

5 Managing intellectual property

This section focuses on the extent to which HEIs in the UK are seeking to secure the rights to exploit their IP through patenting, and their success in licensing that IP to companies. Intellectual property rights have been a growing concern in higher education in recent years, both in the UK and overseas, and most countries have seen a significant investment by HEIs in securing these rights.

The management of intellectual property is best seen as a process with a series of stages that correspond with measurable outputs. At the outset, researchers within the HEI may be generating new knowledge, ideas and concepts that have a commercial potential and could be protected through some form of legal IP. Usually an HEI will have an office or department which provides advice to staff about how to protect this idea, and in some cases this is a proactive service, regularly asking researchers about the outcomes of current and future research.

The technology transfer office may then record the idea in the form of a brief description, which can then be disclosed on a confidential basis to potential users, patent agents or others whilst the commercial potential is judged. These disclosures form the first measurable step in the chain.

After initial soundings, the technology transfer office may then decide that formal IP protection should be sought for the idea and an initial patent application filed. This may be a UK patent application or a European patent.

Initial applications last for one year, after which the application must be re-affirmed, subject to an additional and higher payment. Thus the total number of patents filed in one year consists of the initial applications plus those that are being continued. There may then be a delay before the patent is granted, subject to the decision of the patent office that it is indeed novel and is not precluded by the prior existence of another patent or existing knowledge.

The HEI will in parallel seek to license the patent to a company, with the measure being the number of licences issued and the revenue earned from these. Here though there may be no direct relationship between the number of patents and licences, as some patents are licensed to many different companies whilst others may never be taken up.

5.1 Disclosures

The intellectual property identification and protection process described above is a rather formalised description, and not all steps are monitored closely by all HEIs. An example is the formal disclosure of potential inventions. Whilst 78% of pre-1992 universities monitor the number of disclosures made each year, this is not so for post-1992 universities or HE colleges. Less than two-thirds of post-1992 universities monitor the number of disclosures and just over one-third of HE colleges (Table 5.1). The identification and hence monitoring of disclosures is indicative of a proactive IP protection process, where commercialisation units seek to ensure that all potential patentable ideas are identified and assessed in a methodical manner. Without such a process, patents tend to be only pursued on an ad hoc basis largely at the initiative of academic staff.

Table 5.1 Whether HEIs monitor the number of invention disclosures made each year (%)

	Pre-1992 university	Post-1992 university	HE college	Total
Yes	78.3	62.2	35.0	61.3
No	21.7	37.8	65.0	37.8
No. of cases	60	37	40	137

Source: HEBI survey 2001

Consequently relatively few HEIs were able to provide information on the numbers of disclosures compared with those that responded on patenting rates: only 79 (1999-2000 figure) were able to provide details, of which 46 were from the older universities.

The majority of disclosures were made by pre-1992 universities, with a mean number per respondent of 35.48, although this result was heavily skewed by a few HEIs with very large numbers. The median value was much lower at 15. By the following year the total had increased by 13% to 1,760, with the mean increasing to 38.26. Although the median decreased slightly this was due to a higher response rate in this year (46 as opposed to 44 in 1998/99). Within the other HE sectors there was an increase between the two years, although from a much lower level.

Table 5.2 Number of invention disclosures made in 1998/99 and 1999/2000

	1998/99				1999/2000			
	Mean	Median	Max	Total	Mean	Median	Max	Total
Pre-1992 university	35.48	15.0	257	1561	38.26	14.5	227	1760
Post-1992 university	5.83	2.0	20	105	6.67	3.0	27	120
HE college	1.38	0	10	18	2.31	0	15	32

Source: HEBI survey 2001

Overall the number of disclosures rose from 1,684 in 1998/99 to 1,912 the following year, a rise of 13.5%.

5.2 Patenting

Apart from the post-1992 universities, where the response rates were much higher to this question, the numbers of patents filed were inevitably lower than the number of

disclosures, due to a proportion of disclosed ideas not being taken forward for protection. Again the results for the three HEI sectors are presented, and show very significant differences reflecting the relationship between patents and research income. Among the pre-1992 universities the median total number of patents filed each year has risen from 11 to 19 between 1998/99 and 1999/2000, the mean being higher due to a few extreme cases. The highest performing institutions were filing over 100 patents per year, similar to the total patents for all the post-1992 institutions that replied to this question.

The table also shows a significant increase in patenting between the two years in the sample, although not for the post-1992 universities. The increase from 1,259 in 1998/99 to 1,534 in the following year was a growth of almost 22%, mainly due to growth among a small group of research-intensive institutions. Only one significant patenting university in 1999/2000 had not provided a figure for the previous year, so only a small part of the change (3.4 percentage points) was due to differential response.

These totals are also higher than the totals recorded in the PREST survey for 1996/97 although it is not clear how comparable the two sample populations are, as a different combination of HEIs may have responded. The PREST survey only identified 594 total patents filed in 1996/97 suggesting a growth of 158%, although in reality much of this change is likely to be due to differential response rates.

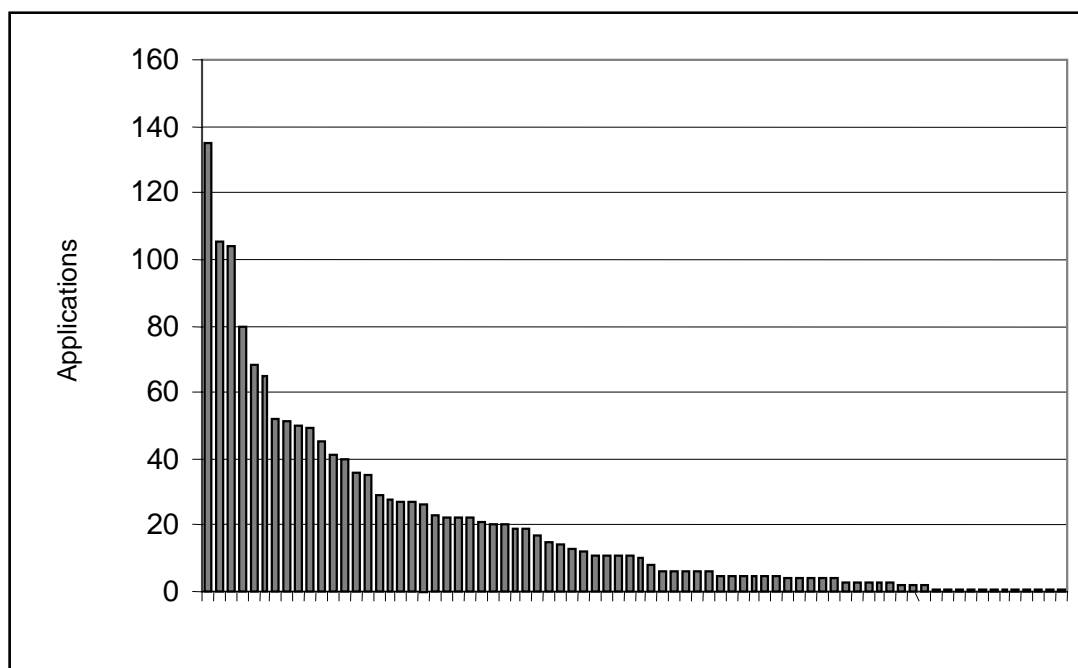
Table 5.3 Number of total UK patents filed

	1998/99				1999/2000			
	Mean	Median	Max	Total	Mean	Median	Max	Total
Pre-1992 university	20.62	11.0	116	1,134	25.31	19.0	135	1,392
Post-1992 university	3.67	2.0	31	121	3.81	2.0	27	122
HE college	0.11	0	2	4	0.51	0	11	20

Source: HEBI survey 2001

The numbers of new patents filed also increased over the two years for the HE colleges and pre-1992 universities, and only slightly decreased for post-1992 universities. Again this could have been due to a slightly smaller sample size in 1999/2000 since institutions had not always recorded data for both time periods. The overall number of 705 was almost twice that of the previous PREST survey (371 in 1996/97), although again it must be stressed that the samples are not necessarily comparable.

Figure 5.1 Total number of patent applications by individual HEIs 1999/2000



Source: HEBI survey 2001 (zero scores excluded)

The numbers of patents granted were much smaller as a consequence of various filtering processes, with only 162 granted in 1998/99 and 188 in 1999/2000. Again though the numbers have increased between the two time periods, and in this case they were also higher than reported in the PREST survey. What is perhaps most notable about the patents granted is that the proportion of the total for the post-1992 universities is very much greater than their proportions of total and new patents filed.

Table 5.4 Number of new UK patents filed

	1998/99			1999/2000				
	Mean	Median	Max	Total	Mean	Median	Max	Total
Pre-1992 university	10.71	6.0	59	557	11.92	6.0	68	620
Post-1992 university	2.43	1.0	14	68	2.48	1.0	15	67
HE college	0	0	1	3	0.50	0	11	18

Source: HEBI survey 2001

Table 5.5 Number of total UK patents granted

	1998/99				1999/2000			
	Mean	Median	Max	Total	Mean	Median	Max	Total
Pre-1992 university	3.02	1	28	136	3.15	1	28	145
Post-1992 university	0.96	0	12	25	1.27	0	9	38
HE college	0	0	1	1	0.14	0	3	5

Source: HEBI survey 2001

The results show that patenting is essentially an activity of the universities in the sample. Table 5.6 shows that the majority of HE colleges take no action on patents, and in the main this will be an appropriate policy given their research profile. Within the university sector, patent filing remains a rather specialist activity which tends to be contracted out to an external agency. Only a minority claim to have developed in-house capability, and these include both universities with high levels of patent activity and some with relatively low levels, suggesting that there is no clear good practice recognised here.

Table 5.6 Whether the HEI has an in-house capability to file patents, or uses an external agency (percentages of each type of HEI)

	Pre-1992 university	Post-1992 university	HE college	Total
In-house capability	35.3	24.2	8.1	24.0
External agency	54.9	63.6	24.3	47.9
No action taken	9.8	12.1	67.6	28.1
No. of cases	51	33	37	121

Source: HEBI survey 2001

5.3 Comparison with North America

The patenting rates outlined above can be compared with those of North American universities using data provided by the AUTM. In 1999 a sample of 139 US universities filed 7,612 US patents of which 4,871 were new patents; 3,079 patents were also issued to the same institutions. A parallel sample of 20 Canadian universities filed 345 US patents of which 206 were new, and 160 US patents were issued.

In order to compare these figures with the UK HEBI survey we need to adjust for the number and size of HEIs: the US sample in particular comprises most of the largest US universities, some of which dwarf the largest UK universities in research income.

Accurate benchmarking is difficult, however, as the key determinant of patent activity is likely to be research expenditure where the HEI has legal rights for IP exploitation, and given that different technology fields will have different ratios of average research expenditure per patent. Furthermore, costs vary between countries: academic salaries are higher in the US so total costs can be expected to be higher.

Given the caveats, how do the UK HEIs compare with the US and Canadian universities? We can calculate the level of sponsored research expenditure in the US and Canadian samples needed for each patent. This can be compared with expenditure on research grants and contracts by the UK HEIs, again divided by the numbers of patents. Taking a conservative approach, the total number of patent filings for the UK sample is coupled with the total research expenditure for all UK HEIs. Table 5.7 shows the results using these cautious figures.

