
2.6 Other characteristics

All of the companies are privately owned. Ninety per cent of the companies cited companies in the USA as their main competition, 68% cited Europe, with only 25% citing competition in the UK. All of the companies own patents on their key technology.

3. Numbers of spin outs from chemistry and comparison with other disciplines

The technology transfer offices from 10 of the 11 universities questioned supplied data for chemistry spin outs and total spin outs as shown in Figure 3.

Figure 3



Bristol – 0 chemistry spin outs out of a total of 17 spin outs from within the whole university
Cambridge – 8 from 37
Cardiff - 3 from 12
Durham – 2 from 6
King's College London – 1 from 8
Leeds – 3 from 41
Liverpool – 4 from17
Oxford – 6 from 34

Strathclyde – 5 from17
UMIST- 2 from 36

Overall, chemistry accounts for 34 out of a total of 225 spin outs or 15%.

There universities surveyed appear to fall into three groups.

- Those with a large number of spin outs including chemistry, such as Cardiff, Cambridge, Strathclyde, Oxford and Liverpool.
- Those with a large number of spin outs and a relatively small number from chemistry departments, such as Bristol, Leeds and UMIST.
- Those with low numbers of spin outs generally (Durham and King's College London).

From the answers from the staff technology transfer offices and heads of departments, it is clear that departments with the low numbers have only recently switched on to the value of spin out companies. In some cases, their approach has been to license technology; in all cases mechanisms are now in place to encourage and support academic staff in commercialising their research via spin outs.

3.1 Comparison with other disciplines

Table 1

University	Chemistry	Bioscience	Medicine	Eng	Physics	IT/CS	Total
Cambridge	**8(5+others)**	**5(3+Chem)**	**9(1+Chem)**	**8**	**6(1+Chem)**	**1**	**37**
Cardiff	**3**	**3**	**0**	**5**	**0**	**1**	**12**
Oxford	**6(2+Eng)**	**4**	**11**	**7(2+Chem)**	**0**	**3**	**31**
Bristol	**0**	**1**	**7**	**5**	**2**	**2**	**17**
King's	**1**	**7**	**4**	**3**	**0**	**3**	**18**
Liverpool	**4**	**3**	**3**	**0**	**2**	**4**	**16**
Strathclyde	**5**	**9**	**0**	**12**	**2**	**1**	**29**
Durham	**2**	**2**	**0**	**3**	**2**	**1**	**10**
Total	**29**	**34**	**34**	**43**	**14**	**16**	**170**

The numbers of spin outs from various disciplines for the universities that made data available in sufficient detail is summarised in Table 1 above. Note that medicine encompasses a range of sub-disciplines (including pharmacology, virology and pathology), as does engineering.

From this limited survey, chemistry appears to be as productive as any other discipline. It is also noticeable that it has a high proportion of spin outs that are joint with other disciplines.

4. Responses from staff in the university technology transfer offices

Eleven technology transfer offices form UK universities contributed to this survey. The purpose of this part of the survey was to determine what level of support the universities provided to departments and individuals in spinning out companies. Comments have been summarised and none of the comments have been attributed to individuals.

4.1 University incentives

- All have mechanisms to encourage and fund spin outs. Staff receive royalties and equity. Equity owned by university varies, note that if equity is less than 24% spin outs qualify for SMART funding.
- Cardiff has a particularly well developed support system, with access to funds from University Challenge Seed fund and a 'staff displacement' fund to allow academics to take time out.
- There are no major differences in university policies towards spin outs but there is evidence that some have invested more than others, although the late developers are now catching up.

4.2 Support and training

- All have dedicated staff to assist academics in the process of setting up a company. Some, including the most successful, have dedicated training schemes for staff and in, one case, for undergraduates, postgraduates and short-term contract researchers.
- There appears to be a correlation between formal training and success.

