

Knowledge-Intensive Services

Ian Miles
Manchester Institute for Innovation Research,
Manchester Business School, University of Manchester, UK
Ian.Miles@mbs.ac.uk

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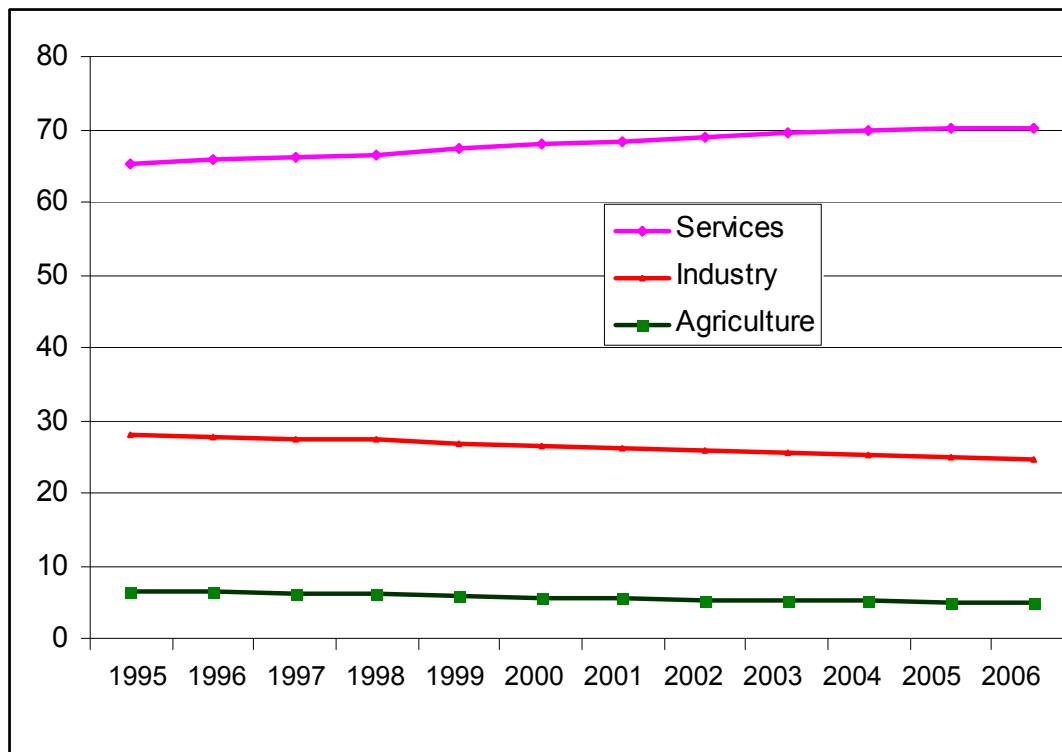
ABSTRACT

“Knowledge-Intensive Services” – including Knowledge Intensive Business Services (KIBS) – are particularly dynamic sectors in the European economies; and indeed, in those of most industrialised nations around the world. More generally, Knowledge-Intensive Service Activities (KISA) take place across all sectors. This essay examines the scale and scope of these service activities, and surveys the literature that has explored their development and their contributions to the knowledge economy and to innovation in the twenty first century.

Introduction

The growth of the services sectors is a phenomenon common to all advanced industrial economies – this is a very long-term trend, and data for European countries in the last decade, displayed in [Figure 1](#), shows that it is still underway. It is apparent that services sectors now dominate the European economy in terms of employment. (Since more services employment is part-time, if we considered the hours worked in the different sectors the differences would be less marked, but still striking). A great deal of this employment is in public services, but just considering *market services*, the trend from 1970 to 1995 was from 31% to 45% of total employment, and the growth in EU-15 GDP was from 36% to 50%.¹ *Non-market services* accounted for another 14% of GDP and 21% of employment in 1995. These figures are slightly below those of the USA, slightly above those for Japan.²

Figure 1 Trends in Sectoral Shares of Employment in Europe (EU-25)



source: EC (2007)

¹ Eurostat (1998)