Table 5.7 Research expenditure per patent in the US, Canada and UK

Patent indicator	Sponsored research expenditure per patent (£)		
	US	Canada	UK
Total patent applications filed	1,919,424	2,017,044	1,255,511
New patent applications filed	2,999,518	3,378,059	2,517,019
Patents issued	4,745,259	4,349,251	9,757,333

Source: authors' calculations based on HEBI survey 2001 and AUTM 1999

Using these rough calculations the UK HEIs are seen to be performing well compared with the US and Canadian institutions. The expenditure required per patent filed is generally lower than that in the North American comparators, although this may be expected from the lower cost structure in the UK. It is only in terms of patents issued that the UK performs worse, and here other factors may intervene. It may be that North American institutions have been more willing to pursue patents in the longer term, whilst UK institutions have been more likely to withdraw patent applications early rather than meet the full costs. The larger size of many US universities would give them the greater financial resources to maintain a strong patent portfolio.

5.4 Licensing

Having devoted resources to the protection of intellectual property, then HEIs must seek to license that IP in order to recoup these costs. The search for licence partners seems to be a more commonly undertaken activity in-house than the filing of patents. The vast majority of universities claim to have in-house licensing capability, although again this activity is not common amongst HE colleges.

The numbers of licences executed in each of the last two years seem at first glance to be quite high, certainly compared with the results of previous years, although they are remarkably concentrated among a very few HEIs. In Table 5.8 the percentages of each total accounted for by the five highest scoring HEIs are given to illustrate this point. So of the 238 non-software licences granted to UK-based companies in 1999/2000, 36.6% originated from just five HEIs. For the other groups in the table the

concentration was much higher, although these were also smaller groups and hence more easily influenced by modest effort on the part of a few institutions.

Table 5.8 Whether the HEI has an in-house capability to seek out licensing opportunities for its IP, or uses an external agency (percentages of each type of HEI)

	Pre-1992 university	Post-1992 university	HE college	Total
In-house capability	78.0	71.4	19.4	60.0
External agency	15.3	14.3	5.6	12.3
No action taken	6.8	14.3	75.0	27.7
No. of cases	59	35	36	130

Source: HEBI survey 2001

Table 5.9 Number of licences/options executed on the basis of HEI-owned intellectual property over the last two years

	1998/99		1999/2000	
	Total	% top 5	Total	% top 5
Non-software licences granted to UK-based companies	192	37.5%	238	36.6%
Non-software licences granted to companies based overseas	73	53.4%	73	45.2%
Software licences granted to UK-based companies	147	67.3%	144	56.3%
Software licences granted to companies based overseas	61	68.9%	126	80.9%

Source: HEBI survey 2001

5.5 Revenues and costs

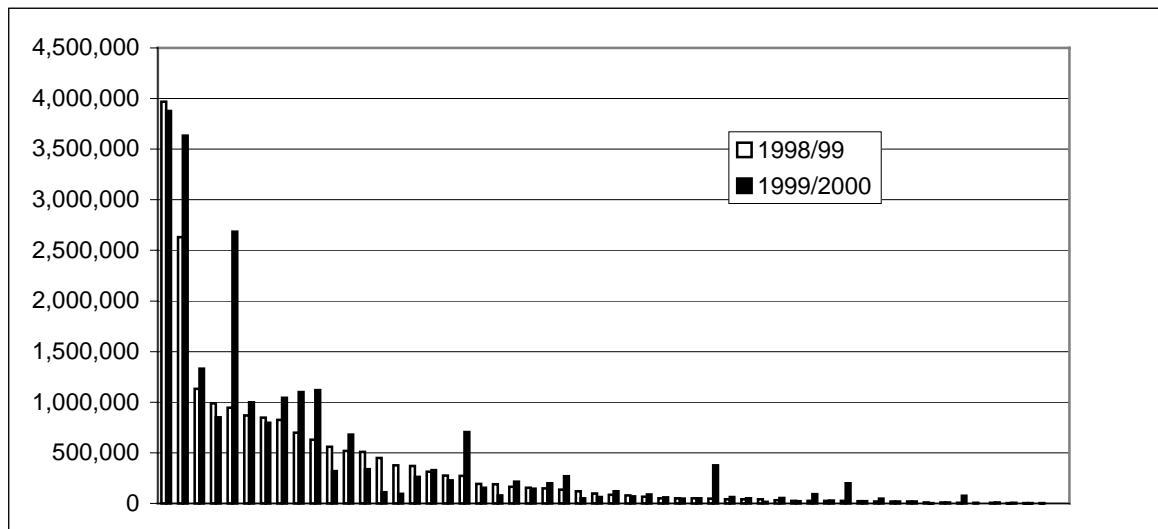
Institutions were asked to provide total revenues and costs for IP over two years. Total revenues for 1998/99 were declared to be £19.2 million (117 responses), and £23.3 million (121 responses) for 1999/2000. However, these figures again do not tally with HESA returns, as the declared total for 1999/2000 recently released was £14.5 million, for the whole sector rather than a sample, and £12.1million for the 121 HEIs that responded to the HEBI survey.

Many of the high income institutions were suggesting much higher levels of income in the survey than in the HESA returns. It is likely that there are differences due to the calculation of gross and net income, to charges for patent protection and payments to individual inventors. For some institutions these reconciliations are made outside the

main university accounts in subsidiary commercialisation companies, so the university may report net income to HESA but gross income in the survey. Considerable effort would be required to disentangle all of these issues.

The simple display of the levels of income in Figure 5.2 shows the extreme concentration of income among a small number of universities. It is also clear that such revenues may be highly volatile, with several showing high increases between the two years, and also sharp decreases. Fluctuations of over 50% between two years are not unusual even among those with quite high revenues, supporting the view that most income is from very few deals.

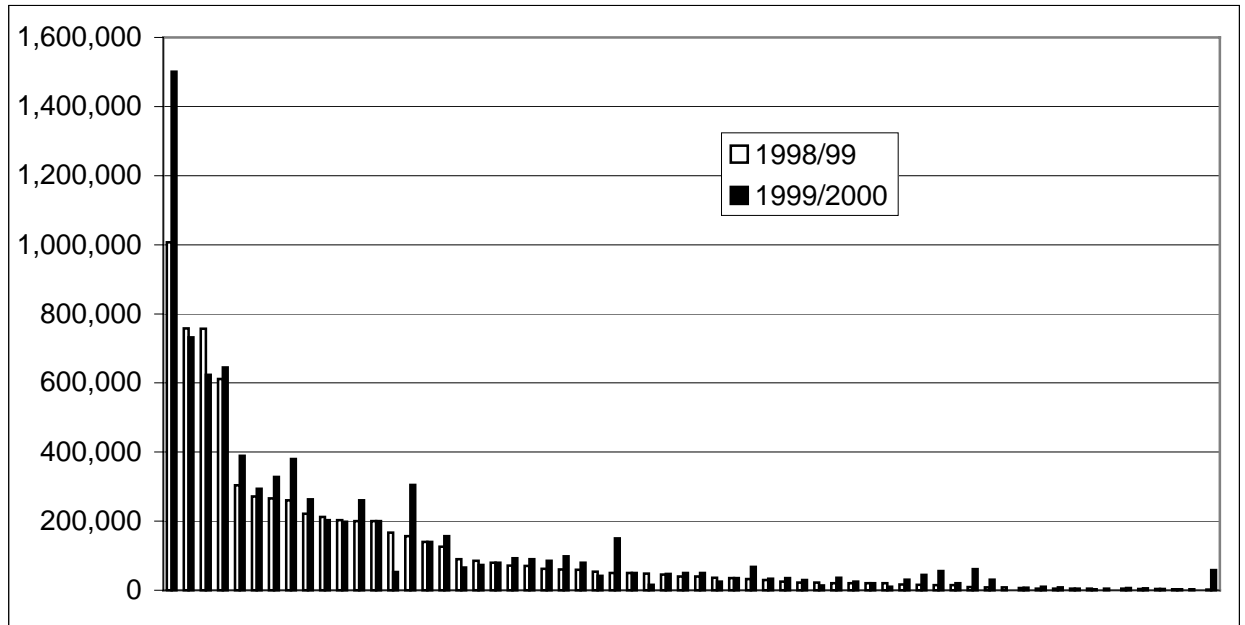
Figure 5.2 Total revenues (£) from intellectual property for individual institutions



Source: HEBI survey

Costs are also highly concentrated among a few institutions, and are also volatile, although perhaps less so than income.

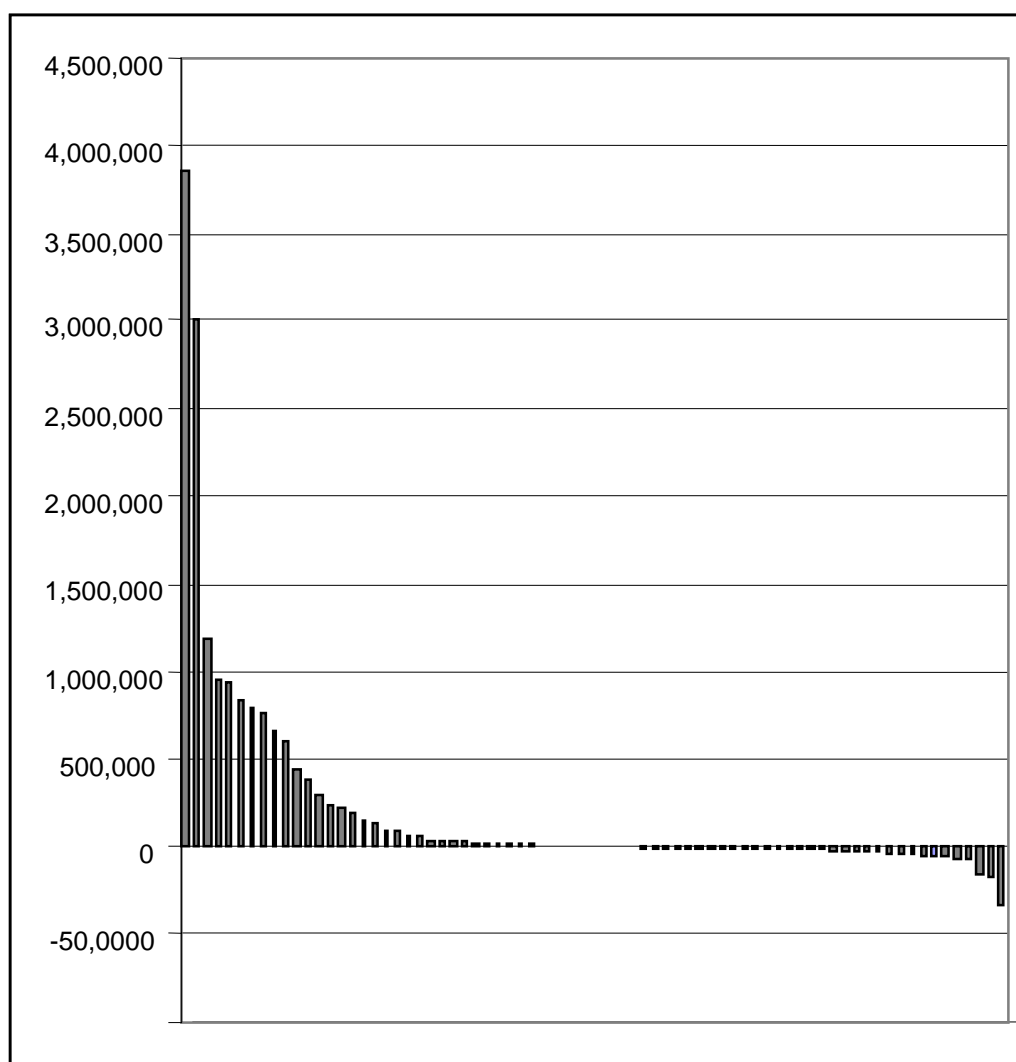
Figure 5.3 Total costs (£) of IP protection for individual HEIs



Source: HEBI survey

If we compare IP revenues and costs to give a crude measure of profitability or net income then we see that only a relatively small number of institutions are generating a significant surplus from IP: only three over £1 million and 10 over £500,000. There may be others which did not provide figures, but there are not likely to be many more. For half of the institutions providing data the costs were higher than the revenues, although there is always the possibility of future income flows from current patent portfolios.