4.3 Factors influencing numbers of spin outs

- Individual enthusiasm to form a spin out.
- Positive encouragement and funding from both university and head of department.
- Financial support for early stages to allow academic to spend time on spin out
- Flexible working arrangements – to take time out.
- Precedents of success, role models, entrepreneurial people and mentors within the university.

4.4 Inhibiting factors

- Academics' other priorities; too many other things to do in day job. Only two mentioned the Research Assessment Exercise as a specific burden.
- Lack of experience in academic staff.
- Lack of entrepreneurial culture in the department. Support from heads of department was specifically mentioned by two respondents (Durham and Bristol). Cardiff mentioned their policy of encouraging heads of departments to encourage spin outs by financial support for the activity from the staff displacement fund.

- Lack of funding at early stages and lack of support staff to assist in technology transfer. Note that all claimed to have these resources, but they are obviously limited in most cases.
- One respondent noted that attitudes are age related. Younger academics look to the USA where many of their peers have spun out their own companies.

4.5 Availability of key staff

- Most successful universities have specific schemes in place to attract experienced management via local/regional mentoring networks or VC contacts.
- Many still find it difficult to identify and attract the right people.
- Small companies need to be able to offer generous equity stakes to attract management and there was some concern over the image of corporate greed stemming from Enron that might motivate government action to make it more difficult for start ups to provide the incentives to these people.
- This is one area where local/regional agencies might help in creating a register of individuals with the right background and willingness to join the management of spin outs. Also the RSC local sections/Industrial Affairs Division with its ready made networks has potential for new initiative.

4.6 Priorities for change

- There should be more seed funding especially for all research intensive universities. For example, extend University Challenge Funds and change rules on TCS and SMART to allow small companies with universities as major stakeholders to participate in these schemes (raise the current 25% equity limit). Create regional venture capital funds of £1-2m with a remit for growing university spin-outs.
- The DTI and the regional agencies should provide more incubators for small high tech companies; allow local authorities to give smaller companies longer rent and rate rebates.
- Research Councils fund high quality research, and this funding should not be diluted with technology transfer activities.
- The DTI should recognise that technology transfer offices in universities take a long time to become self financing and need more dedicated funding.

4.7 Actions for the RSC

The RSC should:

- Provide networking opportunities for academics and others to meet successful entrepreneurs and venture capital firms to share best practice, learn how it's done and meet potential investors.
- Set up mentoring schemes on a regional basis so that mentors can advise spin out companies and act as a source of potential management or non-executives.
- Publicise success stories and role models from university spin outs.

5. Responses of heads of departments

There were seven responses from heads of departments in the 10 universities surveyed and there were two other heads of department responding as individuals involved in spin outs. The survey of university technology transfer offices highlighted the importance of the head of department in creating a favourable environment for members of staff to form spin outs. The purpose of this part of the survey was to determine the views of heads of departments on the factors influencing their attitudes to spin outs. The comments come out of the questions asked in the survey (see items 5.1 to 5.4). None of the comments have been attributed to individuals.

5.1 Are there any university incentives and/or support mechanisms in place to encourage and/or support spin outs?

Almost all cited university support schemes to assist academics in forming spin outs. Some of these are recent innovations, which might explain the low numbers of spin outs from certain departments. While all of the universities take an equity stake in any spin outs, only two heads of department cited a specific mechanism for the department to share in any financial gains. In one university, with very few spin outs, this had only recently been set up. Several do not mention equity for individuals as an incentive or university support mechanisms mentioned by their technology transfer offices.

'At the most basic level, the university did little (up until a couple of years ago) to "encourage" academics to commercialise research. Now we have a formula in place for the distribution of license income that provides a real incentive.'

'We also have an arbitration mechanism to provide a return to the department.'

'…departments are also rewarded via revenue sharing arrangements'

'The university now does the deal with the head of the department involved, and this is now working well.'

5.2 Are there any departmental incentives or support mechanisms?

Here the replies are very mixed with no clear common policy. At the very earliest stage of the spin out, when lab space and freedom to concentrate on developing a business plan are critical, a clear and supportive departmental policy could make a big difference. In most cases departments are constrained in terms of space, funding and staff time. This is a key area that needs further development.

