

## **Industry-university cooperation survey, 1996.**

### **Contributors**

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# INDUSTRY - UNIVERSITY

CO-OPERATION SURVEY

## **Adopt Innovation.**

The successful  
exploitation of  
new ideas

dti

Department of Trade and Industry

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# FOREWORD BY JOHN BATTLE MP

*Minister for Science, Energy and Technology*

*This publication, the 1996 Industry/University Co-operation Survey, builds on the 1995 Survey, which gathered together a wide range of information on the extent to which universities and industry were working together in the research field. The results showed that the best universities were heavily involved in exploiting the commercial benefits of their research, for example through patents and licences, and the income they generate, and through the formation of spin-out companies. However, the picture was patchy, with other institutions hardly involved at all in these activities. I know that as a result, many Vice-Chancellors and industrial liaison officers have used the Survey to measure their own performance in these areas, both against the national average and against the top performers.*

*The 1996 Survey looks at equally important interactions in the area of training and education, as well as research. One of the key factors in the UK's future competitiveness will be the strength of our knowledge base, and the extent to which we can develop and build on this. We have traditionally performed at a level way beyond our national size in the development of new ideas in our higher education sector, but we have been unable to maximise the payback to the nation. If we are to achieve this, it is important that universities and industry should see themselves as allies, working in partnership together to take these new ideas into successful products and services, which blend together wealth creation and improving the quality of our lives.*

*As last year, we were grateful for the help of the Association of University Research and Industry Links in developing and completing the research questionnaire. To help with our work on training and education, we have added new partners in the Department for Education and Employment and the Universities' Association for Continuing Education. Without all their help, we could not have achieved the continuing high levels of response from the universities.*

*This Government is committed to innovation, and to building new partnerships which will take this country into the new millennium ready to face the challenges it will bring. If this survey encourages both universities and industry to look at the real opportunities for working together, to re-assess their performance, to build on their areas of strength and to minimise their areas of weakness, it will have done its job.*





## INTRODUCTION

In 1995 the Innovation Unit of the Department of Trade and Industry (DTI) undertook the first Industry/University Co-operation Survey. This pilot examined a range of co-operative activities between industry and universities, mostly in research links. The project demonstrated considerable industrial co-operation by many universities, although there was some variation in activities, mechanisms and outputs. A summary of the survey results was published in March 1996, and launched by the then Minister for Science and Technology. Copies of the summary were sent to all university Vice-Chancellors, and the majority of comments that came back to DTI have been favourable.

Universities are using the 1995 Survey as a benchmark to scrutinise their own levels of industrial co-operation. The survey has also provided input to the Dearing Committee, and industry is using it as a tool for exploring potential new collaborations with universities. Demand for the summary has been high, and more than 2,500 copies have been distributed in the UK and overseas.

The 1996 Survey aims to give a comprehensive picture of how UK universities co-operated with industry during the academic year 94 - 95. It deepens coverage of the areas included in the 1995 Survey and has begun exploration of the important, but more difficult to measure, area of education and training for industry. DTI has collaborated with the Department for Education and Employment (DfEE) on the 1996 Survey, and DfEE's participation has been particularly helpful in shaping the questions on education and training, and analysing the results. Data was sourced on 111 university institutions from central bodies, and questionnaire surveys to which 89 replied on research links, and 87 on education and training co-operation with industry.

The principal findings are: research income from UK industry has remained roughly constant (bearing in mind the larger sample size) at £145 million, 10.8% of the total of £1,345 million, as has also revenue from the exploitation of patents and software at £14.9 million. Universities have spun-out over 46 companies to commercialise research and technology. 2,315 staff in universities receive their principal source of salary from UK industry, over 2% of the total of 101,685. 79,103 students, nearly 6% of the total of 1.3 million, receive their major source of fees from UK industry. Over 80% of universities have arrangements with industry to provide feedback on the academic curricula, teaching, and placements for students.

The 1995 and 1996 Surveys examined very similar universities for centrally sourced data on research income and collaborative research schemes linking universities and industry. However different universities replied to the questionnaire surveys in the two years and therefore general conclusions have been drawn, rather than statistical comparisons.

The methodology, and a list of acronyms is on page 12.