Figure 5.4 IP revenues less costs for individual institutions (£)



Source: HEBI survey, 2001

5.6 IP policy

The emphasis has been placed here on the protection of inventions through patents and subsequent exploitation, but this is not the only form of intellectual property protection that is feasible. Most HEIs either always or usually require staff to report inventions that might need protection, but there is less stress on some other forms of IP.

What is perhaps surprising is that there is an expectation across the range of forms of IP that reporting should be a requirement. In particular, almost half of HEIs suggested that literary or artistic works should always or usually be reported, even though the normal practice has been for copyright of such works to remain with the individual academic. Similarly a growing area of contention is educational software and related 'courseware', often in the form of multimedia. As lecturers turn their teaching notes into electronic packages, the material acquires a potential commercial value, and a majority of institutions seem to be taking an interest in the protection of such IP.

Table 5.10 Current requirement within the HEI to report the creation of the various types of intellectual property (percentage of respondents)

	Always	Usually	Rarely/Never	No. of responses
Inventions	63.2	16.8	20.0	125
Computer software or databases	40.7	35.0	24.4	123
Literary or artistic works	27.0	19.7	53.3	122
Educational software and multimedia	41.7	33.9	24.4	127
Industrial designs	46.7	20.8	32.5	120
Trademarks	51.7	19.8	28.4	116
Integrated circuit topographies	37.6	14.7	47.7	109
New plant or animal varieties	41.8	17.3	40.9	110

Source: HEBI survey 2001

6 Consulting activities

Although academic knowledge can be applied through the exchange of codified forms as in patents, it is perhaps more usual for companies to turn to academics to assist in solving relatively short-term problems. This may involve new research projects as already covered in section 4, but more typically the particular problem may have been faced by other firms, and therefore can be solved by the application of current knowledge. Such activity falls into the category of consulting.

Consulting itself can take many forms depending on the nature and duration of the relationship between academic and company, or on the nature of the service provided. It could involve a one-off advice session of no more than a few hours, or an ongoing deep involvement in a company of perhaps a day a week over a period of years. It may involve technical or management advice to company managers, developmental activities for a group of company staff, expert witness work in legal cases, or information searches outside the company (see UUK/AURIL, 2001 for more details).

Consulting presents a particular set of problems for HEIs. As much of the value is in the personal knowledge and expertise of the academic, some of this work might be considered to be individual work outside the scope of the normal employment contract, in the academic's own time. Certain institutions have taken a view that such work is to be encouraged to compensate for salaries that might be lower than in other sectors, and because there are significant benefits for the HEI in terms of knowledge gained. Often, however, the benefits to the institution are sufficient to require a more strategic approach: the knowledge gained by the academic can enhance other activities within the institution, or the consulting project may lead on to deeper relationships with funded research, training programmes, etc. This further adds to the desire to encourage consulting, but adds a concern that the HEI will want to assure quality in delivery and protect any potential threat to the reputation of the institution, or problems connected with the legal liability of the academic consultant.

Hence many HEIs have been formalising their policies on consulting, seeking to regulate the amount of consulting carried out by individuals, developing schemes to encourage more consulting within the academic contract, and formalising individual consulting through the provision of legal liability insurance.

A central feature is the provision of mechanisms to help companies identify staff that can address their needs, particularly for SMEs that often find HEIs difficult to navigate. Most HEIs provide some form of enquiry point to deal with SME queries, and most of these provide additional assistance to help the SMEs specify their need. In terms of support for staff, the vast majority of institutions now provide indemnity insurance, usually through levying an overhead on contracts. This is especially the case for universities, where 85-90% provide this support. There is also a significant group of institutions that require all consulting to go through an official system, although this is less common within the pre-1992 university sector, where only 57% require staff to use this system as opposed to 81% of post-1992 universities. The HE colleges have a lower tendency to use formalised procedures, but the differences are less marked than for other areas of policy as consultancy is an activity which is just as relevant to this group of HEIs.

Table 6.1 Existence within the HEI of a central dedicated unit providing specific services (percentages)

	Pre-1992 university	Post-1992 university	HE college
An enquiry point for SMEs	81.1	94.6	79.5
Assistance to SMEs in specifying their needs	75.5	83.8	64.1
A required contracting system for all staff-business consulting activities	56.6	81.1	61.5
Indemnity insurance for staff	84.9	89.2	69.2
No. of HEI respondents	53	37	39

Source: HEBI survey 2001

Eighty-eight per cent of all universities have a commercialisation company and/or an internal commercialisation department. On the whole, HE colleges tended not to have a commercialisation company; where any commercialisation activities existed these tended to be internal to the institution.

Table 6.2 Presence of a commercialisation company or internal department to manage consulting links (percentages)

	Pre-1992 university	Post-1992 university	HE college	Total
No commercialisation company or department	10.5	13.5	42.9	21.3
Commercialisation company	29.8	29.7	9.5	23.5
Internal commercialisation department	36.8	37.8	40.5	38.2
Both	22.8	18.9	7.1	16.9
Number of responses	57	37	42	136

Source: HEBI survey 2001

Many institutions are only able to provide limited data on the numbers of firms assisted and the income associated with this, as much of the activity is not centralised, and even where it is there may be considerable activity which is just not declared. Any measure of consulting therefore tends to be focused on that part which has been formalised, and even then it may be difficult to disentangle consulting income from departmental 'other services rendered' accounts.

Eighty-eight HEIs were able to provide estimates of the numbers of firms assisted through consulting for 1999/2000, with 79 also having figures for the previous year.

Table 6.3 shows that there is a polarisation between those institutions with relatively few contracts, typically involving fewer than 25 firms, and those with over 100. For the higher group the range includes one at 3,185, and several in the 400 to 900 category (1999/2000). These are a mix of pre- and post-1992 universities based in a variety of regions. Many of the highest responses come from HEIs in less favoured regions, and may include firms supported through European Structural Funds programmes.

Table 6.3 Number of firms assisted through consulting

	1998/99		1999/2000	
	No.	%	No.	%
0	10	12.7	10	11.4
1-25	19	24.1	19	21.6
26-50	8	10.1	11	12.5
51-100	11	13.9	10	11.4
101-200	18	22.8	20	22.7
201+	13	16.5	18	20.5
Total	79	100	88	100

Source: HEBI survey 2001

A relatively high proportion of consulting contracts are with regionally-based firms, even for some of the institutions with very high levels of consulting. It seems that proximity is important in the sourcing of consultancy by businesses, both to identify academic consultants and to provide regular face-to-face contacts. In 1999/2000 just over 60% of institutions able to respond to this question considered that more than 50% of consulting was with firms in the same region. Support schemes, such as European Structural Funds, will play a part here, as such schemes will only support firms within defined areas, usually the regions immediately surrounding the HEI involved. Hence HEIs will be both seeking local firms to offer consultancy and offering one-stop shop services for local SMEs. However, even large firms based in metropolitan regions usually look to local universities for consultants, unless their requirements are highly specialised or they have a long-standing collaboration with a university in another region.

Table 6.4 Proportion of firms assisted with consultancy that are based in the region

	1998/99		1999/2000	
	No.	%	No.	%
0	2	3.3	2	2.9
1-25	9	14.8	11	15.9
26-50	13	21.3	14	20.3
51-75	14	23.0	14	20.3
76-100	23	37.7	28	40.6
Total	61	100	69	100

Source: HEBI survey 2001

The total income from all HEI respondents for 1998/99 was £51.8 million, increasing to £60.2 million in 1999/2000. This is much smaller than the real total income, partly due to the difficulties of estimating actual levels of consulting, and partly due to the low response rate for this question.

The pre-1992 universities typically have a greater level of income than the post-1992 universities, and both groups of universities have a much higher level than the HE colleges. The mean values for all three groups of HEIs are inflated by a few high outliers, with the mean being significantly higher than the median value. However the differences between the two university sectors are less pronounced than in research terms, and the leading post-1992 universities are reporting higher consultancy income than the average pre-1992 universities.

Table 6.5 Total income from consulting

	Mean	Median	Maximum	No. of respondents	Total
1998/99					
Pre-1992 university	1,345,128	619,414	6,116,000	27	36,318,464
Post-1992 university	596,419	496,470	2,100,000	22	13,121,239
HE college	85,768	22,357	380,000	28	2,402,516
1999/2000					
Pre-1992 university	1,432,274	716,000	6,062,000	27	38,671,416
Post-1992 university	566,496	397,714	1,700,000	22	17,968,102
HE college	125,949	37,500	503,000	28	3,583,416

Source: HEBI survey 2001

7 Spin-off firms

7.1 Categorising spin-offs and start-ups

'Spin-offs' are enterprises, in which an HEI or HEI employee(s) possesses equity stakes, which have been created by the HEI or its employees to enable the commercial exploitation of knowledge arising from academic research. Other 'start-up' companies may be formed by HEI staff or students without the direct application of HEI-owned intellectual property.

Four types of spin-off or start-up firms can be defined:

- Spin-off companies established using HEI intellectual property and in which there is some element of HEI ownership.
- Spin-off companies to which the HEI has assigned or licensed IP, but in which it has no equity.
- Start-up companies involving current or former university staff as founders where the university has no ownership nor an IP agreement (in this case the HEI staff must be connected to the HEI immediately prior to formation of the company).
- Graduate start-up companies that have originated through the direct involvement of the HEI or through a dedicated graduate start-up programme.

The emphasis in this survey has been on the spin-off category where there is ownership or IP links. This relates to the question of the motivation for the HEI to be involved in the process in the form of some kind of financial return on their investment.

The questionnaire did not ask detailed questions about science parks and incubators. This is already extensively surveyed through the UK Science Park Association, and in many cases the HEI has only a minor involvement in the park and may not be in a position to produce detailed statistics. Also most firms in science parks have been found to be of external origin rather than spin-offs, and may be attracted to the park by the image and quality of environment as much as by the desire to be close to or to collaborate with a university (Massey et al, 1992).

7.2 Spin-offs

HEIs responding to the questionnaire reported a total number of 199 firms established in 1999/2000 where there was some form of HEI ownership or HEI intellectual property involved. Ninety-two per cent of these involved some form of HEI ownership. The spin-offs were concentrated in a relatively small number of HEIs: during 1999/2000 only 24 had seen more than two spin-offs with HEI ownership, and these accounted for 136 of the 183 reported.