'… the head of department has it within his or her gift to make certain facilities available to incubate a spin out. This includes staff time, departmental space and instrumentation as well as other resources. This usually forms part of the service agreement that is set up between the university and the new company that is being formed. The head of department clearly has a key role in enabling his or her staff to participate in this initial and important period, and in

the allocation of departmental resource and there are some interesting managerial issues that have to be dealt with.'

'Heads of departments are normally very supportive of spin out activities… they must ultimately approve the activities of their staff and the new company may be offered access to university/departmental facilities.'

'No departmental incentives – in fact our limited experience of spin outs is that they can take more out than the department gets back'

'None except for the possibility of study leave to develop a project.'

5.3 What factors make a department productive in terms of forming spin outs?

Most cited creative people, a strong research base, examples of success and having role models around the department that build an entrepreneurial culture. None cited support mechanisms, funding or equity incentives.

'High quality research and commercially minded people are the key! A role model or success story within a department is also useful.'

'…you need very clever people in a supportive environment with enough time and financial flexibility to pursue the unexpected and promising. My fear is that as HE budgets are squeezed and accountability demands spiral out of control, our best young people will have neither time nor financial flexibility to be truly innovative.'

'…the academic entrepreneur is the new role model.'

'Need examples of success where both the academic gets rich and the department gets money back.'

One head of a department with few spin outs cited the importance of links between chemistry and other disciplines as the key to applications and therefore spin outs.

'Perhaps a key factor for chemistry is the building of bridges to other disciplines where the chemistry can add significant value to a niche expertise available in another discipline'

This is worth noting because one of the most successful departments has the majority of its spin outs joint with other disciplines.

5.4 Any other comments that you have on what needs to change and why to encourage more academic staff to become entrepreneurs.

Most comments here stressed that the main job of academics is seen as teaching and research. Forming companies and being involved in their running was a major distraction. Ways around this include taking the pressure off the academic by making available business development staff to do the commercial work in setting up and running the company. Another

way is to buy the academic's time from the department (as is the case in one or two departments).

'I am proud of my colleagues' entrepreneurial achievements: some will lead to major enhancements in the quality of life around the world and make significant resource contributions to their university and department. But I also see dangers for the institutional and communal ethos by distracting individuals from their core academic responsibilities.'

'Need to find a way of keeping academics contributing to their departments core activities by getting more 'professional' help to run the company.'

'Exposing academics to those people who drive venture capital businesses, opening universities to these people is key. Most industrial contacts are on the research end and are of a personal nature so one enters a closed loop…. I appreciate that you have arranged meetings like this at the RSC and if we could do more of this at the university level then this might produce tangible benefits.'

'Academic life has become laden with bureaucracy – Research Assessment Exercise (RAE), internal reviews and all of the supporting infrastructure that these activities require. To encourage more entrepreneurial activity (and generally enhancing the quality of research and teaching) would, for me, go hand in hand with removing this load.'

'As long as the current RAE exercise continues there will be a conflict between pressures on staff to achieve high profile in terms of fundamental research and developing ideas which have potential spin out/commercial applications.'

6. Responses of individuals involved in spin outs

There were 20 responses from individuals involved in spin outs. The questions posed determined the views of those starting up spin out companies. The comments come out of the questions asked in the survey (see items 6.1 to 6.5). None of the comments have been attributed to individuals.

6.1 Relationship to departmental research

6.1.1 How is the business related to research in the chemistry department?

Sixty-five per cent of spin outs interviewed were directly connected with research in their respective chemistry department, a further 25% were the result of collaborations between chemistry and engineering, biosciences and materials. Only 10% reported no connection with research in their department.

A quarter of spin outs maintain close links with their 'home' chemistry departments via CASE students, postdocs and other research projects.

