

Annexe A: Defining KIBS

Statistical classification of Knowledge-Intensive Business Services has been the subject of much discussion, and a fair level of agreement has been reached.

KIBS that are liable to be mainly related to new technologies include:

- *Computer networks/telematics services* (e.g. Internet Service Providers, VANs, on-line databases);
- some *Telecommunications* (especially new business services);
- *Software*;
- Other *Computer-related services* - e.g. Facilities Management, Web support services, disaster recovery and business continuity services;
- *Training* in new technologies;
- Design involving new technologies;
- *Office services* involving new office equipment);
- those *Building services* that involving new IT equipment such a Building Energy Management Systems;
- *Management Consultancy* involving new technology;
- *Technical engineering*;
- *Environmental services* involving new technology; e.g. remediation; monitoring;
- *Scientific/laboratory testing services*; *R&D Consultancy*.

Some KIBS are hard to locate as being either technology-based or more traditional professional services: *Architecture* combines elements of both, as do some design services. Table A.1 presents a listing of technology-related KIBS with tentative statistical classifications in the NACE schema, as prepared by Bilderbeek et al (1998).

A list of professional KIBS which are not predominantly technology-based would include:

- *Marketing, market research, and advertising*;
- *Training* (other than in new technologies);
- Specialised *Personnel Recruitment* and headhunting;
- *Design* (other than that involving new technologies);
- some *Financial services* (e.g. securities and stock-market-related activities);
- *Office services* (other than those involving new office equipment, and excluding “physical” services like cleaning);
- *Building services* (e.g. architecture; surveying; construction engineering, but excluding services involving new IT equipment such as Building Energy Management Systems));
- *Management Consultancy* (other than that involving new technology);
- *Accounting and bookkeeping*;
- *Legal services*;
- and *Environmental services* (not involving new technology, e.g. environmental law; and not based on old technology e.g. elementary waste disposal services).

The approach outlined above has been widely used in discussions of KIBS, but there are related concepts that have led to slightly different classifications. For example, Murphy and Vickery (1999) talk of (and provide useful comparative statistics on) “strategic business services”. These consist of computer, R&D & technical, marketing, business organisation, and human resources development services.

Services that do not fall within the scope of KIBS definitions, though they may be knowledge-driven, take various forms. Some are mainly excluded on the grounds of servicing final consumers to a large extent – e.g. *Health/medical services*; *Consumer Financial and Real Estate services*; Education services (other than specialised training for industry); *Broadcasting* and other mass media (with possible exceptions, such as when these media are also used for specialised delivery of business services as in data broadcast or encoded business video transmissions); *Public administration* (with possible exceptions in industry support schemes); *Repair/maintenance* (with the exception of activities related to advanced IT). Other services are less obviously knowledge-driven (in the main) as well as being consumer-oriented: *Social welfare services*; *HORECA* i.e. Hotels, etc. and Catering; *Leisure/tourism*; *Personal consumer services*; *Entertainment*; *Retail and wholesale services* (wholesale is business-oriented of course, and includes some knowledge-intensive branches); *Post, Transport and Physical Distribution* (although some specialised services may be included - e.g. priority delivery services, and transport logistics are highly technology-intensive)

Table A.1 Statistical Classification of Technology-Related KIBS

Definite cases	NACE-codes
Hardware consultancy services	7210
Software consultancy and supply services	7220
Data processing services	7230
Database activities	7240
Maintenance and repair of office equipment	7250
Other computer related activities	7260
Computer and related IT services	72
Research & (experimental) Development	73
R&D on natural sciences and engineering	7310
R & experimental D in social sciences and humanities	7320
Architectural and engineering activities and related technical	742
Technical testing and analysis	743
More tentative cases	
Technology related publishing	Part of 221
Wholesale in machinery, equipment etc.*	516
Logistic services and related transport services	632
T-KIBS in telecommunications	Part of 6420
Patent bureaux	7411.5
Technology-related market research	Part of 7413
Technology-related economic and management consultancy	7414
Technology-related labour recruitment and provision of	Part of 745
Technology related training	Parts of 8042 / 8022 / 8030

* The assumption here is that machinery and equipment wholesale services act as distributors of (technical) knowledge and related expertise.

Source: Bilderbeek et al (1998)

However, just as many traditional professional service sectors include some firms that are becoming more technology-based KIBS, so many of the non-KIBS sectors mentioned above feature some emerging activities that may be regarded as KIBS. For example, health care is a sector where there are extremely highly qualified professional staff, many laboratories and specialised researchers, and a high rate of development and use of new technology and techniques (e.g. health informatics). Some of these staff may supply services to other organisations and eventually new firms or units may be created out of these activities. Specialised information services may well arise for any of these sectors, too, whose status may be debatable.