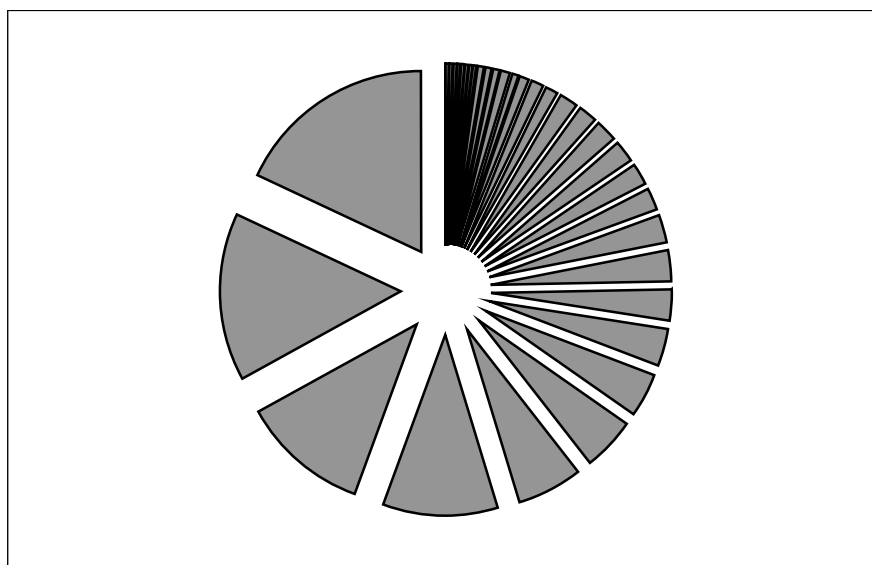
In the previous five years 338 were reported, an annual rate of just under 70, suggesting a significant increase in the rate of formation in the last year or so. The proportion with HEI ownership was slightly lower over this period at only 84%. The growth over time is also demonstrated by the PREST survey which found only 26 spin-off firms established during the 1997 calendar year.

Again there was significant concentration of firms within a small group of institutions. The 10 with the highest number of HEI-owned spin-offs accounted for

169 between 1994/95 and 1998/99, and 84 in the last year. This group was mainly made up of pre-1992 research-based universities, although one post-1992 university was also included.

HEIs were asked about the equity value of their holdings of shares in spin-off companies. Only 45 HEIs declared equity holdings, totalling almost £194 million. Figure 7.1 shows the distribution of equity values between the 45 institutions: over half the equity is held by just four institutions, the largest of which was £35 million. Sixty-two institutions declared no holdings of shares in spin-off companies.

Figure 7.1 Equity value of spin-off portfolio for individual HEIs as proportion of the total



Source: HEBI survey 2001

Only 11 institutions reported income from the sale of shares in spin-offs during 1999/2000, for a total income of £38.4 million. Again this was mainly attributable to an even smaller group of institutions, with only three accounting together for over 80% of this total. However, the low number of reported cases here is not a consequence of non-response, as 110 institutions reported zero income from this source. Only a very few institutions seem to be in a position each year to sell off shares.

Using the same database and methodology as in section 5.3, we can compare the rate of spin-off formation with that in the US and Canada. The AUTM defines a 'start-up' company as a new company dependent on licensing university IP. On that basis this equates to the two types of spin-off defined in this study. The same caveats as before apply, with an additional one that the figures for the UK are for the year following those for the US and Canada.

In the UK a total of 199 firms were identified – one for every £8.6 million of research expenditure. In Canada, 50 firms were identified, one for every £13.9 million. However in the US only 275 were identified, with a ratio of one for every £53.1 million of research expenditure. These figures appear to confound the received

wisdom that UK HEIs are much less entrepreneurial than their North American counterparts. They should however be treated with some caution, as there may be differences in the way in which the definitions have been applied, and we do not know the relative success of these companies in the market. However, UK HEIs seem to be making a significant and internationally respectable contribution to the formation of new companies.

7.3 Staff start-ups

Only 25 HEIs reported a total of 48 start-ups by staff without direct HEI involvement during 1999/2000. Thirty-three institutions reported at least one start-up in the previous five years, for a total of 162 companies; although a large proportion of this total was accounted for by two institutions, which reported staff start-up figures of 37 and 50. The quality of response for this category of firms is believed to be much less accurate than for the spin-offs, as in many cases there is no mechanism for identifying or recording such start-ups centrally. In some cases examples are known almost as a result of accidental discovery and through word of mouth. It may also be the case that this type of company is decreasing in relative importance as HEIs invest more heavily in spin-off programmes, thus capturing staff that previously left the HEI to set up a company, often out of frustration over a lack of interest in their efforts (Webster, Rappert and Charles, 2000).

7.4 Graduate start-ups

HEIs were asked to provide estimates for the number of graduate start-up firms, where the HEI played some supporting role or operated a formal graduate start-up programme. In recent years there has been a trend towards the establishment of such graduate entrepreneurship programmes. The intention was to investigate the extent to which HEIs were able to monitor the numbers of such start-ups being formed. Inevitably all HEIs will see a small proportion of graduates move into some form of self-employment or firm ownership. Approximately 1.5% of all graduates are self-employed six months after graduation, but in the majority of cases the HEI itself plays no significant role in this process beyond having equipped the individual through their degree course – examples include self-employed artists and designers.

In the survey 27 institutions were able to report that at least one graduate start-up had been formed during 1999/2000, with a further 66 indicating that none had been formed. Of those providing a score of zero, only one provided a figure of one for the previous five years, suggesting that in most cases the zeros meant no activity to promote graduate start-ups. In total the number of graduate start-ups claimed for 1999/2000 was 179.

Over the previous five years, nine of the 27 HEIs claiming graduate start-ups in 1999/2000 were unable to provide an estimate, and a further seven gave a figure of zero. This left just 11, plus one other, able to provide a figure of one or more for the five-year period. These 12 HEIs suggested that they had been responsible for supporting 56 graduate start-ups over five years. This figure is no more than the annual number of graduates estimated to move into self-employment from an average-sized university according to data from the First Destination Survey. Clearly in the period up to 1999/2000 this has been a negligible activity in most HEIs. However, anecdotal evidence from a number of universities suggests that numbers may have increased dramatically in the last year. Several universities are now known

to be running entrepreneurship programmes and incubators for graduates, with considerable early success.

7.5 Managing the process

The responses to the questions on the number of spin-offs show an increase in numbers in recent years. This may be in part due to a number of programmes and initiatives taken by HEIs to encourage the greater development of spin-off companies. HEIs were asked about the kinds of support mechanisms currently being provided either directly by the HEI or through a partner organisation. The main forms of support provided by the HEI itself tended to be in the form of business advice and entrepreneurship training, often primarily targeted at students, but also available to staff.

Thirty-six per cent of HEIs offered on-campus incubators, with an additional 13% providing incubator facilities off campus. In 40% of cases incubator premises were available in the locality through a partner organisation. Science park premises were however less common than incubators.

Finance is also increasingly available, with almost 70% of HEIs having some access to seed corn investment, either through their own or a partner's provision. Venture capital was slightly less common, in only half of cases, and was mainly provided through a partner organisation.

Table 7.1 Support mechanisms for spin-off firms

	HEI provided (%)	Partner provided (%)	None (%)	Respondents (number)
On-campus incubators	36.1	9.8	58.2	122
Other incubators in the locality	13.4	40.2	50.9	112
Science park accommodation	18.6	22.9	59.3	118
Entrepreneurship training	64.8	13.6	32.0	125
Seed corn investment	36.6	35.0	39.8	123
Venture capital	10.1	46.2	49.6	119
Business advice	76.2	41.5	15.4	130

Source: HEBI survey 2001. Note: A specific mechanism could be provided both by the HEI and by a partner, so row totals do not equal 100%

8 Training and personnel links

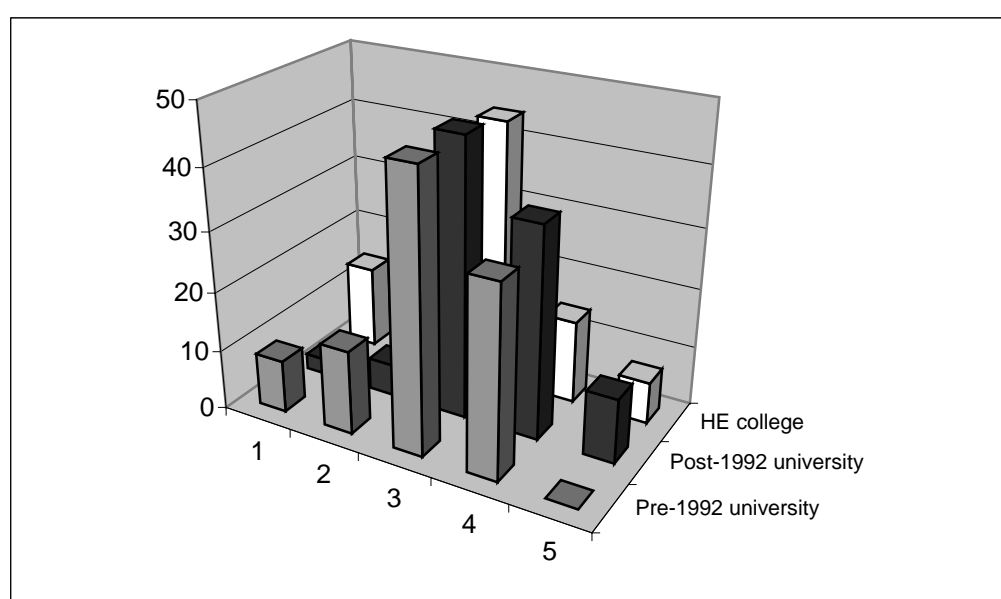
8.1 Benchmarking contribution to the labour market

Important areas of interaction with business remain the core activities of providing a supply of trained graduates, and providing general and bespoke training courses for businesses. As in the earlier section on institutional strategies, benchmarking questions were asked on skills and training issues to assess the extent to which HEIs were actively seeking to understand and meet business needs in this field.

The first question asked about the extent to which the HEI monitors skills needs and sector change through labour market intelligence (LMI), and takes this into account in planning provision. The intention was to ascertain whether HEIs were developing monitoring systems and making labour market intelligence available to departments to assist in the development of new courses and in the redesign of existing courses. The scale used is provided below.

1	2	3	4	5
No monitoring of skills, nor general use of LMI, nor collaboration with employers.		Moderate responsiveness – some changes in provision based on forecasting of demand using LMI, but little ongoing dialogue with employers and other bodies. LMI would typically be examined in central service units but not disseminated and used in departments.		Sophisticated monitoring systems at HEI level, with provision of appropriate data to individual departments. Evidence that information from LMI and employer suggestions are acted upon at central and departmental levels.

Figure 8.1 Extent to which labour market intelligence is used in planning provision (percentages of each grouping)



Source: HEBI survey 2001

The modal group of HEIs in all three categories were those indicating a moderate level of activity, making use of LMI perhaps at a central level without fully embedding this into all departmental planning processes. Amongst all three categories of HEI there was a secondary group that scored 4 on the scale and were making more intensive use of LMI, especially within the post-1992 universities. None of the pre-1992 universities considered themselves to be at the good practice level, unlike 11% of post-1992 universities and 7% of HE colleges. Of the 12 institutions who indicated that they did not monitor LMI, five were pre-1992 universities and six were HE colleges. There was not a strong regional differentiation in the pattern of response.