6.1.2 How much does the business rely on expertise and knowledge generated form EPSRC research grants?

Fifty-five per cent of spin outs were based on technology that relied heavily on research carried out with funding from EPSRC, of which 30% reported equal reliance on EPSRC and BBSRC research projects, including BMS. A further 30% reported some reliance on EPSRC projects, with the majority of funding coming from other sources.

The 15% not directly founded on EPSRC funded research acknowledged the importance of other EPSRC funded projects in developing expertise for them to collaborate with, via CASE, and postdoctoral students, and for training students whom they have subsequently hired.

6.1.3 Which EPSRC programmes or sub-programmes (chemistry materials, responsive mode or managed programmes, others) have contributed most to the company's technology base?

Of the 85% of spin outs based on outputs from Research Council funded research, 65% reported responsive mode programmes as the most important, the majority of these (41%) being in chemistry.

EPSRC Materials Programme projects were key to 24% of spin outs. Unlike the chemistry based spin outs, most of these cited 'managed' Materials Programmes such as the Electronic Materials for Displays and Smart Materials. BBSRC projects were cited by a number of the individuals responding, mainly from BMS.

A fifth of the chemistry spin outs cited Chemistry ROPAs as the projects that provided the base for the company.

6.1.4 What other sources of research funding have contributed, Industry, DTI, departmental, others?

Industry and the DTI (LINK, TCS) were the main source of additional funding for 50 % of the spin outs early stage research; 20% received money from charities (Wellcome Trust, The Royal Society, National Fund for Cancer Research); and a further 15% relied on venture capital funding.

6.1.5 Is the company still supported in research in any way by EPSRC or other Government funded programmes?

Only 10% of spin outs are currently 'supported' by Research Council projects. 32% are supported via LINK, SMART and TCS projects, with the majority (58%) now funded independently.

Some of the reasons why more spin outs don't participate in Government programmes designed for small companies will be covered below.

6.1.6 Does the company collaborate with other research groups in industry or academe and in what disciplines?

Seventeen of the twenty who replied cited strong collaborations with both industry and academe, with nine of them collaborating with the pharmaceutical industry and academic groups in the life sciences. The remaining eight are all involved with both industry and funding academic groups in the UK, Europe and the USA (physics, material sciences, electronics, electrochemistry).

The three not involved in collaborations answered 'not yet'. This implies that they too would be collaborating and possibly funding academic groups in future once critical intellectual property had been secured.

The intensity of collaboration between these spin outs and both industry and academe is very significant. Reasons include the need to develop products with potential customers as fast as possible and to access and exploit world class research groups.

The multidisciplinarity of the collaborations is also significant, with all 17 working with one or more disciplines in addition to chemistry as a commercial necessity.

If this is replicated throughout the whole of the sector, spin outs could be a key source of industrial funding for UK academe.

6.2 Entrepreneurial support mechanisms

6.2.1 Are there or were there any university or departmental incentives in place to encourage spin out companies?

Fifteen of the individuals who replied thought there were incentives in the form of university and departmental support for academics in setting up companies. In responses from two departments some individuals replied 'yes' while their colleagues replied 'no'. There is clearly a difference of opinion as to what constitutes an incentive.

Surprisingly, despite the equity stakes and royalties offered by all of the universities, few of the academics cited equity as an incentive. This is consistent with their non-financial motivations for spinning out companies reported below.

In terms of support, ISIS Innovations stands out as very highly regarded by members of the chemistry department at Oxford.

'…for the past four years, we have had an excellent company, Isis Innovations, to help both set up the company and assist it during its early years.'

6.2.2 In your opinion what factors make a department productive in terms of forming spin out companies?

Apart from the obvious requirement to have a strong research base and creative people, the factors cited by most respondents included the following, in order of frequency cited.

- A culture of entrepreneurship with a flexible attitude from the department that encourages multidisciplinary research and allows spin outs to use lab space in the early stages.

'Creative individuals, given the flexibility and time (by the department) to develop new ideas.'