KIBS do **not** include business services whose roles are not knowledge-based in this way: cleaning, catering, security, transport, etc. In practice there are many borderline cases and grey areas, especially when we move from the characterisation of broad sectors and subsectors to looking at individual firms. For instance, logistics services may not only transport goods from place to place, but can also supply sophisticated and knowledge-intensive support for the planning and management of transport, storage and related arrangements for clients. If such support is the main role of the firm (a logistics firm may even contract the actual transport out to other companies), then it makes sense to regard the firm itself as a KIBS (though the whole sector in which it falls may not be a KIBS sector). When, in contrast, the main activity is the transport itself, then the firm would not be a KIBS (and will not in general fall within a KIBS sector). Similarly, a manufacturing company that supplies some KIBS functions internally is not regarded as a KIBS – if these come to predominate, we may well query whether this really remains primarily a manufacturing firm.

Annexe B: Detailed Results of CIS3 Analyses

This Annexe presents the data on which the Figures of Chapter 4 are based, as well as a few examples of alternative workings of the data.

Tables B.1, B.2 Employment of Graduates – UK CIS3 Data

Calculated by Bruce Tether and Peter Swann from CIS3 data.
Subsectors are displayed only if sufficient cases available. Data are unweighted.

Table B.1 Employment of Graduates in non-Services

	Total	S&E graduates				Other Graduates			
		OF TOTAL		Of those employing		OF TOTAL		Of those employing	
		% employ ing	Mean	Mean	Median	% employ ing	Mean	Mean	Median
Low Tech Manufacturing (OECD def.) [n. 1325]	1074	39%	2%	4.4%	2%	56%	5%	8.2%	3%
Medium Low Tech Manufacturing (OECD def.) [n. 744]	637	52%	4%	7.2%	5%	43%	3%	7.0%	3%
Medium High Tech Manufacturing (OECD def.) [n. 1006]	873	71%	8%	10.8%	6%	59%	5%	8.0%	4%
High Tech Manufacturing (OECD def.) [n. 242]	214	86%	13%	15.6%	8%	73%	7%	9.9%	5%
Extraction, Utilities, Recycling [n. 207]	159	58%	7%	12.8%	8%	58%	6%	10.1%	5%
Construction [n. 947]	768	38%	3%	9.0%	5%	39%	4%	11.1%	4%

Note

A note on the data in [Table B.1.](#), which are of interest though not strictly pertinent to the main themes of the present paper. First, consider manufacturing. We see that the share of firms employing scientists and engineers (S&E) increases with the sector's classification on a continuum from low to high tech manufacturing (see Annexe 1 for definitions here). Not surprisingly, the mean number of S&Es employed by firms in these sectors also increases along this continuum, as does the mean and median shares of graduates employed by firms. (Note that since firm sizes vary, these figures should *not* be equated with the share of graduates in the sector's overall employment.) This is not quite paralleled by the results for other graduates (OG). Here, the lowest tech sectors seeming to rival the medium high tech ones in their uptake of OGs. (Perhaps these are established industries where many graduates are required to help with marketing and similar functions? In any case, the result prevents us speaking of a clear trend here.)

Table B.2 Employment of Graduates in Services

	Total	S&E graduates				Other Graduates			
		OF TOTAL		Of those employing		OF TOTAL		Of those employing	
		% employ ing	Mean	Mean	Median	% employ ing	Mean	Mean	Median
Technical Services	277	74%	33%	45.4%	48%	62%	15%	23.7%	11%
Tech Servs 1 – Architectural & Engineering (SIC92 74.2)	194	68%	30%	43.6%	43%	59%	16%	27.6%	15%
Tech Servs 2 – R&D and Technical Testing	83	87%	42%	48.7%	50%	69%	11%	15.9%	10%
InfoTech Services (in electronic media reprod)	202	78%	29%	37.6%	30%	76%	19%	24.3%	17%
InfoTech 1 – Computer Services (ex. Maintenance & Repair)	146	82%	36%	43.3%	40%	78%	21%	27.2%	20%
InfoTech 2 – Telecoms and other IT services	56	68%	13%	19.4%	9%	71%	11%	15.9%	10%
Financial Services	503	31%	3%	10.8%	5%	72%	14%	19.2%	10%
Fin Servs 1 – Banking, Insurance, Property Trading	347	31%	4%	11.6%	5%	78%	16%	19.9%	10%
Fin Servs 2 – Renting and Leasing	156	31%	3%	9.1%	4%	58%	10%	16.8%	10%
Business Services (inc. Publishing, Property Dev.)	738	25%	5%	20.4%	10%	82%	24%	29.0%	20%
Prof Servs 1 – Qualifiational – Legal / Accounting	385	14%	2%	18.0%	10%	88%	26%	29.3%	24%
Prof Servs 2 – Informational – Publish, Trav/Est Ag, Mkt Res	180	33%	5%	15.6%	5%	73%	21%	29.3%	18%
Prof Servs 3 – Managerial / Organisational	173	41%	11%	26.2%	12%	78%	22%	28.1%	15%
Transport & Storage (not travel or tour agents)	472	23%	1%	6.1%	2%	47%	4%	9.2%	3%
Transport 1 – Passenger	108	29%	1%	4.7%	2%	47%	3%	7.4%	2%
Transport 2 – Freight (inc. Storage)	281	20%	1%	4.4%	2%	41%	4%	8.8%	3%
Transport 3 – Other	83	24%	3%	12.9%	3%	66%	8%	11.7%	5%
Wholesale	905	35%	5%	13.2%	5%	53%	7%	13.8%	5%
Total (all sectors)	6822	45%	6%	14.1%	5%	58%	8%	14.7%	5%