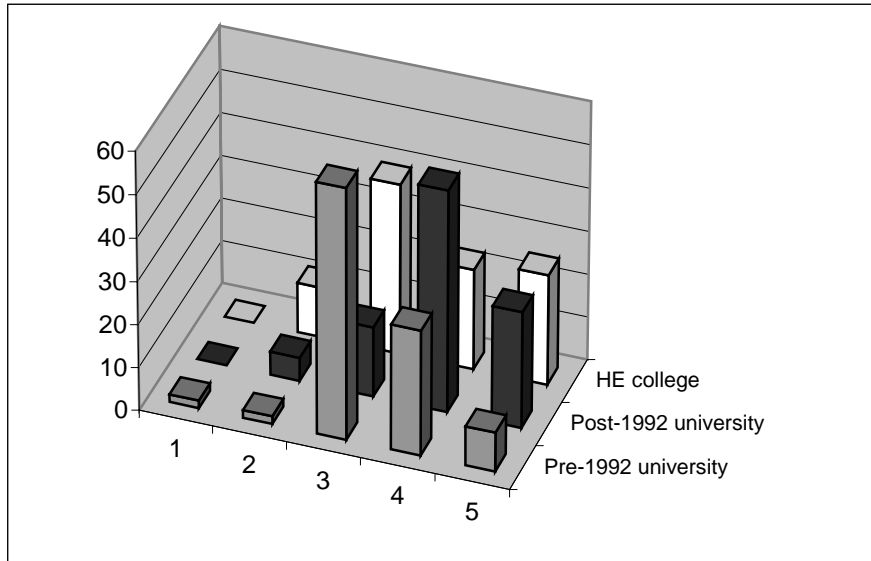
The second benchmarking question focused more directly on the role of employers in the development and regular reviewing of the curriculum. Here the scale ran from those HEIs with no links with employers, through to those where all departments consulted with employers where relevant and courses were updated to meet the needs of employers.

1	2	3	4	5
No links with employers in development of locally oriented courses or overall shaping of the curriculum.		Some dialogue with employers and other bodies about the nature of courses, but limited e.g. to specific vocational areas, or one-off exercises.		All departments regularly consult with employers and other partners on curriculum where relevant. Specialist subjects are kept up to date and relevant to the labour market. More generic skills developed in all courses as required.

In this case there were very few HEIs scoring either 1 or 2, with most having some form of dialogue with employers. For the pre-1992 universities the majority still saw this as an ad hoc exercise limited to specific areas, although a minority (9.1%) considered themselves as meeting the good practice benchmark. It was evident from the scores of the post-1992 universities that there was much more interaction with employers. Twenty-seven per cent indicated that they had regular consultations with employers, and that specialist subjects were kept up to date and made relevant to the labour market. Over half (51.4%) scored just below the highest benchmark. HE colleges also saw themselves as meeting employer needs, and one-quarter scored in the highest category.

The regional analysis of this indicator revealed a slight bunching of responses from the North of England around the 3 and 4 categories, with very few in the highest category. Within the other regions, although the majority clustered again around 3 and 4, in most cases at least 20% indicated that they considered their activities with employers to be at the best practice level.

Figure 8.2 Involvement of employers in curriculum review and development (percentages of each grouping)



Source: *HEBI survey 2001*

8.2 Placements

A key element in facilitating links between the educational role of HEIs and the interests of businesses is through the placement of students within business. However, in the survey the question which tried to capture placement activity was not answered well. As a result the information on placements is limited and probably not very reliable, especially the proportions of placement students that found work with their employers after graduation. For this reason we have decided to omit this question from our analysis.

Information was however available on the mode of organisation of placements. The most important mechanism was through individual schools or departments, with over 90% of all three groups of institutions identifying this approach. Central placement units were mainly used by post-1992 universities, whilst the careers service was used by all the institutions, although less so by the HE colleges. In a large number of cases placements were organised in an ad hoc way between the student and the business.

Table 8.1 Means by which placements are organised (percentages)

	Pre-1992 university	Post-1992 university	HE college
Via a central placement department	18.5	32.4	22.0
Individual school or department level	92.6	97.3	95.1
Via careers service	57.4	54.1	31.7
Via students union	13.0	18.9	7.3
Ad hoc between students and businesses	59.3	62.2	46.3
Via external intermediary organisation	20.4	13.5	4.9
No. of cases	54	37	41

Source: HEBI survey 2001

8.3 Business oriented courses

Often a more direct relationship between the HEIs and business is in the provision of courses, where the course itself is designed to meet the needs of particular groups of businesses. These may be courses that are publicly-funded but are designed with specific employers in mind, such as undergraduate modules, or courses that have been developed in the anticipation that businesses will pay for their own staff to attend.

In the survey HEIs were asked if they ran courses that were specifically designed to meet the needs of a particular firm or group of firms. In general, HEIs were least likely to offer standard undergraduate degrees or degree modules, and were much more likely to offer sub-degree or masters level qualifications developed specifically for businesses. However, non-accredited courses were most commonly offered, with almost 90% of post-1992 universities running such courses.

There were some differences between groups of HEIs. The post-1992 universities were most likely to have undergraduate degrees specifically designed for businesses, whereas pre-1992 universities were only half as likely to do so, and less than a third offered degree modules designed to meet particular business needs. In each of the categories, post-1992 universities ran a higher percentage of courses designed to meet business needs.

This focus on more bespoke provision for business rather than building business needs into the curriculum came through strongly in the direct training provision for companies: a high percentage of all HEIs provide some form of short course on campus. When it came to provision on the company's premises, nearly all the post-1992 universities had some provision, compared with 70% of pre-1992 universities. The number fell even more for the provision of continuous work-based learning, and here the HE colleges also made little provision.

Table 8.2 Existence of courses that were specifically designed to meet the needs of a particular firm or group of firms (percentage for each type of HEI)

	Pre-1992 university	Post-1992 university	HE college
Undergraduate degree modules	30.4	47.2	27.9
Undergraduate degree	25.0	50.0	16.3
Masters degree	64.3	66.7	18.6
Diploma	42.9	58.3	23.3
Non-accredited course	67.2	89.2	44.2
No. of cases	58	37	43

Source: HEBI survey 2001

Table 8.3 Provision of training for companies (percentages for each type of HEI)

	Pre-1992 university	Post-1992 university	HE college
Distance learning for businesses	55.0	78.4	34.9
Continuous work-based learning	45.0	75.7	26.2
Short bespoke courses for business on campus	83.3	94.6	69.8
Short bespoke courses at companies' premises	70.0	97.3	58.1
No. of cases	60	37	43

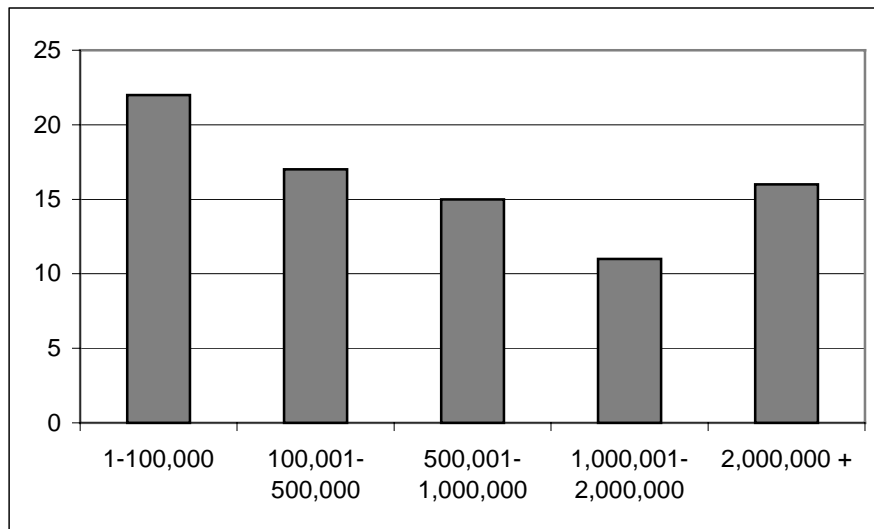
Source: HEBI survey 2001

On this last question there is little regional differentiation except for a low score for distance learning and work-based learning in southern regions, but this may largely be as a consequence of there being more HE colleges in these regions.

A relatively small proportion of HEIs were able to identify exactly how much revenue they gained from the provision of continuing education and training to companies, largely because there are no systems to separate company training from that provided for other organisations or individuals. From the 81 institutions that responded to this question, a larger proportion of pre-1992 universities were in the highest income group whilst a greater number of post-1992 HEIs were in the £500,000-£2 million groups. The majority of HE colleges received revenue from training of £1-£100,000.

On a regional basis, institutions in northern England and in the Midlands and South-West group received revenue of £500,001-£1,000,000 on average from training and continuing education. Some institutions in London and the South-East and in Scotland and Wales received higher amounts.

Figure 8.3 HEIs' annual revenue from continuing education and training (£)



Source: HEBI survey 2001

9 Regeneration

9.1 Involvement in regeneration programmes

In this section we focus on specific programmes with a regional or local economic development objective, and in which universities may be involved.

The growth of the partnership principle in many aspects of regional, urban or local development policy has been seen in the emergence of programmes such as City Challenge and the Single Regeneration Budget (SRB). In parallel, existing programmes such as ERDF and the European Social Fund (ESF) have been opened up to a wider range of organisations, including universities, and have taken a more collaborative form in many cases. As can be seen from the table, the majority of universities have been involved in at least one of these kinds of programmes over the past two years.

Some programmes are only open to HEIs in specific regions, such as the ERDF, the SRB and City Challenge, but generally HEIs have been very active at ensuring they have accessed those funds for which they were eligible. The recruitment of regional and European funds officers has brought a more professional approach to participation in such programmes. Usually this is undertaken on an institutional basis rather than through individual departments.

Table 9.1 Involvement in regeneration programmes (percentages for each type of HEI)

	Pre-1992 university	Post-1992 university	HE college university
European Regional Development Fund	46.7	62.2	33.3
EU Community Initiatives	58.3	91.9	35.7
European Social Fund	68.3	89.2	50.0
Single Regeneration Budget	21.7	56.8	14.3
City Challenge	6.7	8.1	0
DfEE Higher Education Regional Development Fund/ Skills Development Fund	31.7	67.6	21.4
Other local economic development programmes	26.7	45.9	23.8
No. of cases	60	37	42

Source: HEBI survey 2001

The scale of this involvement can be judged by the resources involved. HEIs were asked about their income from various regeneration-type programmes in 1999/2000, the results of which are summarised in Table 9.2. The role of the European programmes is significant, and underpins much of the local activity with small firms

and with community groups. The aggregate sum of £148 million is equivalent to the total income of a medium-to-large university, and is the largest element within the third strand activities. It encompasses a huge diversity of activity, much of which is summarised within the recent Regional Mission reports published by Universities UK (Charles and Benneworth, 2001).

Table 9.2 HEIs' Income from regeneration programmes 1999/2000

Source	Total for UK HEIs (£)
European Regional Development Fund revenue projects	43,727,375
European Regional Development Fund capital projects	15,845,438
European Social Fund	60,397,530
Single Regeneration Budget	9,585,931
Other programmes	18,970,898
Total	148,527,172

Source: HEBI survey 2001

9.2 Role of regeneration programmes

HEIs are becoming involved in regeneration programmes for a wide range of reasons. Involvement brings access to resources that can be used to address other missions in terms of developing new training courses, enhancing research infrastructure, or enhancing the estate through new buildings. The art of bidding for such programmes is to identify projects that meet the development needs of the institution whilst delivering the community or business development objectives of the funding scheme.

The HEIs were asked about those reasons which were appropriate to them in accessing regeneration programmes, and to identify the three most important. Overall the reasons most often identified within the top three were additional funds for teaching activities, building links with industry, and providing new services to industry. Least important were acquiring research equipment, enhancing knowledge of labour market requirements, and enhancing the redesign of the curriculum. However, there were significant variations between the different types of HEI.