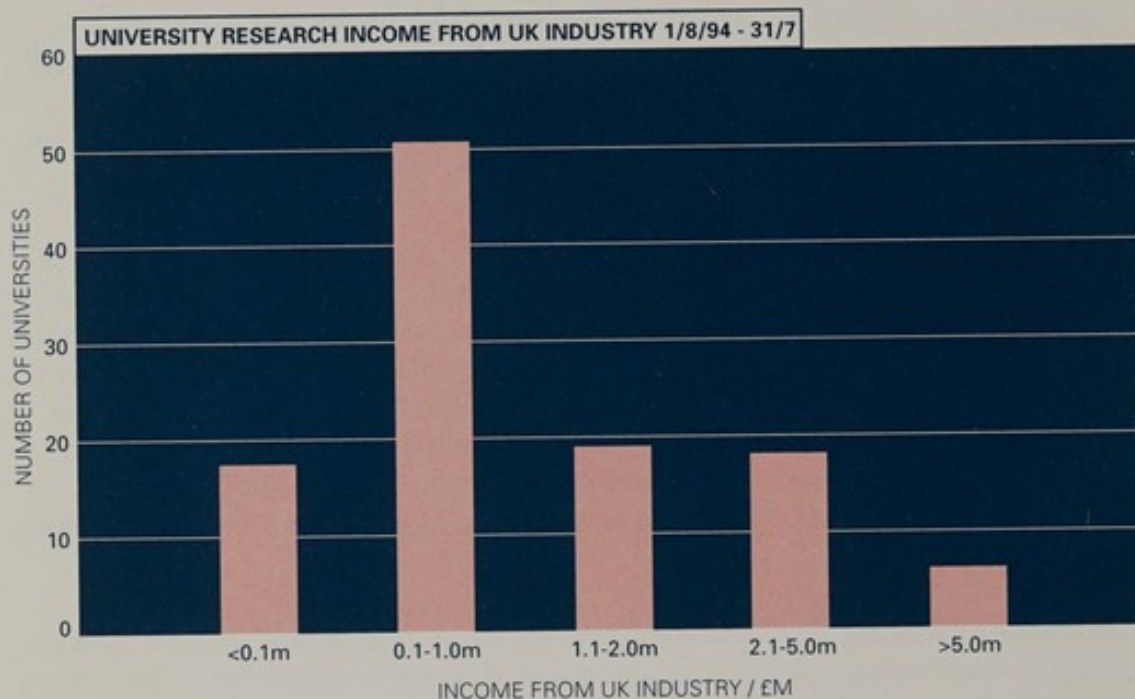
## UNIVERSITY RESEARCH INCOME

The Higher Education Statistics Agency (HESA) reported that the total external research income for the 111 UK universities surveyed was £1,349 million for the year 1/8/94 - 31/7/95:

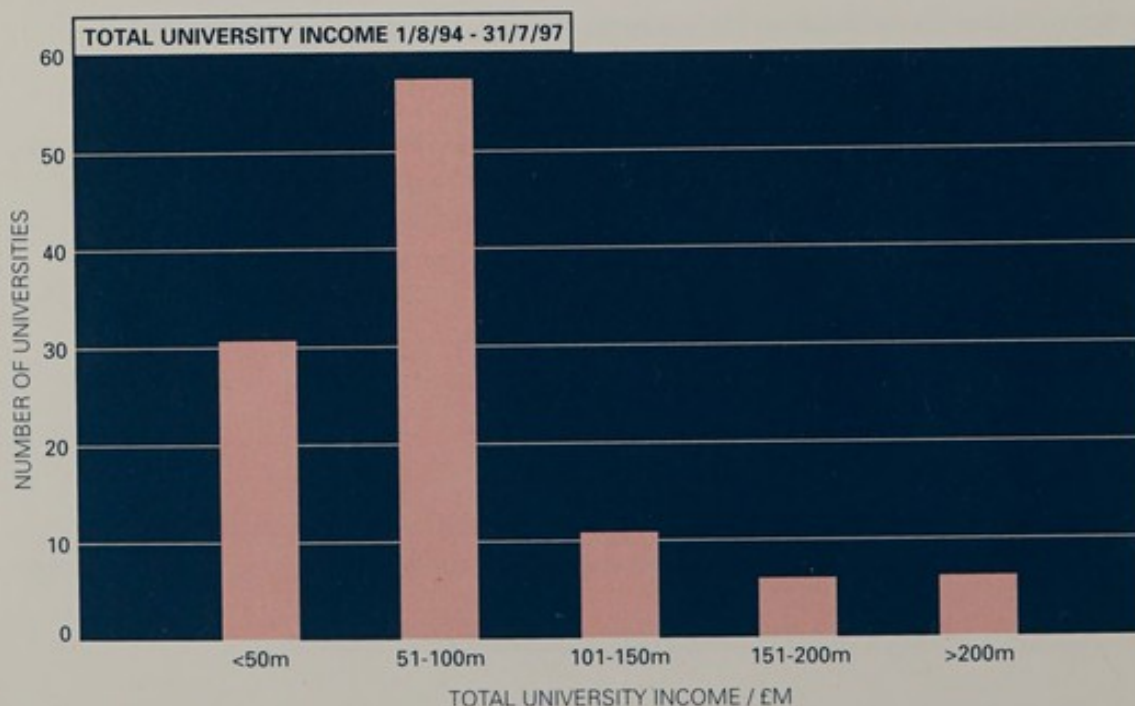
- Research incomes varied from £66,000 to £93 million per university.
- Research income derived from UK industry was £145 million:

- Research incomes varied from £13.4 million to £1,000 per university.
- UK universities obtain between 3 to 44% of their external research income directly from UK industry, with a mean of 10.8%.