The lower versions of each figure concentrate on the service industries only, and suggest that a few “clusters” of KIS can be depicted. At first glance, these seem to indicate that there are actually positive associations between employment of each type of graduate - but these are not terribly strong relationships, with some sectors deviating considerably from the regression lines, concentrating on one or other type. (If anything, the strength of the relationships looks lower once the nonservices are excluded from the graphs. Indeed, a visual inspection suggests that there is quite a striking tilted V-shaped pattern for the services - perhaps telling us that there are two broad vectors, at different angles, in the data. Speculatively, we could suggest that one of these represents the requirements for professional staff to be backed up by S&E staff in non technology-intensive services, while the other pattern represents the different interrelation between needs of the two types of knowledge in more technology-intensive services. Non-technologists need technologists for different reasons and to different extents than vice versa.

Figure B.1 Mean of Firms' Graduate Employment, by Sectors (OG vertical S&E horizontal)

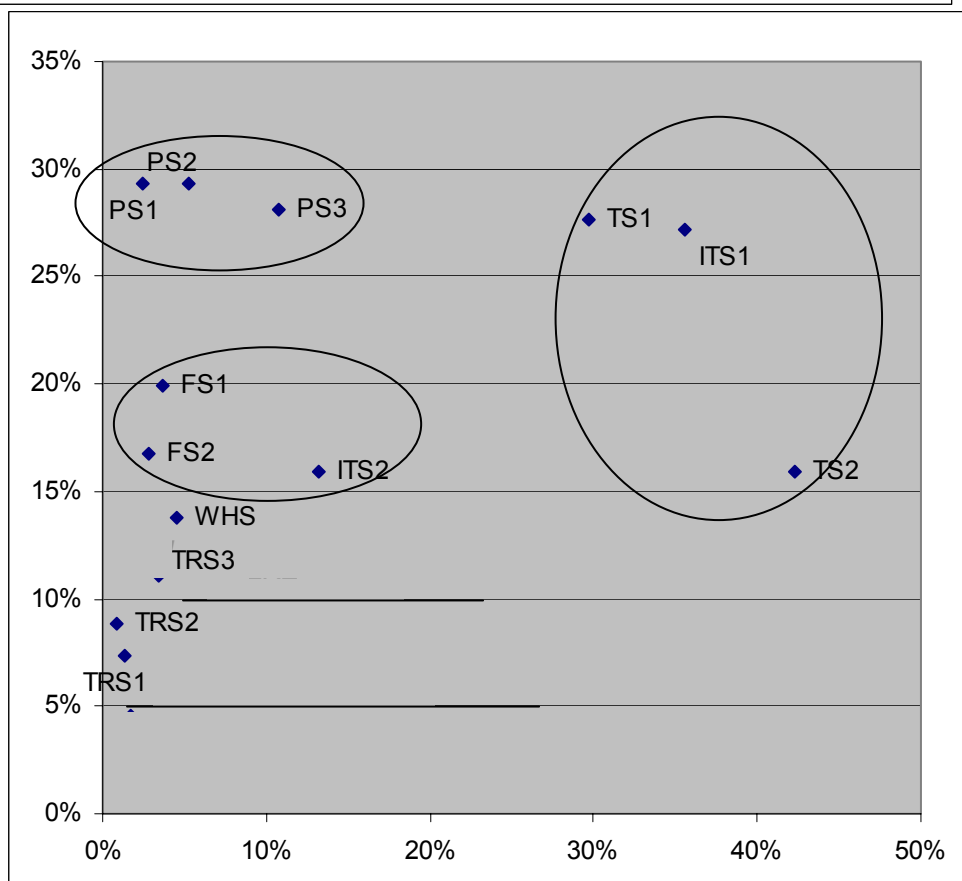
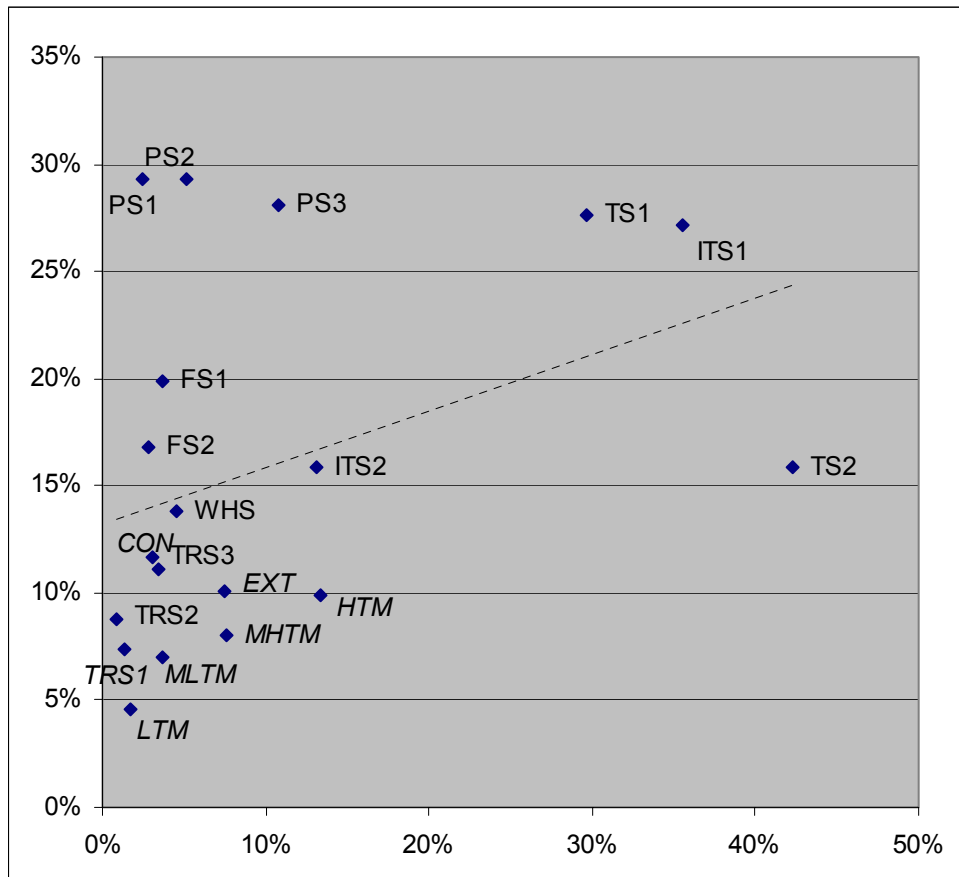