'Departments that encourage academics to collaborate, both within the department and with other departments stand to spin out more companies than those departments that operate in isolation.'

'…..need a culture where people are encouraged to commercialise their ideas and are supported flexibly by the university maintaining their academic role.'

'Departments should set aside some laboratory space to serve as rented incubator units housing company employees, properly separate from but in close proximity to ongoing academic research workers.'

- A support organisation to evaluate potential spin out opportunities and provide access to funding.

'It is vital to have an organisation to assess potentially patentable work and then to make sure it is exploited.'

'Financial support pre-funding, contacts, help in drafting business plan.'

- Examples of success

'Above all examples of success – 3 millionaires in department is good motivator'

6.2.3 Did you receive any support from the university and/or your department?

Eighteen of the 20 who responded had received support from their universities and departments. Universities typically covered patent costs and legal fees setting up the company, writing the business plan and in many cases provided funding in return for an equity stake. Key support from departments included providing lab space and time off to focus on getting the company established. In one case the academic was given a one year sabbatical.

'*IC Innovations gave advice on starting company, seed-corn financial help, arranged Business Angel support, identified CEO and contacts with bank and lawyers.'*

'University invested in company and assigned intellectual property rights.'

'The university made an investment in the company from the University Challenge Seed Fund.'

'I was allowed 50% of my time on the commercialisation of our company for five to six years. The university had a patenting policy in place and a commercial department to deal with the intellectual property and its exploitation.'

'Provision of laboratory space in return for bench fees.'

6.2.4 What sources did you consult for advice and assistance that you found useful and why?

Most respondents had benefited from advice from their university technology transfer offices. Other important sources of advice included colleagues who had done it before and regional development agencies. BBSRC's BioBusiness Plan competition and related seminars were quoted by two respondents as good sources of contacts and advice in the early stages of setting up the company.

6.2.5 What support would have been useful to you but wasn't available when you were starting up or considering starting up a company?

Responses included easier access to funding, lab space and more support after founding the company.

'VC is still a problem in the UK, no problem in USA.'

'Dispassionate legal and financial advice on the structure of the deal setting up the company, and on the actual legals themselves. The promoters (academics) really had to fend for themselves against experienced negotiators.'

'More hands-on assistance post-company formation.'

'A faster lawyer than the university lawyer.'

'All of the information necessary was available initially because the founding team was complete and included people with financial experience, business experience and scientific experience. Had any one of that team been missing it would have been extremely difficult to get information about the aspect that the specific person brought to bear on starting up'

6.2.6 What factors inhibit academics starting spin out companies?

Respondents were almost unanimous that there were two factors inhibiting academics from spinning out companies; pressure of their day job and inexperience.

'Financial inexperience of the commercial world. Lack of knowledge about VC networks.'

'Pressure of academic work, especially teaching. Inexperience of patenting, funding, raising investments, employment law… The latter is probably the most daunting and it is getting more complicated.'

'Fear of failing, having a "brilliant idea" but not the rounded skill set to make it into a company, having to perhaps "leave" academe to really push the idea or being dependant on industrial staff to make the idea happen. Lack of industrial experience.'

'Priority is academic science – need to see that it can be done without harming academic careers. Must be confident they can keep the day job and not think they have to run the business.'

'The work interferes with the academic research; the attitude still prevailing amongst members of the academic profession and in professional bodies, that such work isn't 'respectable'; the apparent ease of dealing with venture capitalists in the USA compared to the unsympathetic short-term attitude of most UK venture capital firms has been enlightening and, from the UK point of view, disappointing.'

6.2.7 What was your personal motivation for starting a spin out company?

Here again there was almost unanimous agreement that the motivation was mainly to take a good idea through to market, often in the form of a product that would be beneficial to society and the economy. Many respondents also thought it would be a change from academic research and even fun. Only a minority (25%) mentioned making money.

'Belief in potential of technology. Interest in business. Excitement.'