There is variation in the way in which universities report research contracts which involve a combination of public and industrial funding, and it is possible that the industry contribution is under-reported. In the academic year 93-94 the UK Funding Councils reported that the external research income for 108 universities was £125 million from UK industry, with a mean of 10% of the total of £1,267 million.



Analysis of income derived from UK industry by academic subject shows considerable variation:





Subject	UK industry income £ million	Total Research income £ million	UK industry/ Total research income %
Medical & Life Sciences	55.5	658.6	8.4%
Physical Sciences & Maths	23.2	236.4	9.8%
Engineering	42.7	197.4	21.6%
Electrical, computing & IT	11.1	106.0	10.5%
Business, Social Sciences & Humanities	13.0	139.9	9.3%
Other services & Administration	0.2	10.9	1.8%
<b>Total</b>	<b>145.7</b>	<b>1349.2</b>	<b>10.8%</b>

Co-operation between universities and industry is encouraged by a wide range of UK Government mechanisms, frequently involving the Research Councils. The four major schemes are: Co-operative Awards in Science and Engineering (CASE), Industrial CASE, LINK and TCS (the Teaching Company Scheme). Additionally, Research Councils promote links between academe and industry through an extensive range of other mechanisms.

CASE, LINK and TCS use different industrial categories for their awards. The 1996 Survey reports on new schemes started, whereas the 1995 Survey reported on active schemes and so they are not directly comparable.

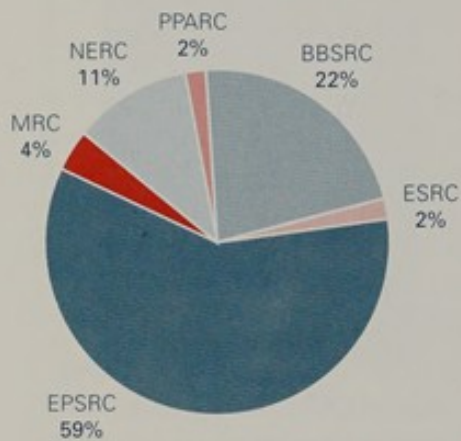
- CASE awards are financed largely by the Research Councils with some industrial finance and encourage industrially relevant research projects by PhD students at universities. Industrial CASE operate in exactly the same way as CASE except that the Research Councils allocate the awards to industrial companies to support projects at universities which they select. 1994-5 is the first year in which Industrial CASE has become fully established by the Research Councils. A total of 896 awards were allocated for 1/8/94-31/7/95. EPSRC remains the majority provider of CASE awarding a total of 532 grants, followed by BBSRC with 200.

<b>Awards Started 1/8/94- 31/7/95 (includes CAST awards from Northern Ireland)</b>	<b>Case</b>	<b>Industrial Case</b>	<b>Total</b>
BBSRC (includes SERC initiated awards)	182	18	200
EPSRC	472	60	532
ESRC	0	15	15
MRC	32	0	32
NERC	80	15	95
PPARC	18	4	22
<b>Total</b>	<b>784</b>	<b>112</b>	<b>896</b>