Figure B.2 Mean Employment Shares of Graduates, among Employers only, by Sector

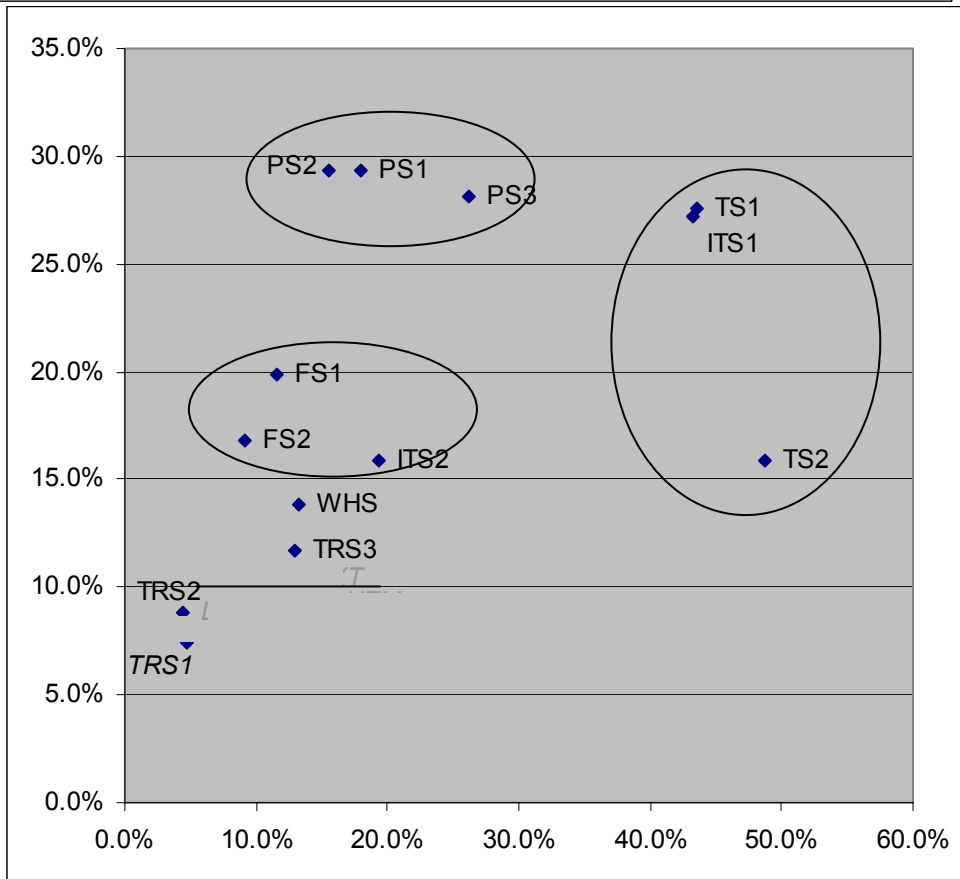
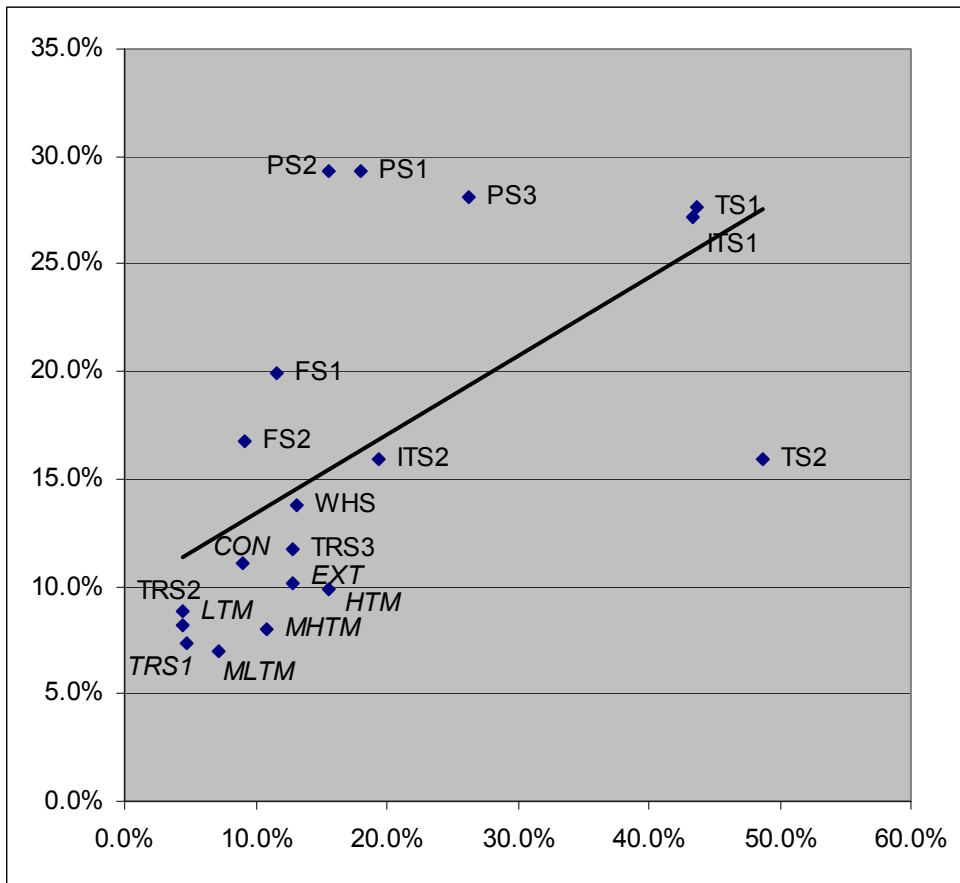


Figure B.3 Proportion of firms employing OG graduates (horizontal), by mean of Firms' S&E Graduate Employment (vertical), by Sectors