Taking all appropriate reasons, the most frequently mentioned reason was 'facilitating partnership', along with building strategic links with industry. Pre-1992 universities were more inclined to mention additional funds for research and capital projects, but otherwise post-1992 universities tended to mention almost all reasons more frequently.

Focusing on the three most important reasons for each institution, the pre-1992 universities were more likely to pick out strategic links with industry, partnerships, and funds for research. Although only a minority identified research equipment as a reason, these were also concentrated in the pre-1992 university sector. Post-1992 universities focused on new services to industry, whilst HE colleges rated community development more highly than the universities, and partnerships and additional funds for teaching.

Table 9.3 Role of regeneration programmes for the HEI (percentage response from different types of HEI)

	Pre-1992 university		Post-1992 university		HE college		Total	
	All appropriate	Top three	All appropriate	Top three	All appropriate	Top three	All appropriate	Top three
Additional funds for teaching, training	79.2	56.0	81.1	55.9	72.4	63.3	78.2	57.9
Additional funds for research	69.8	32.0	59.5	17.6	48.3	23.3	61.3	25.4
Enabling capital projects - new building/accommodation	47.2	24.0	40.5	20.6	31.0	16.7	41.2	21.1
Acquiring research equipment (used also by industry)	34.0	14.0	45.9	2.9	27.6	3.3	36.1	7.9
Building strategic links with local industry	77.4	56.0	91.9	52.9	75.9	36.7	81.5	50.0
Fulfilling regional mission through new services to industry	67.9	40.0	89.2	64.7	79.3	43.3	77.3	48.2
Facilitating partnerships	75.5	44.0	97.3	35.3	89.7	50.0	85.7	43.0
Enhancing knowledge of labour market needs	52.8	6.0	64.9	5.9	65.5	13.3	59.7	7.9
Enhancing redesign of curriculum	43.4	8.0	64.9	8.8	48.3	10.0	51.3	8.8
Facilitating community development	49.1	10.0	67.6	17.6	72.4	30.0	60.5	17.5
Other	3.8	0	13.5	11.8	3.4	3.3	6.7	4.4
No. of cases	53	50	37	34	29	30	119	114

Source: HEBI survey 2001

At the regional scale the main differences were notably low scoring by the southern England HEIs for capital projects, research equipment, and labour market reasons. The northern England institutions tended to rate most reasons more highly, perhaps reflecting a broader engagement with these programmes through access to the ERDF. However in Scotland, Wales and Northern Ireland there was a downplaying of new services to industry, labour market projects, and community development.

Table 9.4 Role of regeneration programmes for the HEI (percentage response from different regions)

	NW/YH /NE	EM/WM/ SW	L/SE/ E	S/W/ NI
Additional funds for teaching, training	76.9	66.7	84.6	81.5
Additional funds for research	65.4	51.9	61.5	66.7
Enabling capital projects – new building/accommodation	46.2	59.3	23.1	44.4
Acquiring research equipment (used also by industry)	50.0	40.7	17.9	44.4
Building strategic links with local industry	84.6	85.2	71.8	88.9
Fulfilling regional mission through new services to industry	96.2	81.5	71.8	63.0
Facilitating partnerships	92.3	88.9	82.1	81.5
Enhancing knowledge of labour market needs	73.1	70.4	51.3	48.1
Enhancing redesign of curriculum	69.2	55.6	46.2	37.0
Facilitating community development	92.3	55.6	53.8	44.4
Other	3.8	7.4	7.7	7.4
No. of cases	24	26	36	26

Source: HEBI survey 2001. Regions: North-West (NW), Yorkshire and the Humber (YH), North-East (NE); East Midlands (EM), West Midlands (WM), South-West (SW); London (L), South-East (SE), East (E); Scotland (S), Wales (W), Northern Ireland (NI)

Participation in the programmes is not without problems, however, and HEIs do struggle with the burden of regulations and financial complications of these schemes. Almost all institutions identified administrative burdens and the requirement of matching funds as problems they had experienced, although pre-1992 universities had fewer problems with partnership management. The administrative requirements are typically much more intrusive than for research projects, and varied greatly between programmes. Matched funding needs also tend to vary, both in level and in eligibility and complexity. The ESF is particularly complex, with specific exclusions from allowable overheads, and a requirement for both public and private elements of matched funding. Pre-1992 universities tended to be more concerned about inadequate funding rates and eligibility rules, perhaps as a consequence of their greater dependence on research income with more generous overhead rates. Timing was a general concern across all sectors of HE, but particularly for HE colleges.

Table 9.5 Specific problems experienced in regeneration programmes (percentage response from each type of HEI)

	Pre-1992 university	Post-1992 university	HE college	Total
Administrative burdens	91.7	88.6	84.6	89.0
Matching funds requirements	77.1	82.9	61.5	75.2
Timing of bidding process	62.5	65.7	76.9	67.0
Difficulties of partnership management	39.6	54.3	53.8	47.7
Inadequate funding rates	81.3	62.9	69.2	72.5
Eligibility rules	60.4	57.1	46.2	56.0
Co-ordination problems internal to the university	37.5	42.9	50.0	42.2
Other	6.3	14.3	0	7.3
No. of cases	48	35	26	109

Source: HEBI survey 2001

Linked with these issues of participation in regeneration schemes, HEIs were asked to assess their own commitment to partnership arrangements with local and regional bodies using a benchmarking scale.

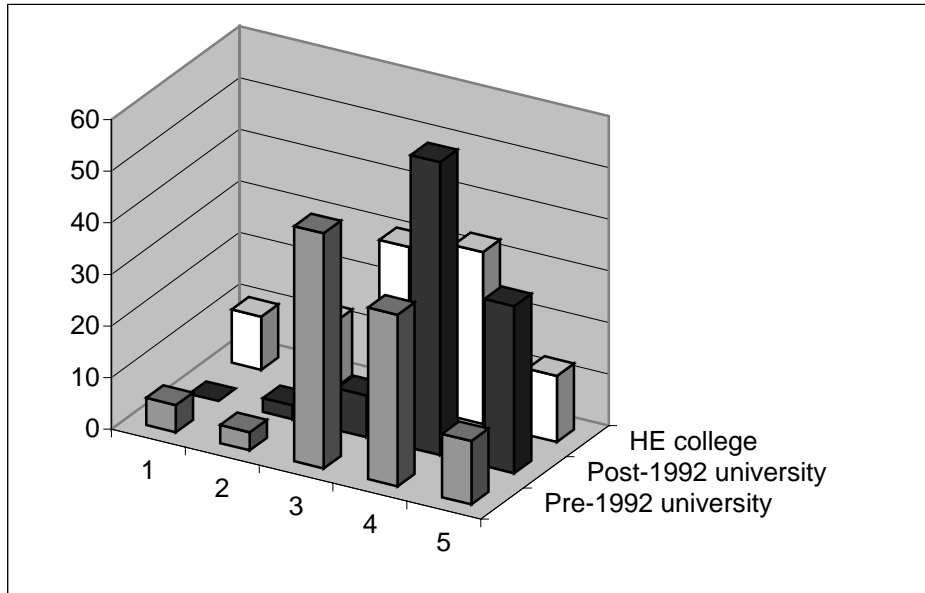
1	2	3	4	5
No engagement with community regeneration schemes, apart from individual efforts.		Some representation of the HEI on local partnerships at senior management level, but with limited implementation capability. Main focus is on research role and possible property development role.		Active and creative engagement with community programmes, with the HEI taking a leadership position and applying a wide variety of resources. Community regeneration seen as a mainstream activity with role for access policy, link to student community action, and staff involvement as part of staff development.

The highest ratings tended to be for the post-1992 universities, with almost 90% considering themselves to be at or near the good practice level. In contrast the pre-1992 universities were more likely to consider themselves to have limited implementation capability. HE colleges had a more varied response overall with some scoring more highly than the post-1992 universities, but others with low scores.

At the regional scale the HEIs in London and the southern regions tended to score lower on average, as on many of the other indicators, partly due to the greater number of HE colleges. In the northern English regions only one institution considered itself to have no engagement with community regeneration schemes. The remainder considered themselves to have at a minimum some representation of the HEI on local

partnerships at senior management level. HEIs in the other two groups of regions clustered around 3 or 4 on the scale.

Figure 9.1 Partnership arrangements with local and regional bodies (percentage of each type of HEI)



Source: *HEBI survey 2001*

10 Issues of data collection and the development of systems

The objectives of the study included:

- To establish and test the robustness of selected indicators which might later inform decisions on further targeted funding for knowledge transfer activities.
- To assess the opportunity costs of an annual survey against the value and utility of the data collected.

So in addition to establishing the nature and scale of business interaction, the study was required to examine the extent to which it was possible to collect meaningful data through a questionnaire, without imposing unreasonable demands on the HEIs. It is always possible to generate data, but do the data provide an accurate and meaningful interpretation of the phenomenon being investigated? All data collection has a cost, but the cost should not be excessive and should not deflect from the main objectives of the HEIs and of the HE funding bodies.

In order to judge the burden placed on them, HEIs were asked to comment on the time and cost of completing the questionnaire, on questions that were difficult or impossible to complete, and on the format of receiving and returning questionnaires.

In parallel a sample of 25 HEIs were interviewed by phone to explore these issues in more detail. The institutions contacted for this survey were assured of confidentiality: individual responses were not passed to the funding body. The approach was to be completely non-judgemental, with the institution not being evaluated on the responses, and with the objective being to improve the future effectiveness of such surveys and to lighten the future burden of response.

The 25 HEIs contacted were selected to be a representative sample of size, age, mission, and location (Tables 10.1 and 10.2). They ranged from small specialist colleges to large research-based universities, and including institutions with distinctive regional missions and others with a highly international orientation. Some had a strong reputation for industrial and business links whilst others were regarded as more academically based.

Table 10.1 Survey of burden for HEIs: sample by date of formation or entry into university sector

Type of institution	Number selected
Pre-19 th Century	2
19 th Century (civic-redbrick)	5
1900-50	2
1950-70 (Robbins expansion)	5
Post-1992 and HE colleges	11

Table 10.2 Survey of burden for HEIs: sample by geographical location (region)

Region	Number selected
North-East	1
North-West	2
Yorkshire & the Humber	2
East Midlands	2
West Midlands	2
South-East	3
East of England	2
South-West	2
London	4
Scotland	2
Wales	2
Northern Ireland	1

Each of the institutions was contacted initially through a call to the vice-chancellor's or principal's office, to identify to whom the questionnaire had been passed. This person was then contacted by e-mail to ask if they were willing to be interviewed by telephone for the survey on the burden of providing the data. A brief telephone interview, usually of around 30 minutes, was then conducted by a project team member. The notes of the interview were transcribed and used to prepare the report which follows.

The majority of institutions responded very positively and an interview was arranged soon after initial contact, although we quickly discovered that in some cases it was better to wait until the questionnaire had been completed to get a full response. Of the 25 HEIs contacted for interview, 24 were completed.

10.1 Appropriateness of survey

In general there was support within the HE sector for the objectives of the questionnaire in terms of measuring the nature and scale of business interaction and communicating that. It was felt that investigations of this kind were appropriate, subject to the nature of the specific questions and indicators, their timing and their use. There was widespread recognition of the public interest in the contribution of HE to business and the economy, and that there was a need for accountability.

Other agencies were also asking HEIs for similar information and hence for some HEIs there was little difficulty in providing it, although a concern that the data requirements could be standardised. In Scotland and Wales there was considerable demand for this kind of information already from the devolved bodies, whilst in

England the RDAs were expressing through their enterprise directors a new demand for detailed information on business interaction.