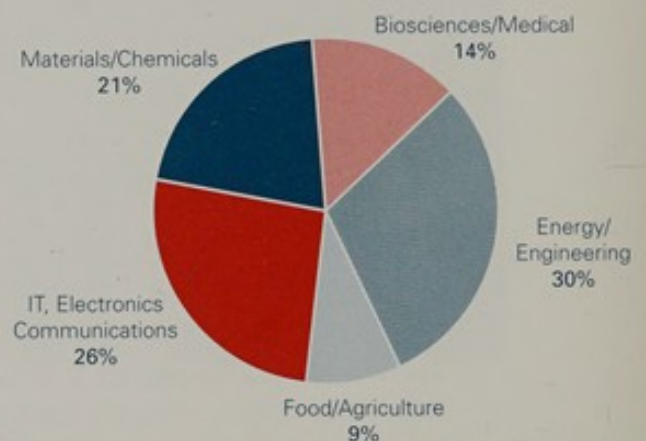


- LINK promotes partnerships between industry and the research base (usually universities) through managed programmes of pre-competitive collaborative research. There are now 54 LINK programmes, comprising 800 projects. Government departments or Research Councils provide up to 50% of eligible research costs, with the balance of support coming from industry. Project work in universities is normally undertaken by post-doctoral researchers. 103 new projects with universities were started in the academic year 1/8/94-31/7/95.
- TCS supports partnerships between companies and universities facilitating technology transfer and aims to forge lasting partnerships between them. Through the Scheme, grants are made available to universities to support the Programmes which are undertaken by young graduates, known as TCS Associates, under the joint supervision of company and academic staff. In addition to the grant, each Programme is also funded by the participating company. 140 new projects, involving universities, were started in the year 1/8/94-31/7/95.

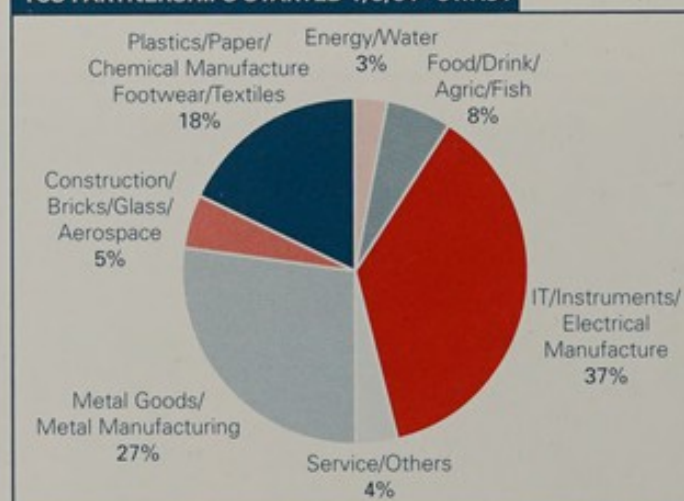
**CASE PROJECTS STARTED 1/8/94 - 31.7.94**



**LINK PROJECTS STARTED 1/8/94 - 31.7.94**



**TCS PARTNERSHIPS STARTED 1/8/94 - 31.7.94**



## EXPLOITATION COMPANIES

Statistics reported by 89 universities are:

- 63 universities reported 93 wholly or partially owned exploitation companies. Such trading arms are used by universities for three main reasons: to carry out commercial

activities while protecting institutions' charitable status, for conducting joint ventures, and for rewarding key staff. Unlike spin-out companies (page 6) they remain part of universities.

- Gross income for the 93 companies for 1/8/94 - 31/7/95 was £121 million.
- Nearly all the companies handle consultancy, and most the exploitation of intellectual property rights (IPR).

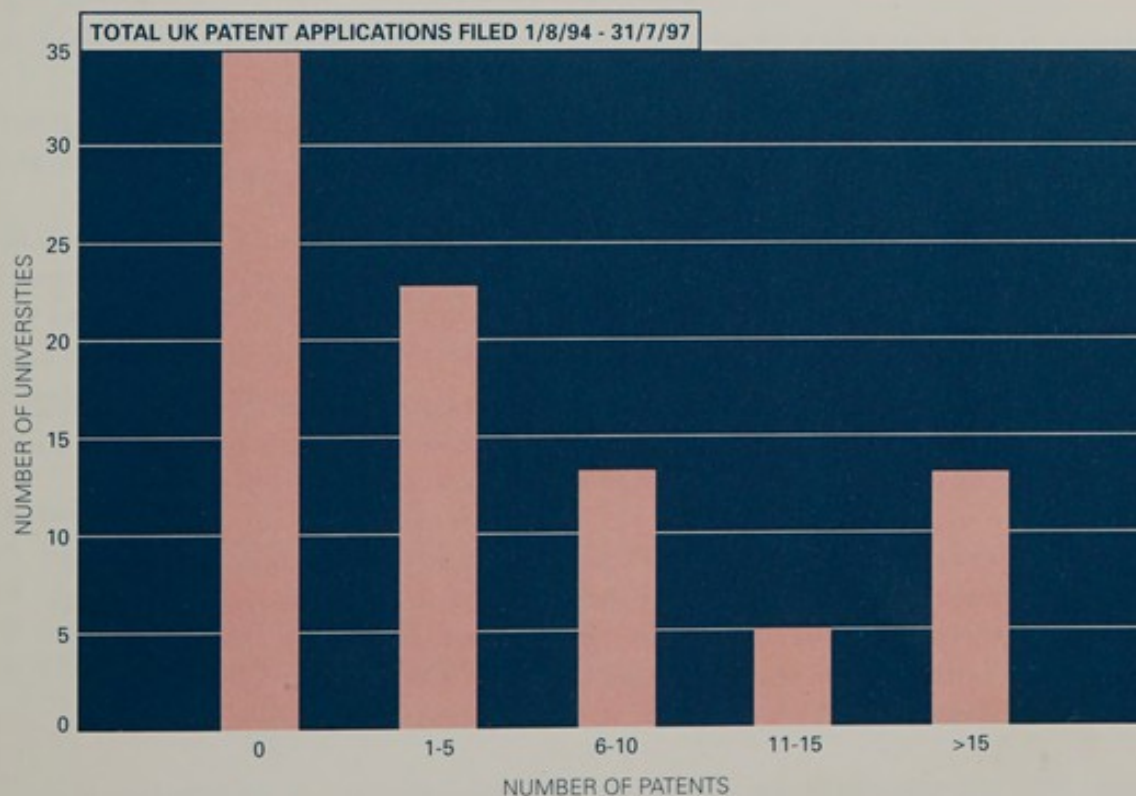
In the 1995 Survey, out of 80 universities responding, 46 stated they had exploitation companies with total gross income for 93-94 of £65 million. Double the number of companies and income are reported this year, and this can largely be attributed to the fuller reporting from the universities.