'Technology could be used for rapid diagnosis and hence could save lives. Felt obligation to fast track this and get to stage where it could be used in hospitals. Only way to raise significant amounts of money is to form a company.'

'Wanting to make a "difference". Wanting to rectify the view that UK academics do not create wealth. I did not want to make myself rich!'

'The idea needed exploitation: it was too risky for an established company so they suggested we start our own. If successful, it should be really valuable for many people, creating local wealth and employment.'

6.2.8 Have there been any negative experiences that might deter members of your department from founding a spin out company?

Common issues included the large amount of time required to get the company up and running, finding VC funding and the shock of the commercial culture in the 'real world'.

'…begun to be concerned about the amount of time and effort I and my colleagues now spend on start-up companies, which puts pressure on normal university duties. This needs careful management if teaching and academic research are not to be compromised by burgeoning start-up effort.'

'The current IPO market and funding is very tough – there are several start ups/spin outs from the university that have recently had to lay staff off and are likely to be pretty short of funds by year end – not the easiest climate for starting a new company.'

'The truly appalling attitude of the UK banking and venture capital community. They are greedy, risk averse, pride themselves in not having a clue how things work or fit into a wealth creating chain. I would deport most of them to some far- flung outcrop of rock in the north Atlantic!'

'It's a rough tough world out there and indeed in there. I would warn people of these problems because unless people are brave enough to tackle and surmount these negative experiences they should not be encouraged to leave the security of their university labs.'

'The blinding conservatism of British industry.'

6.2.9 What advice would you give to anyone in a university considering starting up a company?

Almost all respondents stressed the need to get the best advice as early as possible, build a team with complimentary business and technical skills, and be prepared to spend most of your time on it.

'Seek good advice, talk to established spin outs. Do not underestimate the time and effort involved for success.'

'Get good advice and go and see VC's (or funders) early on. They do not need a business plan and will help write it. Meeting them will be very helpful even if they do not decide to fund. Express science simply.'

'Make sure that the necessary expertise is available to help you write a business plan, raise capital and do the necessary legal part of setting up a company.'

'Very early need to have very have clear IP situation. Employ a fast lawyer.'

'Take a long hard look at the research and identify the unique selling point that must exist if it is to be successful… pitch it to someone who has commercial knowledge and gauge their response…. decide if you can devote most of the next five years of your life at the expense of everything else to pushing ahead with your idea… find a team with the same values and complimentary financial and business skills and go for it, because spinning out is a thrilling experience'

6.3 Financing and resourcing spin outs

6.3.1 What sources of finance did you explore and use, venture capital, business angels?

Funding is typically in stages, starting out with founders' funds, business angels and progressing on to venture capital once the company needs to grow. A quarter of the companies are in the very early stages with funding from their founders and/or universities, a fifth have funding from business angels and over 50% are VC funded. Fourth fifths of the companies in this survey were considering venture capital or had received VC funding. Almost half had their first support from business angels, with only 6% citing university funding and a similar proportion of founders putting their own money in.

'We explored every avenue of financial support. Initial funding was provided by the founders (very important to convince other investors that founders and academics are committed to the project) and their family and friends. Second round funding was provided by venture capitalists. Further funding was provided by entering into joint developments with multinational companies with interests in the field.'

6.3.2 How long did it take to raise finance?

Almost a fifth of the companies in the survey reported getting funding within weeks, although some of these had previous experience in setting up spin outs. 24% took up to 6 months with the remaining 47% spending around a year or more in some cases. Business angels were cited as being much faster in making decisions on funding than VCs, presumably because the amounts of money in most cases are much smaller.

'Two weeks for business angel, two years for VC (not yet completed).'

'Raising funding never stops.'

6.3.3 How much of your or the CEO's time is spent raising next round finance vs. managing the company?

Fifty-eight per cent reported that their CEO spent over 50% of their time raising finance; for many of these it was their full time job! 25% spend up to half their time raising funds and only 17% spent the majority of their time running the company.