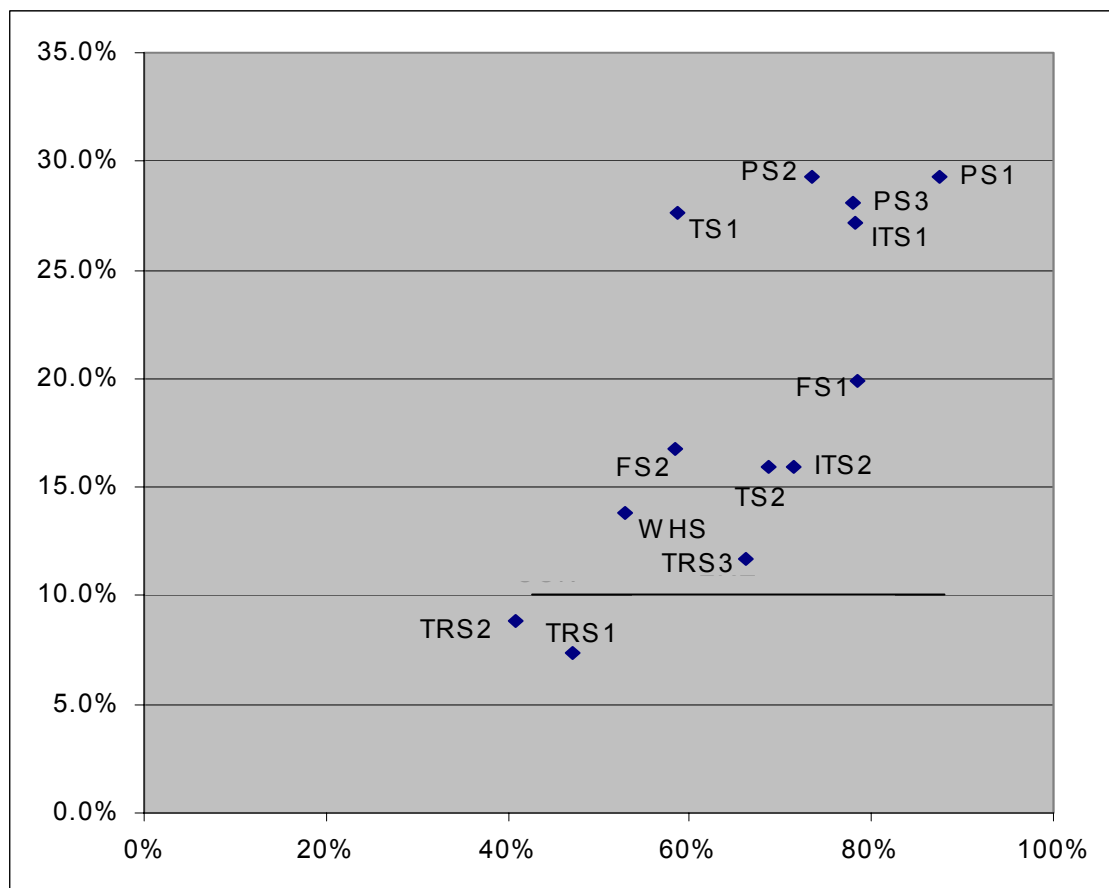
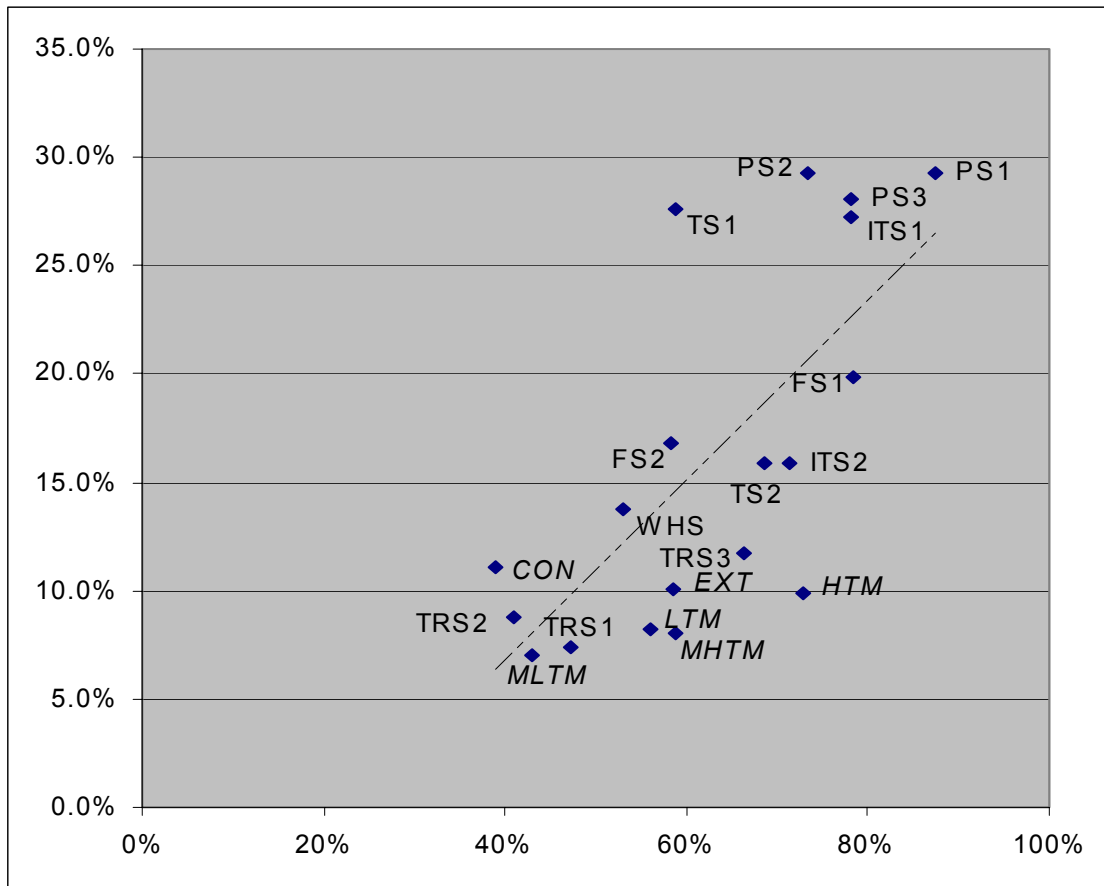


Table B.3 provides a simple unweighted analysis of responses to the question about sources of information for innovation, contrasting service and manufacturing enterprises. Some of these data are used in Figures 4.5 and 4.6.