## PATENTS AND SOFTWARE

Results from 89 universities showed the following patent filing activity for 1/8/94-31/7/95:

- 546 UK patent applications were filed, 397 of these were new applications
- The largest number of patents filed by a university was 38
- 56 UK patents were granted.
- Estimated external costs for patent filings were £2.3 million.

For the three year period 91-94, 80 universities reported they filed 757 UK patent applications, 252 per year on average. The figures for 94-95 are therefore over twice as great. As before, the number of patent filings recorded is likely to be a considerable underestimate as filings which arise from industrially funded work are generally made by the industrial partner. This year, 55 universities (62%) reported that patent applications filed by industrial sponsors are notified to the university, either by the sponsor or researchers. 78 universities, 88%, reported they have a formal policy on the ownership of staff IPR, and 54, 61%, universities have one for students.

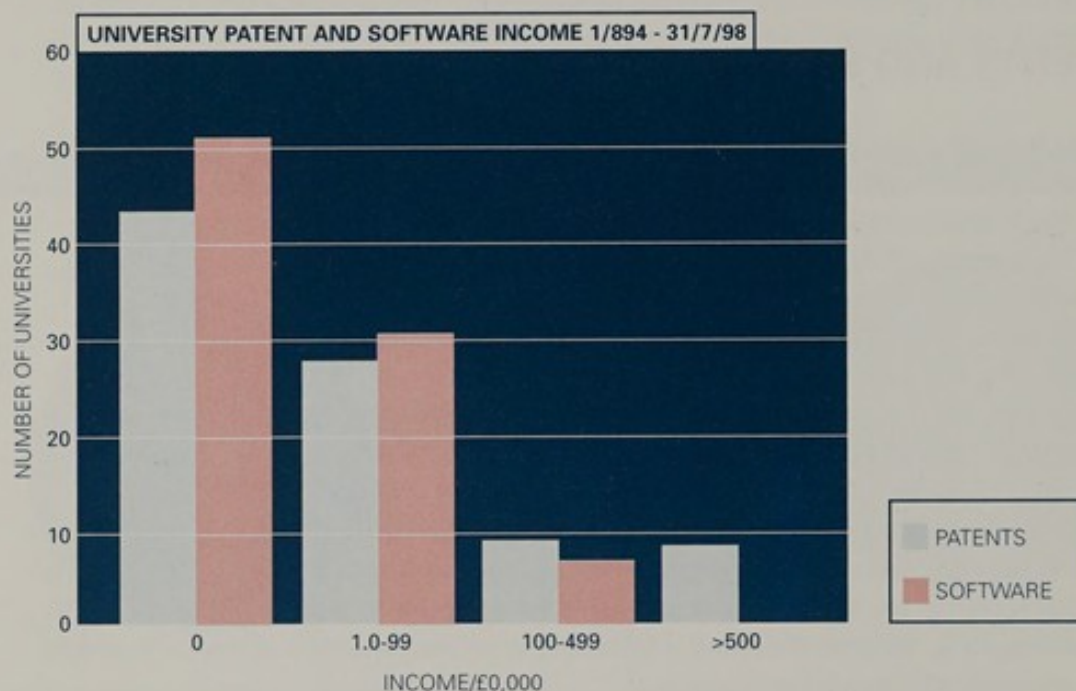




Intellectual property revenue statistics reported by 89 universities for 1/8/94-31/7/95 are:

	£/ million
• 569 active licences, options, sale of patents	11.9
• 329 software licenses or sales	1.9
• 1050 other licences (copyright, design rights)	1.1
<b>TOTAL</b>	<b>14.9</b>

Most universities license the majority of their patents to UK companies. In the 1995 Survey, total IPR income reported by 80 universities for the three year period 91-94 was £43 million, therefore on average £14.3 million per annum. Hence there has been a small rise.