6.3.4 Is access to facilities, labs *etc* a problem?

Four-fifths of the companies surveyed did not have a problem finding lab space because they are still in their early stages of development and have access to university lab space and equipment at reasonable rates. Many foresee access to suitable facilities at affordable rates will become an issue when they want to expand.

University chemistry departments are clearly playing a critical role here in providing lab space and access to equipment.

6.4 Recruitment & training issues

6.4.1 What sort of graduates are you looking to employ in terms of discipline, higher degrees and non-technical skills?

Not surprisingly, chemists are the main recruits in to these start ups but with a surprisingly high proportion of other technical disciplines. Biologists and physicists were cited by 40% of those respondents specifying disciplines with 15% citing electronics engineers or engineers.

Seventy-five per cent cited PhD or post doctoral scientists as their preferred recruits with only 16% requiring industrial experience, these being in the pharma sector.

Energy, adaptability and good communication skills were cited frequently as being the most important non technical attributes.

'Extremely intelligent organised and creative people, ideally with postdoc experience - chemists, physicists, engineers, electronic engineers, software developers.'

'Across the board but main pinch point is industrially experienced medicinal chemists – national and international shortage.'

'Require good specialist skills and the willingness to adapt; mainly looking for PhD and should be good at communicating.'

6.4.2 Can you find the right sort of graduates and if not what's the problem?

Over 80% reported no problems in attracting high quality applicants although there are specific shortages of molecular biologists, industrially experienced medicinal chemists, solid state physicists and device physicists in the UK.

6.4.3 What aspects of graduate training do you see as being important to provide you with the staff you need?

Apart from good technical skills, most respondents cited flexibility, adaptability and good organisational skills as the most important aspects of training.

'Tough question – bright, well trained, flexible, motivated, self confident, assertive, team oriented - for a number we are looking for specific skills.'

'Good grounding in experimental science such as good scientific technique as opposed to button pushing and handle turning. Start-ups usually require scientists with initiative, who are prepared to do everything rather than rely on a small number of lead scientists and lots of technicians. Start-ups by their nature are very flat organisationally and this requires people to be able to construct and run their own projects effectively.

A skill that is universally lacking in fresh PhD level graduates is the ability to construct and track project plans and stick to deadlines and targets. This is even though they have completed notionally independent research projects as part of their PhD. Project planning and tracking should be taught early on in a PhD student's career at the university.'

6.4.4 Do you have a CEO and or management team with previous experience running a technology business?

90% have an experienced CEO, with the remainder of the spin outs being at an early stage and still looking for senior management.

6.4.5 Are these types of people available and affordable to spin outs?

Most respondents thought that CEOs and senior management were available, but at a cost. Stock options were cited as critical to attracting the right people.

'They are available but at a grossly inflated price.'

'Crucial bottleneck is getting correct CEO. More available than in past with industry mergers etc but still rare to find one with all the right qualities. Stock options are key to getting people in and keeping them in the company.'

'Hard to find – there are quite a few not very experienced CEOs around that have only ever worked in a company that was able to ride the markets on the way up – that's fine, but not a broad skill set. We recruited from the US in our second year.'

'The people are available; finding them is difficult and getting an introduction to them is even harder. Once an introduction is arranged by a party that the non-Exec trusts, then the non-exec is usually willing to come on board if they think the idea is viable'

6.5 Priorities for change

6.5.1 What would you recommend as the priorities for Government (DTI, Research Councils, other departments) or universities in terms of action to support small technology based companies?

The main areas for change are as follows.

- Incentives for university departments to spin out companies and support their early stage development.

'Incentives at university departmental level to spin out companies. This can take the form of tax incentives, grant funding incentives for example a spin out triggers further grants for more research.'

'Since most are based initially in university laboratories, assistance for a limited time in bearing the costs of use of space, facilities [for example a two- to three-year support of space charges, electricity etc] would encourage departments to devote space in the crucial very early stages of start-up companies.'