Within the HEIs there was a growing need for better data on enterprise links and performance, for management concerned with the implementation and monitoring of commercialisation and reach-out policies. Several respondents responsible for business development found the questionnaire useful to support their own needs for better data. Often the questionnaire showed up existing data collection inadequacies, where HEIs have typically invested in systems that deliver only that which is required by the HE funding bodies and no more.

Some institutions have already identified data collection and management as a key element of their HEROBC bids. The questionnaire reinforced these efforts and exposed weaknesses, especially a lack of centralised data. A common problem was the need to gather information currently held only at the faculty or department level. It had been anticipated that different central services might be involved in the completion of the questionnaire, but perhaps not that in so many cases information needed to be gathered from the faculties.

Although generally views were positive, there were also some negative views. A central concern was the mix of factual, qualitative and strategic information, and hence its accuracy and confidentiality. The questionnaire combined factual indicators on levels of income or numbers of firms with qualitative questions that requested a self-assessment of the nature of the HEI's strategy. This prompted two main critiques: first, whether the factual indicators are the most appropriate; and second whether the qualitative indicators reflect an appropriate model of business interaction, and whether they accurately reflect the state of strategy in the individual institutions. In particular, the nature of the benchmarking questions as self-assessed and judged often through negotiation were seen to lack the rigour and consistency that HESA data require.

The question as to whether the basic model is appropriate was a reflection of a view that there were other perspectives on business, and forms of interaction. One view was that national indicators were not necessarily appropriate given the differentiated approaches to business interaction. One vice-chancellor argued that the HEI should be able to set its own performance indicators based upon its institutional plan and HEROBC programme. A related comment concerned the purpose of business interaction: income generation or public interest. The balance of these will significantly affect the choice of indicators.

The biggest concern, which was in fact addressed in the present survey, was over individualised data and its publication. Experience of the use of all kinds of indicators to produce a whole series of league tables led to concerns that this would become another league table, trivialising some approaches at the expense of others and artificially setting the business agenda around a set of indicators that may not be appropriate as objectives.

10.2 Burden

A specific concern at the outset of designing the questionnaire was the time and effort needed to complete it. Some of the questions required considerable detailed and disaggregated data, which would only be easily available if appropriate systems were already in place.

In the questionnaire response, 102 institutions were able to provide estimates of the time taken to complete the questionnaire, albeit rather rough estimates in many cases. The mean time taken was 24.5 hours, although this was skewed by some extreme cases such that the median value was only 10.9 hours. 38.2% of HEIs had spent one day or less completing the questionnaire, but two-thirds of these were HE colleges, reflecting the relatively low relevance of many of the questions to the colleges and the small size of the institutions.

Table 10.3 shows the differences between types of HEI in the effort required to complete the questionnaire. Inevitably the more research-intensive pre-1992 universities tended to spend longer on the questionnaire, although there were some outliers. Three post-1992 universities spent more than two person-weeks on the questionnaire, as did four pre-1992 universities, whilst seven of each group took less than one day. In the main, however, the older more research-intensive institutions tended to be concentrated around one or two weeks, whilst the new universities were concentrated around one to three days. Only one HE college took more than three days: 78% of colleges spent less than one day on the questionnaire

Table 10.3 Time taken to complete the questionnaire: mean and median for different types of institution (staff hours)

	Mean time taken	Median time taken
Pre-1992 university	35.7	24.5
Post-1992 university	28	16
HE college	6.8	4
Total	24.5	10.9

Source: HEBI survey 2001

Institutions also typically costed completion of the questionnaire in terms of the time needed at a compound day rate. It was interesting to note the types of day rates quoted in this exercise, ranging from £27 per hour to £125 per hour. Assuming the data collection and questionnaire preparation were mainly done by fairly senior administrative staff, then the higher costs imply a significant overhead calculation. Figures of around £400 per day are realistic costs for research costs with full overheads, but such costs may not be entirely appropriate in this case.

Overhead recovery rates quoted for research recognise that in addition to the direct costs of undertaking research there are administrative and infrastructure costs which need to be covered. Some of these costs include the operation of financial control systems and production of management information, involved in the task of replying to questions. So it could be argued that this activity is an overhead itself on the

research activity of the institution. Some other overhead costs include the provision of a library and research computer network, which may be deemed to be irrelevant to the exercise of completing the questionnaire. Thus the estimation of an appropriate overhead for such administrative tasks is problematic, but essential to the estimation of the cost, as normal HEI overheads are in the region of 100% of staff costs.

Estimations of costs were much less frequent than estimations of time involved. Even among the interviewed HEIs some were unable or unwilling to give a cost, and so there is insufficient data to estimate costs directly. However, applying a 'typical' cost per hour to the 102 responses that provided a time estimate will give a sense of the total investment, and this can be grossed up accordingly. The 102 HEIs spent a total of 2,501 hours, and at a 'reasonable' average cost per day of £300 that would give a total cost of just over £100,000. This would give £120,000 if grossed up proportionately to include those who did not give cost estimates, and a likely cost of perhaps £150,000 for a full response from all HEIs. (The marginal cost of including all HEIs will be reduced as the non-respondents are strongly biased towards the HE college sector.)

These cost estimates have a number of caveats though:

- The true cost includes significant ongoing investment in data entry and accounting systems, which is needed for other purposes in terms of institutional management. If there were to be new requirements for more rigorously auditable figures such as the questions in this survey, then there would be a significant increase in these costs, at least whilst systems were enhanced. These investments may be sensible for other reasons of accountability, and better management of the business interaction function, but nonetheless would be real additional costs.
- If these questions were an annual formalised requirement and information systems were revised, then the cost of completing the questionnaire itself would be potentially less as data would already be available. The aggregate cost was inflated by those institutions that had to check back over individual contracts and search for data.
- The estimates for time and costs are for partially completed questionnaires, and some of the more difficult questions were poorly answered, or answered on the basis of estimates. In one case a sample of contracts was checked and the results grossed up. Full compliance with the present questionnaire would impose a significant increase in costs, but it is likely that a less demanding requirement would be suggested.
- Although the costs could be seen as high, especially if ongoing investments were included, the net additional cost is very small compared with the Research Assessment Exercise. It is not unreasonable to suggest that a large research-active department in the year before the RAE might spend at least £20,000 on preparing their submission, excluding central university support. The whole cost of the HEBI survey might therefore be less than the RAE costs for a single faculty in a research-based university.

10.3 Standardisation

The cost of compliance is closely related to the standardisation of the data requirements and the stability over time of indicators. If, for example, there is a known requirement to monitor the proportion of research contracts with industry that are with SMEs, then research contract services can add a suitable flag to contract databases to enable the easy retrieval of data on the number and value of contracts with SMEs. The biggest problem with the current survey was that, in the absence of such prior requirements and suitable database systems, a response required manual checking of all contracts, even if there was some information on the criterion specified. In the case of SMEs there was often no information at all available to the administration on whether a research partner was an SME or owned by a multinational.

Hence, given the long lead-times of putting such systems into place, concern was expressed about the lack of adequate prior notice on data requirements and the short response time to the specific questionnaire. In this case the survey was aiming to combine two functions – of gathering information that was timely and developing the concept of future surveys, and so in a sense is part of the prior notice process. But as a consequence the results need to be seen in this light, as best estimates which could be tightened up significantly in future years as indicators become institutionalised.

There was a general demand for the standardisation of the data request, preferably in the form of an annual survey to a common format, giving time for the HEIs to develop appropriate systems to respond easily, rather than ad hoc surveys that changed from year to year. It was recognised that these data would be required on an ongoing basis, and so having stable requirements would make it much easier for HEIs to respond.

A particular issue was the deadline. The questionnaires went out with a deadline of around a month, yet many institutions took considerably longer to respond. Why should this be the case when in the interviews and on the questionnaires the HEIs indicated that completion only took a few days' work split across five or six people?

First there were delays in passing the questionnaire through the organisation, from the vice-chancellor's office to the staff responsible for completion, and then difficulties in getting all the elements from individuals with varying levels of workload. Given the lack of a precise warning, and a perception that the questionnaire should be completed in between other tasks, it proved difficult for institutions to co-ordinate completion within a tight timetable. This would be improved by having a regular fixed time of submission each year.

Second there were delays due to missing data. Two institutions interviewed still claimed not to have all the data for 1999/2000 even though all financial data should already have been declared to HESA. Others needed to gather information from the faculties as some data had never been collected centrally before. Again, whilst the time involved for data analysis was not great, the co-ordination time was extensive.

Third, there was an overlap with the RAE submission period and specifically with the completion of the RA4 finance forms, which had a knock-on effect on the completion of section B on research contracts. Essentially the same staff were needed for questions B1 and B2 as were involved in finalising the B4 forms for each RAE unit of assessment. This tended to affect only certain institutions.

Given these points about timing and the need for advance warning and the programming in of data preparation, the HEIs were asked what was an appropriate time of year for the exercise.

This produced a very varied response from the interviewees, but January to April tended to be popular as it was sufficiently long after the end of the financial year for financial data to be available. Some requested the summer months, although this would further delay the production of statistics, and would be less desirable in policy terms. Some suggested November to December although this may be too early for many, due to the need to have completed financial reporting and the timing of other HESA reports.

10.4 Specific questions

The development of a standardised questionnaire for use in future years requires the assessment of the ease of completion of particular questions and their usefulness in policy terms. Here we will simply consider the level of difficulty of completion of individual questions, as reported in the interviews and as seen in the questionnaire responses.

Overall there were few problems with the qualitative questions, such as those in section A on strategies (see copy of questionnaire attached as Annex A). Whilst there were other potential criticisms of these questions for their reliability and appropriateness, they were easy to complete and there were few omissions.

The biggest problem was with section B on research collaboration. This section had the most reported difficulties, uncompleted returns and queries. It is worth noting at this point that the questionnaire contained telephone and email contacts for advice on difficult questions or help with definitions. Around half of respondents made some contact to check on specific questions or to explain late delivery, and the majority of these calls related to section B.

The main problems were as follows:

- A difficulty in understanding what was required for questions B1 and B2 in terms of identifying the level of grant income associated with business collaboration, and the nature and location of contract research income.
- Problems in understanding the differentiation of grants and contracts. Essentially we wanted to differentiate between those grants from public bodies where the HEI specifies what they want to do, but does so in collaboration with business, and those contracts where the HEI agrees to perform research on behalf of a firm or public body. Existing HESA returns provide the total value of grants from research councils and income from industry sources, but do not distinguish how much of the grant income involves collaboration. Many research council programmes now require industrial collaborators, but by no means all.
- There were definitional problems concerning what was a business (did it include the NHS was one question), and which programmes were operated by OST.
- Most HEIs had no existing breakdown of business-related research council income, and this tended to be one of the most labour-intensive elements of the survey as each grant needed to be manually checked.