The first pair of columns shows how often the various sources of information were used by service and manufacturing enterprises respectively. The second pair of columns shows how often these sources of information were regarded as of 'high importance' to innovation activities.

Table B.4, detailing the use of public and private sources of information in different sectors, is the basis for Figures 4.7 and 4.8.

Table B.3 Sources of Information / Knowledge Used for Technological Innovation

	<i>Used as a Source</i>		<i>Of High Importance</i>	
	Services	Manufacturers	Services	Manufacturers
• Within Enterprise	81%	85%	33%	38%
• Suppliers	77%	83%	21%	19%
• Customers	73%	80%	19%	21%
• Technical Press, etc.	65%	65%	7%	5%
• Competitors	62%	66%	7%	8%
• Conferences, Meetings	62%	52%	6%	3%
• Fairs & Exhibitions	58%	72%	6%	8%
• Trade Associations	58%	58%	5%	3%
• Consultants [#]	56%	48%	8%	4%
• Technical Standards ^{\$}	56%	71%	10%	14%
• H&S Standards, etc ^{\$}	56%	76%	11%	15%
• Environmental Standards ^{\$}	52%	73%	9%	13%
• Within Group	48%	51%	12%	11%
• Government Offices	27%	30%	1%	1%
• Universities*	24%	36%	2%	2%
• Private R&D Enterprises [#]	21%	36%	1%	2%
• Govt Research Org's*	19%	23%	1%	1%
• Private Research Institutes [#]	18%	24%	1%	1%
* Public Science Base	29%	39%	2%	3%
# Private Sources of Expertise	61%	56%	9%	5%
\$ Standards & Regulations	66%	81%	17%	22%

Based on responses from those with innovation activities only.

Table B.4 Sources of Information / Knowledge Used for Technological Innovation

	N.	Public Science Base		Private Sources of Expertise	
		Used	High Impt	Used	High Impt
All Services	1,531	29%	2%	61%	9%
Arch. & Engineering (TS1)	108	44%	6%	69%	6%
R&D & Tech. Testing (TS2)	66	77%	20%	76%	20%
Computer Services (IT1)	127	35%	1%	67%	9%
Telecoms & Other (IT2)	41	44%	0%	71%	10%
Banks, Insurance, etc (FS1I)	204	23%	1%	70%	15%
Renting & Leasing (FS2)	61	26%	2%	64%	10%
Legal & Accounting (PS1)	145	19%	3%	56%	10%
Informational Services (PS2)	120	27%	2%	57%	9%
Managerial Services (PS3)	74	28%	1%	68%	7%
Passenger Transport (TR1)	40	25%	0%	38%	15%
Freight & Storage (TR2)	113	19%	0%	54%	4%
Other Transport Serv's (TR3)	39	26%	5%	74%	8%
Wholesalers (WS)	393	26%	1%	53%	7%
All Manufacturers	1,944	39%	3%	56%	5%
High Tech Manufacturing	165	45%	3%	64%	10%
Medium High Tech Manuf.	694	50%	3%	60%	5%
Medium Low Tech Manuf.	381	38%	3%	54%	5%
Low Tech Manufacturing	704	28%	1%	51%	5%

Based on responses from those with innovation activities only.

Table B.5 Participation in Co-operative Arrangements for Innovation

	Services	Manufacturers
Any Partner Type	21%	22%
Suppliers	12%	13%
Other Enterprises in Group	12%	10%
Customers	9%	12%
Consultants [#]	6%	6%
Universities *	5%	9%
Competitors	5%	4%
Private R&D Enterprises [#]	3%	5%
Private Research Institutes [#]	3%	3%
Govt Research Orgs *	2%	3%
* Public Science Base	6%	10%
# Private Sources of Expertise	8%	9%

Based on responses from those with innovation activities only

Table B.6 Co-operation Arrangements with the Public Science Base by Sector of Activity

	N.	Universities	Govt Research Organisations	Public Science Base	Private Sources of Expertise
All Services	1,587	5%	2%	6%	8%
Arch. & Engineering (TS-AE)	112	10%	4%	11%	11%
R&D & Tech. Testing (TS-RD)	67	42%	22%	45%	33%
Computer Services (IT-CS)	130	3%	1%	3%	8%
Telecoms & Other (IT-TO)	41	7%	0%	7%	7%
Banks, Insurance, etc (FS-BI)	204	1%	0%	2%	8%
Renting & Leasing (FS-RL)	64	6%	2%	6%	11%
Legal & Accounting (PS-LA)	151	1%	1%	1%	4%
Informational Services (PS-I)	123	5%	2%	5%	3%
Managerial Services (PS-M)	78	5%	1%	5%	12%
Passenger Transport (TS-P)	42	5%	5%	5%	14%
Freight & Storage (TS-F)	122	2%	1%	2%	3%
Other Transport Services (TS-O)	42	2%	0%	2%	7%
Wholesalers (WS)	411	4%	2%	5%	7%
All Manufacturers	1,992	9%	3%	10%	9%
High Tech Manufacturing	170	11%	4%	12%	14%
Medium High Tech Manufacturing.	701	14%	4%	15%	12%
Medium Low Tech Manufacturing.	394	10%	3%	10%	8%
Low Tech Manufacturing	727	5%	2%	5%	6%

Based on responses from those with innovation activities only

Annexe C: List of Main Interviews for the Study

Note: a number of briefer interview and telephone conversations have also been conducted with ESRC staff, members of other Universities, and with social researchers working in the field.