'Encourage universities and other organisations with large and often under-utilised laboratory and other appropriate space to make these available at zero or a non-commercial cost to start-up companies.'

'The enthusiasm within a university for start-up companies is ultimately finance-based, such as the successful ones will provide a fund to encourage more; in the longer term, some of the companies might be expected to succeed spectacularly, injecting large amounts of capital into the university. There is a need to recognise at the outset that some of these earnings when realised will flow back to the department whose members bore the initial cost in staff time, space, and other resources. In general I do not believe such arrangements are in place at an early stage; doing so would provide further encouragement for a department to act in an entrepreneurial fashion.'

- Funding for secondments to allow academics to grow the company.

'The need for academics to devote time to the start-up occurs after one to two years i.e. at the point where the company is really starting to expand, often away from the university laboratory. An EPSRC competitive, funded secondment scheme for principal academic participants would allow them to devote 100% of their time to the company for say, one to two years, the department then being able to cover their normal duties by a temporary appointment. This would remove much of the tension which can be created within a department with many start-ups.'

- Grants for early stage research and business development.

'Grants for proof-of-principle early stage research and for recruiting a suitably skilled consultant for developing business strategy prior to seeking funding.'

'More funds for grants to small companies. US companies have access to much more funds. In DNA area I know of companies that received more than $20M from the US government-funding at this level is not available in the UK making it an uneven playing field.'

'The most difficult step is the first. Therefore postdoctoral grants targeted at the first stage are likely to be most productive. They are also cheapest to provide as long as departments are encouraged to set up incubator facilities. Relief from undergraduate teaching for the initial 2 year start-up would be an enormous help.'

- Reduce red tape.

'The paper chase involved in getting SMART awards, European grants and similar schemes has been a major deterrent to us getting involved – we could raise larger amounts of money with much less effort elsewhere. The government and government agencies should decide whether they really want to support such initiatives and if so reduce the amount of time, paperwork and effort required from the small company to participate in such schemes'

'Remould the LINK scheme so that it is less onerous to manage on the company side.'

'Make the regulatory rules easy to implement, we waste too much time and resource on tax/legal issues.'

'Look into methods of accounting for small companies e.g. what can be charged as research expenditure'

6.5.2 What would you recommend the RSC do to support members in small companies?

Almost all respondents recommended that the RSC should support spin outs through networking to share best practice, introducing individuals to potential partners, CEOs, non-executive directors and sources of funding.

'Publicity, information flow to relevant government agencies, Research Councils. Run seminars for potential start-up participants, disseminate best-practice.'

'A network of RSC members that have successfully started and run small companies – people that would give some time to meeting people and networking with them about new idea for businesses – could be contacts on the web, socials, organised meetings etc'

'Advice/consultancy – has the RSC people that know the ropes to give advice? Guidance is not easy to find or fund. Perhaps the VCs could be asked to contribute a small sum each to

support a RSC chemistry entrepreneurial prize –best business model wins consultancy time with a high quality VC/consultant.'

'Important to build networks – people running companies get together to share experiences. These things happen in clusters. Getting people together in local/regional get togethers – Cambridge, Oxford, Manchester N East etc. Informal session plus one speaker to tell story.'

'RSC could use its extensive industrial links to identify panels of people who would be prepared to act as non-execs and consultants to small companies. It could publish this list, together with the individual's areas of expertise with the intention that small companies could approach these people to see if they are interested in the small company's business. This would be particularly important in the formative stages of a spin-out company's existence.'

***'**Big equipment availability is a problem for start-up companies. We, for example have the technical know-how to utilise the expensive big-gun apparatus of chemistry departments but could not afford to buy or maintain such. Such equipment is often under-utilised and out-of-hours use using and paying for the university technical operator (to his/her financial benefit) to provide a modest service on demand might be useful. Perhaps RSC could encourage the networking and building of relationships at this operational level.'*