- There were also great difficulties with the regional breakdown, as systems did not routinely record region. So addresses needed to be checked, and the address of the contact might not reflect the location of the partner branch in a multi-site firm. A related issue was that in some parts of the UK there was a very vague understanding of the concept of region. Clearly in the devolved areas such as Scotland there was clarity, and some acceptance that this was an important issue as this related to the territory covered by the funding council, but in England there was some variation in perception. In London and the South-East the biggest issue was the regional boundaries: central London HEIs regard the surrounding counties as part of their region, but the government boundaries separate London as a distinct unit. Elsewhere there was some confusion over precise boundaries, and problems for HEIs lying near the edge of regions, and with campuses in more than one region.
- Some institutional databases had no data on the location of a company, only perhaps an invoicing address.
- A comment made by a number of institutions with a strong health role concerned the status of the NHS. For these institutions the NHS was the core and most appropriate partner, and was regarded by them as a 'business' stakeholder. However in the survey we regarded the NHS as public sector and therefore excluded. This created some concerns that those institutions would appear to be less engaged, when in reality their engagement was simply directed strongly at a major public sector 'business'. It is suggested that the decision to regard the NHS as public is entirely appropriate, but it signals the importance of not over-emphasising the need for business interaction at the expense of other equally valid public policy outcomes.
- As already noted, the question relating to the proportion of contracts with SMEs presented significant definitional problems. Currently most HEIs do not record details on SMEs except where particular funding sources require it, such as in ERDF projects. One of the problems in future will be where, within the HEI, the check on SME status is made. Often it is only the department in direct contact with the firm that will be able to check whether it is indeed an SME. But the convoluted and arms-length nature of ownership means that a research partner may not be aware of the true ownership status, and this status may change during the course of a project.
- Finally in section B there were significant problems with the question on income from equipment-related services to industry. There are definitional questions here, but a more important issue is that such small scale income is often dealt with at departmental level, and merged with a range of other consulting and training services, so few institutions have accurate centralised data.

Section C of the questionnaire on intellectual property presented few problems for institutions. Many of the smaller HEIs had little to declare, and large research-based universities already have good tracking systems for these indicators. The indicators themselves are becoming internationally standardised, and fit with the US AUTM definitions, so there were no real surprises. Only one large research-based university reported difficulty in monitoring such information, which was presumably a reflection of problems in its own internal IP management systems.

The main problems with the consultancy data (section D) was concern that the full activity of the HEI was not captured, as there is often no requirement for reporting to a central body. Staff either do consulting outside the HEI, and hence it is not recorded, or do work through the department but it is submerged within 'Other services rendered' accounts. It was for this reason that the question asked for centrally monitored activity only, but it was clear that the scale of under-reporting was significant and variable between institutions.

There is perhaps a need for better guidance for institutions on policy for and reporting of consulting. One particular area of confusion was over the status of consulting as an 'other services rendered' activity and its VAT status. Some institutions regard work that is done on a day-rate basis and charged with VAT as consulting, but some of this activity may also be classifiable as research. Even if consistent policies have been developed, it is not clear that they are applied at departmental level.

Spin-off firms was a topic where there was only partial data. Institutions that had experience of spin-offs, where the HEI was involved with the firm through part ownership or royalty agreements, were able to provide information on numbers, employment and sometimes in equity. Few though had data on start-ups in which there was no IP agreement, nor on graduate start-ups.

Almost no information was available on equity or turnover. For many firms this was either confidential or meaningless. A firm that has recently been established and has no traded shares has no meaningful equity value, only a nominal value. This contrasts with a longer established firm that might see its shares traded at highly fluctuating values. HEIs are not in a position to monitor these figures, unless affected through their own equity investment portfolio, and in any case the figures have little direct meaning. It would seem to be inappropriate to ask HEIs to provide data on other legal entities, especially with the strict requirements of HESA.

Again there were comments from HEIs on their inability to track individual graduates, even though the questionnaire asked only for those that had completed formal graduate start-up programmes or by the direct intervention of the HEI.

Section F on training and personnel links mainly included qualitative questions, which did not present any problems, but the quantitative questions concerning the numbers of students undertaking placements and business-related courses presented some difficulties. Several institutions were unable to accurately disaggregate the different types of placement or course, and there were some definitional problems with these. The biggest problem though was an inability to identify the percentage of placement students that took up work with the employers they had worked with. This was not typically tracked, although in future it could be built into the HESA First Destination Survey thereby removing the need for HEIs to monitor this separately.

The considerable definitional problems with graduate measures were focused on issues such as how to treat part-time placements, the duration of placement, and the categorisation of employer. Several respondents presented a figure which included non-business placements, such as the NHS, as they were unable to easily disaggregate these figures.

10.5 Format

Overall, the format of the questionnaire was regarded positively by respondents. Most had a general preference for a Word document which could be emailed or made available as a download, as was done in this case. The format of the questionnaire was therefore deliberately simple to ease its use and manipulation. This experience can be contrasted with the anecdotal experience of dedicated formats such as research council and EU research proposal tools, which are disliked for their unportability, difficulty of printing and complexity of use.

Respondents were happy to have the option of return by either email or post.

The Word document option was preferred to other online forms, as the paper-based format is still useful for passing around the questionnaire internally for completion and discussion. In this sense the data requirements are still very different from HESA statistics, as they still need to be discussed and involve considerable dispersed effort rather than a more routine accounting input.

11 Recommendations for future surveys

This final section of the report focuses on detailed recommendations for future surveys.

Overall there is broad support for the collection of better information on the nature and scale of HE-business interaction. With increasing levels of involvement in the HEIs there is evidence of demand for better internal information systems to manage these activities more effectively. The currently available indicators, from published financial statistics for example, give only a very partial view of current activity, and one that is biased towards certain kinds of interaction. There is therefore a need both to further disaggregate existing data collected by HESA and to introduce the regular collection of new kinds of indicators. This survey has examined a variety of indicators and the ease with which they can be collected in future.

Enhanced data availability in the future will require greater investment from the HE sector to deliver accurate information in a more timely manner. The current survey has gained valuable information and will provide a baseline to some degree, but has been hampered in some areas by the difficulties faced by HEIs in retrieving information. In order for HEIs to commit themselves to the changes in data collection and storage needed to answer questions relevant to public policy, they need a clear statement of future data requirements. This should include specifications of what data needs to be collected and by what methodology, and an appropriate timetable for implementing the necessary changes.

Currently data are collected by three principal means and these approaches will continue in the future:

- HESA collects rigorously defined indicators on finance, students and staff on an annual basis.
- The HE funding bodies collect a mixture of qualitative and quantitative information from institutions via annual operating statements.
- There are a variety of ad hoc questionnaire surveys and other information requests.

It is important to recognise that this three-way data collection process is unlikely to change. However, a shift in the balance of which data is collected by what means, and a sharpening of the definition of some elements, would be beneficial. This would enable the better monitoring of performance and allow HEIs to better communicate the scale of their contribution. By standardising some data in a way that can be delivered through the HESA process it may be possible to reduce the impact of collecting more data by rendering the process more mechanistic, and therefore reduce the burden compared with ad hoc surveys.

Ultimately therefore we recommend that the current questionnaire approach is partly replaced by the formal collection of a limited set of hard indicators by HESA, as part of the annual financial return. This will take some time to implement, and so a questionnaire approach can be continued in the interim, but with HEIs being informed well in advance what the proposed indicators will be so that migration of information systems can be gradual. There will, however, still be a need for some form of

questionnaire for more qualitative questions, and as a means for the introduction of new issues as they are deemed appropriate.

The implications of extending the set of HESA indicators are that: the data required must be tightly and unambiguously defined, must fit with current collection processes and timing, are focused on the institution only and do not refer to external bodies, and are non-confidential, as most HESA data is published at an institutional level. The main emphasis therefore will be on the disaggregation of the existing financial data provided by institutions. So the research contract and 'other services rendered' categories could be further split beyond that which is already available to provide more useful information. Information on intellectual property could also be collected by HESA, but it is suggested that only limited information on spin-off companies falls into the category, and this mainly concerns shareholdings and income from dividends and share dealing. It is not appropriate for HESA to collect data on numbers of spin-off companies or their employment and equity value, as this is not information directly concerned with the institution.

Being more specific we suggest the following, subject to full consultation and discussion within the HE sector.

Research contract financial data could be disaggregated as follows. The heading on research council/OST income could be further divided to differentiate those contracts with industrial collaboration and those without. Research contracts from UK business could be split between those with SMEs and those with other firms. The overseas research contracts could be split to show the element from business. It is not suggested that a regional breakdown is essential here, although this may be of greater priority for HE funding bodies in Scotland and Wales.

'Other services rendered' income is already disaggregated to some extent, but this could be further enhanced. One element that could be better identified is consultancy, where there are some difficulties in definition to be resolved. Income from the sale of shares in spin-off companies could be added as a discrete element. Finally the income from IP should be further investigated to see if gross incomes and costs could be separately identified, especially where third party IP management companies are used.

An additional area of data collection for HESA could be the collection of IP indicators such as disclosures, patent applications and patents granted. These kinds of indicators are already collected and monitored by a majority of HEIs using robust international standards. Those institutions that do not collect such data at present mostly have very low levels of this activity, and so the burden of collection would be very limited. Numbers involved are also not sufficiently large that sophisticated data collection system would be needed in the institutions.

In moving down this route it must be acknowledged that such data will then be published for each HEI. This is important in determining that the data should be limited to matters addressing the financial performance of the HEI only and not any other organisation linked with the HEI (such as a spin-off company). It may be that some of this information may be used to evaluate or rank institutions, but this is only an extension of existing data on research and related income and therefore already subject to this potential use. In the US the individual HEI responses to AUTM surveys are published.

Qualitative indicators and questions are still useful for other purposes of developing appropriate policies for the sector, and could be continued through an annual

questionnaire that might change to a degree from year to year. It is important that such information is only published at an aggregated level as responses would be affected by any decision to publish individual HEI data.

Our interactions with individual HEIs revealed that the information systems on research grants and other interactions with industry tend to be designed to comply with the demands of HESA, but do not permit the production of more sophisticated management information. Many are currently thinking about new forms of client tracking systems and monitoring systems associated with an increased involvement in reach-out programmes such as HEROBC and HEIF. The current questionnaire has stimulated some thinking on these matters; several respondents have enquired about future information needs so that they can redesign systems accordingly. HEIs should therefore be further encouraged to invest in more detailed information systems. Often this is less a matter of redesigning the IT systems than the paper-based data collection systems that feed into them.

HEIs also need to take a more strategic view of some of the kinds of interactions examined in this report. Although business interaction is recognised as an important part of the mission, and is in aggregate an important source of funds, it is still managed as a marginal activity in the true meaning of that term. HEIs plan and manage their business primarily on the basis of core funding streams, with activities such as those examined in this survey treated as additional, volatile and managed on a self-contained basis. Following this logic, much of this activity is devolved, with departments only providing essential financial information to the centre of the HEI. If such activities are instead regarded as an ongoing core activity, then central monitoring would appear to be required, and more detailed information would be collected on levels of activity and beneficiaries in addition to income.

For government, the implication of the survey findings is that there is a very varied approach to business interaction, with some traditional forms of business collaboration essentially limited to very few institutions. The monitoring of patents and spin-offs requires a response from relatively few HEIs due to the extreme concentration of outputs. However, other HEIs are much more active in other forms of business interaction, such as providing services to SMEs through regeneration funds. This suggests extreme caution is needed on the setting of narrow models of business interaction, the application of few indicators, or the direction of funds to particular categories of HEIs. All HEIs can make a positive contribution to business or their local community, although some may continue to choose to focus on other objectives. It is therefore important that all HEIs are offered the opportunity to meet this challenge through additional funding for reach-out activities. The practices and performance of HEIs are affected both by the type of institution, and hence their historical endowments, and by the local business environment, as well as the management decisions taken within the HEI. The achievement of benefits for the UK as a whole and all its constituent elements will depend on an inclusive approach that recognises this diversity and supports it accordingly.