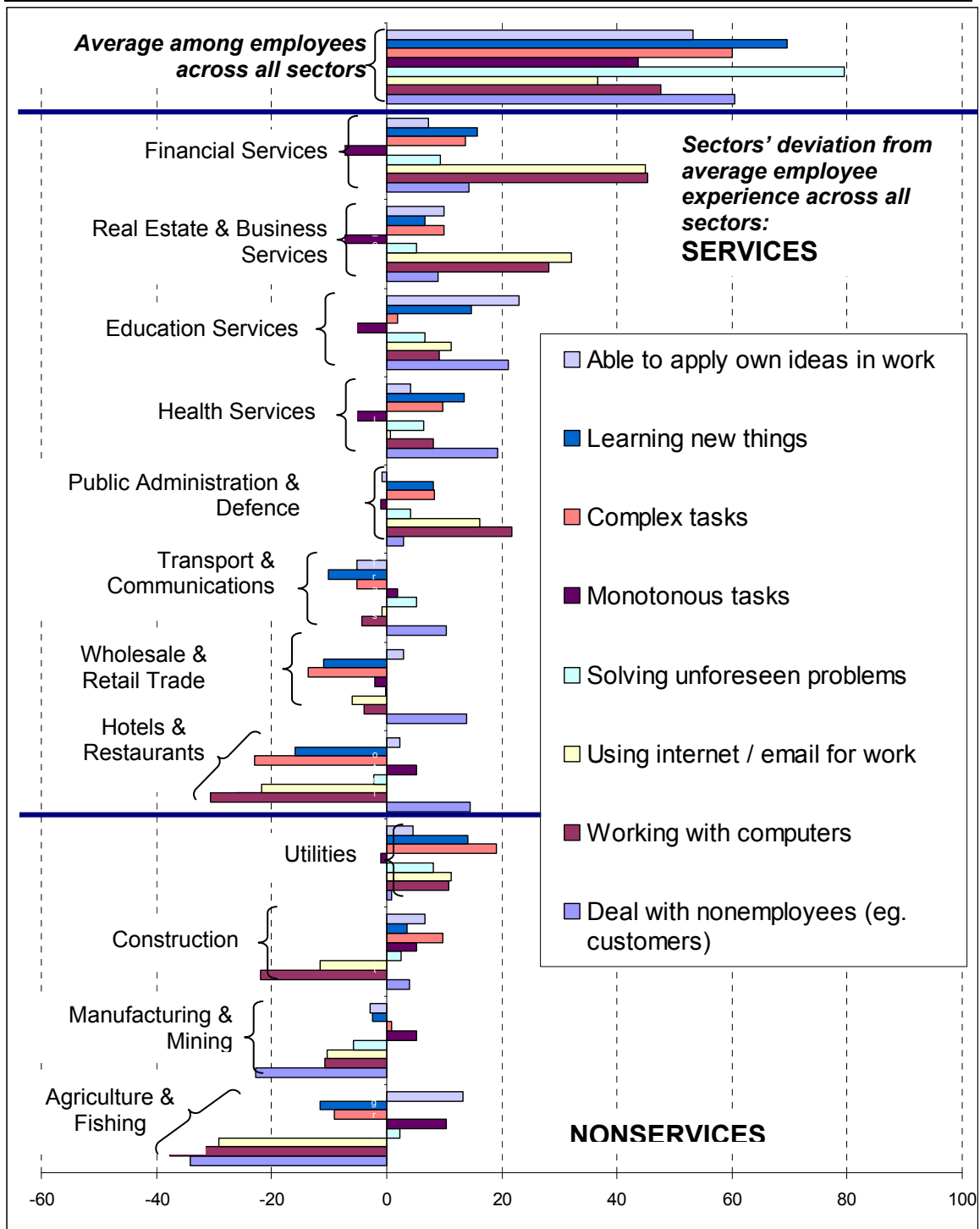
² OECD (1997)

But not all service sectors are knowledge-intensive, and not all service work is knowledge work. If we see knowledge work as providing substantial opportunities for learning and/or requiring significant skills, as undertaking complex tasks, and so on, then we can see that some service sectors feature high levels of such work, while some – notably HORECA (hotels, restaurants and catering) – are rather poor in these terms. Figure 2 uses data from the European Working Conditions Survey (of economically active individuals) to contrast services sectors and other areas of the European economy. It shows that – almost by definition – work in services is much more likely to require contact with customers than in nonservices. But we see major differences across the various service sectors featured here.

Some service sectors – finance, real estate and business services, public services like education – feature relatively large shares of jobs where the employees report complex tasks, problem-solving, learning new things on the job, computer and internet use, and so on, and relatively low shares of people reporting monotonous work. The reverse ends to be the case for transport and trade services, and HORECA (hotels, restaurants and catering). In effect, the contrast is between sectors featuring high shares of high skill jobs and knowledge work, and low levels of the same.

The services sector is extremely heterogeneous. Service sectors vary in terms of **markets**. Some mainly provide services to their clients' business processes – business services. Some mainly provide services to private consumers – personal and entertainment services, and also many financial, transport and hospitality services. Some are public services (e.g. health and education), which may be organised whether as state agencies, or through state reimbursements and funding of (highly regulated) private or voluntary organisations. Services vary in terms of **functions**. Some services involve moving, maintaining, manipulating physical artefacts – freight transport, repair and maintenance, warehouses, etc. Some have a major responsibility for supporting people's wellbeing – their health, social welfare, personal appearance. Some process data and providing information – consultancy, telecommunications, computer services - even finance can be seen as processing information about property rights. And, as we have seen, service sectors vary in terms of working practices and **employment**, ranging from highly professionalised work, and some sectors that feature high shares of white-collar, high-skill work; while other services preponderantly involved relatively basic and menial cleaning, sales, and similar tasks. One approach to grasping the heterogeneity of services focuses on their "knowledge-intensity". This idea has a history: Starbuck (1992) discussed knowledge-intensive firms and Miles et al, (1995) focused on knowledge-intensive business services – KIBS. More recently international organisations have focused on knowledge-intensive services (e.g. EC, 2003; OECD, 2000).