## SPIN-OUT COMPANIES

89 universities reported the formation of 46 spin-out companies between 1/8/94 - 31/7/95. These companies are formed to exploit services or technology which have emanated originally from universities, but now have a separate identity.

- 28 companies, 61%, are dependent on licensing of university technology.
- 153 companies are estimated to be in incubation.

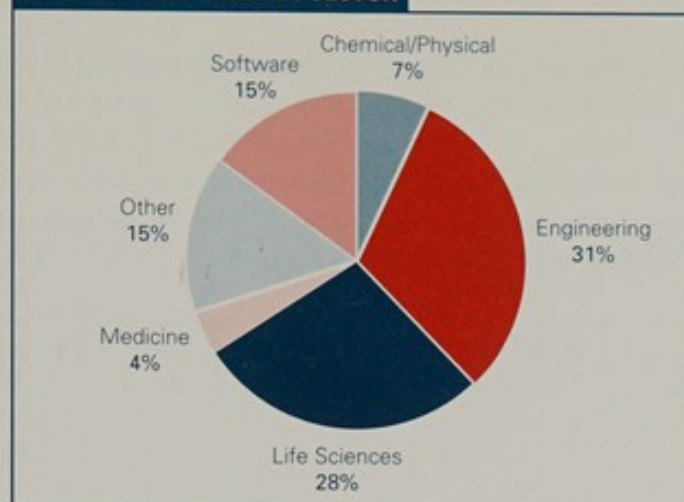
The number of companies formed is likely to be an underestimate since there are known to be companies set up directly by academics without the benefit of university support. In the 1995 Survey, 80 universities reported that 277 spin-out companies were in existence.

43 universities are partners in UK Science Parks, and 35 universities, 39%, reported that they have access to incubator units where there is accommodation for start-up companies with support services, for example meeting rooms and advice for entrepreneurs. Of the 39%, 48% of universities have access to units on campus, and 71% to units on their university's science park.

Note : Data was gathered on companies which have been formed with a licence from a university, or in which it holds equity, or both.



#### SPIN-OUT COMPANIES BY SECTOR



## CONSULTANCY

Consultancy is undertaken by individuals, departmental groups, and via central organisations and frequently several routes are used. 76 universities, 85%, reported that they have a written policy on consultancy. Universities reported that the majority of consultancy is undertaken by individuals, a pattern unchanged since the 1995 Survey.

## SUPPORT SERVICES FOR INDUSTRY

89 universities provided information on whether they offer equipment-based specialist services (for example analysis, measurement and testing) in a variety of areas as follows:

	% Universities
• Engineering	78
• Chemical and Physical Sciences	78
• Life Sciences	69
• Medicine and Pharmacy	38

The principal difference with the 1995 Survey is the figure for Medicine and Pharmacy which has dropped by 9%.

Of 89 universities, 42 reported they provide industry clubs. The clubs generally hold informal meetings for researchers and representatives from industry, centred on an industry sector (for example paper) or technology (for example opto-electronics). 37 universities, 41%, regard small and medium sized enterprises (SMEs) as important customers. Results on the provision of clubs are:

	% Universities
• Engineering	39
• Chemical and Physical Sciences	24
• Life Sciences	22
• Medicine and Pharmacy	6
• Other (eg business management, innovation)	21

## INDUSTRY SPONSORSHIP OF STAFF AND STUDENTS

HESA reported on the funding of 101,685 full and part-time staff in 111 universities for 1/8/94 - 31/7/95:

- 2,315 received their principal source of salary from UK industry, over 2% of the total
- There is wide variation in sponsorship from UK industry across subject areas, with the highest occurring in the Medical and Life Sciences.

Principal source of staff salary 1/8/94 - 31/7/95	Medical & Life Sciences	Physical Sciences & Maths	Eng'g	Electrical, Computing & IT	Business, Social Sciences & humanities	Other Services	Total
UK Government bodies	3842	494	359	260	756	21	5732
OST Research Councils	3589	3011	1864	1189	866	20	10539
UK Industry Commerce	886	416	492	240	270	11	2315
UK based Charities	4773	212	85	41	461	17	5589
EU Commission funded	454	487	319	378	200	10	1848
Other sources, including institution & Funding Councils	15738	11771	6759	6127	33773	772	74940
Other overseas	332	175	70	54	89	2	722
<b>Total</b>	<b>29614</b>	<b>16566</b>	<b>9948</b>	<b>8289</b>	<b>36415</b>	<b>853</b>	<b>101,685</b>

HESA also provided data on the major source of under- and post-graduate student fees for 1.367 million students at universities for 1/8/94-31/7/95. 79,103 students, nearly 6% of the total, receive their major support from UK industry.