Organisation Interviewed	Date of interview	Mode of Interview
Environmental Sector		
1. Context group Ltd	March 31	Telephone
2. Terra Consult Ltd	March 31	Telephone
3. Next Step Consulting	April 2	Telephone
4. WSP Environmental Ltd	April 4	Telephone
5. Envirocare Technical Consultancy	April 4	Telephone
6. GEMS Urban Sustainability Consultants Ltd	April 7	Telephone
7. Young Associates	April 10	Face-to-face
8. Bureau Veritas	April 10	Telephone
9. Carl Bro Group	April 14	Telephone
10. MWH Consulting Ltd	April 17	Telephone
11. PwC	April 23	Telephone
12. Environmental Business Intelligence	May 1	Telephone
13. ABB Eutech	May 1	Face-to-face
14. White Young Green Environmental Ltd	May 2	Telephone
15. ADAS Environment	May 2	Telephone
16. Legiste Ltd	May 6	Telephone
17. ECUS Ltd	May 8	Face-to-face
Business Continuity Sector		
1. ZipToNet	April 1	Face-to-face
2. Continuity Systems Ltd	April 3	Telephone
3. ICAS	April 11	Telephone
4. Garrison Continuity	April 23	Telephone
5. Assurity Europe Ltd	April 23	Telephone
6. BSH Associates	April 24	Telephone
7. Standza Consulting	April 25	Telephone
8. Pentire Solutions	April 28	Telephone
9. Redan International	April 28	Telephone
10. Rusell Scanlan	April 29	Telephone
11. Synstar International	April 29	Telephone
12. Link Associates International	May 6	Telephone
13. Insight Consulting	May 13	Telephone
14. Business Continuity Institute	May 14	Telephone
15. Info Sec Associates	May 14	Telephone
16. Visor Consultants Ltd	May 16	Telephone
17. Belfor-Relectronic (UK) Ltd	May 20	Telephone
18. Office Shadow Ltd	May 20	Telephone
Market Research Sector		
1. TheHolyGrail.net	April 7	Telephone
2. BDRG	April 9	Telephone
3. Wirthlin Europe	April 11	Telephone
4. MORI	April 17	Telephone
5. BSRIA World-wide Market Intelligence	April 30	Telephone

IOIR Report on KIS and Science Base

6. Arkenford Ltd	April 30	Telephone
7. Continental Research	April 30	Telephone
8. Double Helix	May 1	Telephone
9. Buckingham Research	May 1	Telephone
10. Market Measures	May 2	Telephone
11. IFF Research	May 7	Telephone
12. Intrepid Consultants Ltd	May 8	Telephone
13. Taylor Nelson Sofres	May 8	Telephone
14. Oxford Research Agency	May 9	Telephone
15. Topflight Research	May 13	Telephone
16. Product Perceptions	May 13	Telephone
17. Reading Scientific Services	May 15	Telephone
18. SGA Research International	May 19	Telephone
Insurance Sector		
1. Axa UK	April 17	Telephone
2. Bank of Scotland	April 29	Telephone
3. Friends Provident	May 15	Telephone
4. MYLA Ltd	May 17	
5. Zurich Financial Services Marketing Dept	June 4	Telephone
6. Zurich Financial Services Consumer Research	June 12	Telephone
7. Zurich Financial Services Graduate Recruitment	June 19	Telephone
8. Winterthur Life	May 28	Telephone
9. Standard Life	June 12	Telephone
10. Lloyds TSB	June 18	Telephone
11. Royal Sun Alliance	June 10	Telephone
11. Genetics and Insurance Research Centre, Heriott Watt University	June 6	Telephone
12. Tsunami project (Director)	June 9	Telephone
13. Centre for Risk and Insurance Studies (CRIS) Nottingham University	June 18	Telephone
14. Cambridge University Centre for Risk in the Built Environment (CURBE)	June 12	Telephone
15. London Guildhall University (CIP course organiser)	June 3	Telephone
Universities		
1. Birmingham University	May 9	Telephone
2. Newcastle University	May 19	Telephone
3. Glasgow University	May 19	Telephone
4. Sheffield University	May 19	Telephone
5. Warwick University	May 21	Telephone
6. UCL	May 21	Telephone
7. Oxford University	May 22	Telephone
8. Southampton University	May 29	Telephone
9. Leeds University		Telephone
10. Cambridge University		Telephone
11. Liverpool University		Telephone
12. Cardiff University		Telephone