Figure 2 Features of Work in Sectors of European Economy (EU-27+), 2005



Source: derived from data presented in Fourth European Working Conditions Survey Parent-Thirion et al (2007)

Notes: countries covered are EU27 plus Croatia, Norway, Switzerland, Turkey. The comparison with the average for employees will not take into account the experience of self-employed people.

Knowledge-Intensive Services

It has been common to see manufacturing industry as essential for growth and competitiveness, and high-tech manufacturing industry has been seen as particularly important as a source of innovation and dynamism. “High-tech” is imputed on the basis of indicators such as the intensity of R&D investment, which is particularly high in manufacturing sectors such as aerospace, automotive engineering, and pharmaceuticals. But measures of R&D, patenting, and the like are less relevant to services. With the growing recognition of the importance of services, “high-tech/low-tech” distinctions appear to be less relevant (there are also reasons to be cautious about the high-tech/low-tech classification – see for example the PILOT studies.³) Knowledge-intensity may be a more useful way of drawing distinctions, and a new classification framework has been developed accordingly (Table 1). The “knowledge-intensive” classification is, perhaps, rather more liberal than was the “high-tech” one: displays the classifications of the various sectors of the economy, identified in terms of their NACE codes, into the new categories. No less that half of the workers in services in the EU25 are classified as being employed in knowledge-intensive services (KIS) (Under a third of all workers in these KIS are recorded as having received a tertiary education , as compared to around one in five people in the EU25, aged 25-64, (Gottfried, 2004b).)

Knowledge-intensity might be assessed in various ways, of which the most frequently used is data on the educational attainments of the workforce – the share of employees who have completed education at primary, secondary and tertiary levels – which is translated into low, medium or high skills. Figure 3 present data on the composition of the labour force of major services subsectors in these terms. (Such a classification, based on formal credentials, may of course fail to capture the knowledge acquired on the job or through informal channels. However, the sectoral differences that emerge from this approach do correspond fairly well with information on problem-solving, complexity of work, etc. a derived from working conditions surveys.) From Figure 3 we see that two mainly public services (education and health) and two private services (business services especially, and also financial services) have particularly large proportions for high skilled workers. Public administration is notable for its large share of medium skill jobs (presumably much of this is back- and front-office work). Considering the sectors with large shares of highly qualified workers, important features come to the fore.

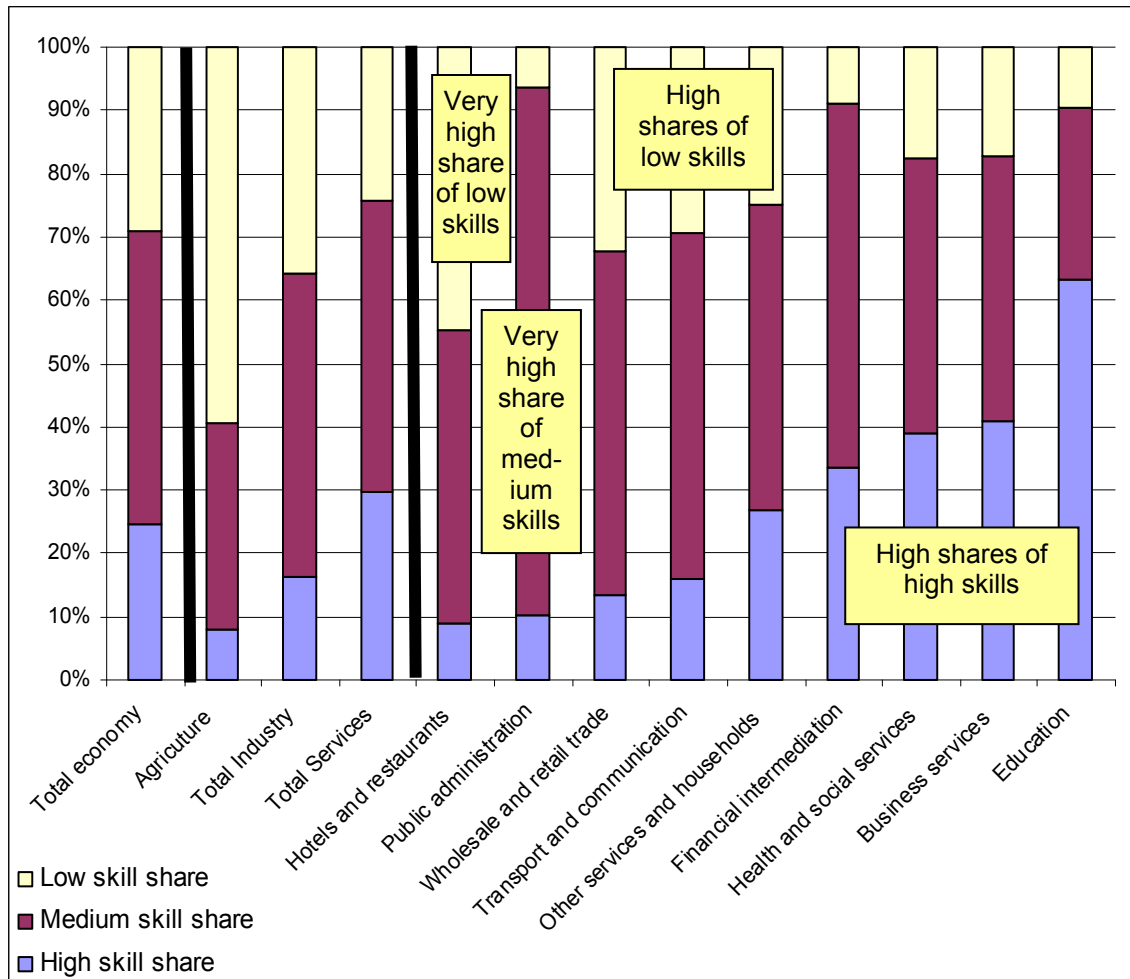
³ See the PILOT project website at: <http://www.pilot-project.org/> and such published products as Laestadius (2006).