Major source of student fee- 1/8/94 - 31/7/95	Number of students (thousands)	% students
No award or financial backing	267.4	19.6
UK LEA mandatory discretionary awards	725.4	52.9
Institution	24.7	1.8
Research Councils & British Academy	21.7	1.6
Charity and international agencies	4.1	0.3
UK Government bodies	48.7	3.6
EU Sources	6.5	0.5
Other overseas sources	27.1	2.0
UK industry/commerce and students' employer	79.1	5.8
Absent/no fees	162.8	11.9
<b>Total</b>	<b>1367.5</b>	<b>100</b>



## COURSES FOR INDUSTRY

HESA provided data for 111 universities for 1/8/94 - 31/7/95 on the number of students who took non-certified courses - those which do not lead to a formal qualification: UK industry funded 62,000 students, 6% of the total of 1,028,000.

Major source of student fee-	Number of students (thousands)	% students
Funding Councils	188.3	18.3
UK Government bodies	176.2	17.2
Research Councils	2.9	0.3
TECs/LECs/Scottish Highlands & Islands Enterprise	2.3	0.2
UK industry, commerce & public corporations	62.0	6.0
UK based charities	6.4	0.6
EU sources	5.4	0.5
Other overseas	6.1	0.6
Other	578.4	56.3
<b>Total</b>	<b>1028.0</b>	<b>100.0</b>

87 universities reported on the variety of delivery routes for courses for UK industry. The courses may or may not lead to a qualification, and are managed by individuals, departmentally or centrally:

	% Universities
• Distance learning courses	64
• One day courses on campus	93
• Short (2-5 day) courses on campus	91
• Week-long courses on campus	75
• One day courses at companies	82
• Short (2-5 day) courses at companies	79
• Week-long courses at companies	64

In Employee Development Schemes institutions work in close partnership with employers to meet the needs of employees from a wide range of backgrounds over a long period of time, opening up the whole range of resources and provision available across all parts of universities. Universities reported in the questionnaire survey that most schemes are undertaken with large companies with over 500 employees, and most frequently in Engineering, followed by IT, and Life Sciences.

## PROMOTING CO-OPERATION WITH INDUSTRY

Academically initiated contacts and Industrial Liaison Office activities generate the majority of new university research and technology business. Industry and academic-initiated projects were the most frequently cited means for developing new education and training projects with industry, while TECs, LECs and professional associations were also rated highly.



87 universities reported on how they are supporting economic development as follows:

	<b>% Universities</b>
• Formal written policy to support industry in meeting its education and training needs	67
• Policy to contribute to local economic development	86
• Members of universities sit on Board of:	
• Local councils	57
• TECs/LECs	75
• Business Links	51
• SRB Projects	48

Results from 89 universities on their involvement in schemes targeted at SMEs are:

	<b>% Universities</b>
• Business Links	64
• TECs/LECs	65
• Regional Technology Centres	34
• Business Innovation Centres	31
• Other universities	55
• European Union schemes	71
• Research and Technology Organisations	38

Data from 87 universities indicated they have arrangements with industry to provide :

	<b>% Universities</b>
• Industrial feedback on the academic curricula	84
• Teaching by industrialists	85
• Work & project placements for:	
• undergraduates	90
• post graduates	87
• Work experience for staff in industry	45

## HOW IT WAS DONE

As stated in the Introduction, the Innovation Unit of the Department of Trade and Industry established a Steering Group to oversee the project. Its members include: Association of University Research and Industry Links (AURIL), Confederation of British Industry (CBI), Committee of Vice-Chancellors and Principals (CVCP), Department for Education and Employment, Funding Councils, HESA, National Westminster Bank, Office of Science and Technology, Research Councils, Royal Academy of Engineering and the Royal Society.

Maximum use was made of data from the Funding Councils, Research Councils, TCS Directorate, LINK Secretariat, and UK Science Park Association. In addition, the Higher Education Statistics Agency has provided data, and this has been particularly helpful with regard to education and training. A three part questionnaire was used to gather further information direct from universities. Parts 1 and 2 on university/industrial research links and support services was sent to AURIL contacts, and Part 3 on education and training was sent to the Universities' Association of Continuing Education contacts. In consultation with CVCP, 111 university institutions were contacted. 89 (80%) universities replied to Parts 1 and 2 of the questionnaire, and 87 (78%) to Part 3. It was agreed that it would not be appropriate to rank universities in the survey in any single order because of their disparate natures.

DTI commissioned Tartan Technology Ltd to undertake the 1995 and 1996 surveys and prepare this summary. DTI welcomes comments and correspondence should be addressed to:

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## ACRONYMS

AURIL	Association of University Research and Industry Links
BBSRC	Biotechnology and Biological Sciences Research Council
CASE	Co-operative Awards in Science and Engineering
CAST	Co-operative Awards in Science and Technology
CBI	Confederation of British Industry
CVCP	Committee of Vice-Chancellors and Principals
DFEE	Department for Education and Employment
DTI	Department of Trade and Industry
EPSRC	Engineering and Physical Sciences Research Council
ESRC	Economic and Social Research Council
EU	European Union
HESA	Higher Education Statistics Agency
IPR	Intellectual Property Rights
LEA	Local Education Authority
LEC	Local Enterprise Company
MRC	Medical Research Council
NERC	Natural Environment Research Council
OST	Office of Science and Technology
PPARC	Particle Physics and Astronomy Research Council
SERC	The former Science and Engineering Research Council
SME	Small or Medium Sized Enterprise - employing less than 250 people
SRB	Single Regeneration Budget
TCS	Teaching Company Scheme
TEC	Training and Enterprise Council
UACE	Universities' Association for Continuing Education



Universities surveyed are listed alphabetically in England, Colleges of London University, Northern Ireland, Scotland and Wales. A shaded box indicates they did not reply to the questionnaire survey.

\* indicates the university was not surveyed in 1995.

University Name	1995 Survey	1996 Survey P1 + 2 of questionnaire	1996 P3 of of questionnaire
Anglia Polytechnic University			
Aston University			
Bath University			
Birmingham University			
Bournemouth University			
Bradford University			
Brighton University			
Bristol University			
Brunel University			
Buckingham University			
Cambridge University			
Central England University			
Central Lancashire University			
City University			
Coventry University			
Cranfield University			
De Montfort University			
Derby University			
Durham University			
East Anglia University			
East London University			
Essex University			
Exeter University			
Greenwich University			
Hertfordshire University			
Huddersfield University			
Hull University			
Keele University			
Kent University			
Kingston University			
Lancaster University			
Leeds Metropolitan University			
Leeds University			
Leicester University			
Lincs & Humberside University			
Liverpool John Moores University			
Liverpool University			
London Guildhall University			
Loughborough University			
Luton University			
Manchester Metropolitan University			
Manchester University			
Middlesex University			
Newcastle University			
North London University			
Northumbria University			
Nottingham Trent University			
Nottingham University			
Open University			
Oxford Brookes University			
Oxford University			
Plymouth University			
Portsmouth University			
Reading University			
Salford University			
Sheffield Hallam University			
Sheffield University			
South Bank University			
Southampton University			
Staffordshire University			
Sunderland University			
Surrey University			
Sussex University			
Teesside University			



University Name	1995 non-respondents	P1 + 2 non-respondents	P3 non-respondents
Thames Valley University			
UMIST			
Warwick University			
West of England University			
Westminster University			
Wolverhampton University			
York University			
Birkbeck College			
Charing Cross & Westminster Medical School*			
Goldsmiths College*			
Imperial College of Science, Technology & Medicine			
Institute of Education*			
Kings College			
London School of Economics			
London School of Hygiene and Tropical Medicine*			
London School of Pharmacy*			
Queen Mary and Westfield College			
Royal Free Hospital School of Medicine*			
Royal Holloway College			
Royal Postgraduate Medical School			
Royal Veterinary College*			
St George's Hospital Medical School*			
United Medical & Dental School of Guy's*			
University College London			
Wye College			
Queens University of Belfast			
Ulster University			
Aberdeen University			
Abertay Dundee University			
Dundee University			
Edinburgh University			
Glasgow Caledonian University			
Glasgow University			
Herriot-Watt University			
Napier University			
Paisley University			
Robert Gordon University			
St Andrew's University			
Stirling University			
Strathclyde University			
Aberystwyth College			
Bangor College			
Cardiff College			
Glamorgan College			
Lampeter College*			
Swansea University College			
Wales University College of Medicine			
<b>TOTAL RESPONDENTS</b>	<b>80</b>	<b>89</b>	<b>87</b>
<b>TOTAL UNIVERSITIES</b>	<b>108 (includes others not listed here)</b>	<b>111</b>	<b>111</b>
<b>RESPONSE RATE</b>	<b>74%</b>	<b>80%</b>	<b>78%</b>







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