Table 1 The OECD/EC classification of knowledge-intensive sectors

MANUFACTURING	
High-technology	Aerospace (35.3); Pharmaceuticals (24.4); Computers, office machinery (30); Electronics- communications (32); Scientific instruments (33)
Medium-high-technology	Electrical machinery (31); Motor vehicles (34); Chemicals - excl. pharmaceuticals (24 excl. 24.4); Other transport equipment (35.2+35.4+35.5); Non-electrical machinery (29)
Medium-low-technology	Coke, refined petroleum products and nuclear fuel (23); Rubber and plastic products (25); Non metallic mineral products (26); Shipbuilding (35.1); Basic metals (27); fabricated metal products (28)
Low-technology	Other manufacturing and recycling (36+37); Wood, pulp, paper products, printing and publishing (20+21+22); Food, beverages and tobacco (15+16); Textile and clothing (17+18+19)
SERVICES	
Knowledge-intensive high-tech services	Post and Telecommunications (64); Computer and related activities (72); Research and development (73)
Knowledge-intensive market services (excl. financial intermediation and high-tech services)	Water transport (61); Air transport (62); Real estate activities (70); Renting of machinery and equipment without operator, and of personal and household goods (71); Other business activities (74)
Knowledge-intensive financial services	Financial intermediation, except insurance and pension funding (65); Insurance and pension funding, except compulsory social security (66); Activities auxiliary to financial intermediation (67)
Other knowledge-intensive services	Education (80); Health and social work (85); Recreational, cultural and sporting activities (92)
Less-knowledge-intensive market services	50 Sale; maintenance and repair of motor vehicles and motorcycles/ retail sale of automotive fuel (50); Wholesale trade and commission trade, except of motor vehicles and motorcycles (51); Retail trade, except of motor vehicles and motorcycles/ repair of personal and household goods (52); Hotels and restaurants (55); Land transport/ transport via pipelines (60); Supporting and auxiliary transport activities/ activities of travel agencies (63)
Other less-knowledge-intensive services	Public administration and defence/ compulsory social security (75); Sewage and refuse disposal; sanitation and similar activities (90); Activities of membership organizations n.e.c. (91); Other service activities (93); Private households with employed persons (95); Extra-territorial organizations and bodies (99)

Sources: compiled from Gottfried (2004a, b), Strack (2004). The numbers in parentheses are the NACE codes of the sectors. (NACE = "Nomenclature statistique des Activités économiques dans la Communauté Européenne".)

Figure 3 Skill Composition of Economic Sectors in the EU-15, 2000



Note: low skill is defined in terms of attainment of less than upper secondary education (below level 3 in the International Standard Classification of Education (ISCED) classification); medium skill involves attainment of upper secondary education (ISCED level 3). High skill is an attainment of higher education (ISCED levels 5, 6, and 7).

Source: developed from data and skill classifications presented in annexes to EC (2005)

Health: here, applies knowledge of biochemistry, physiology, pharmaceuticals, surgery, psychology, etc. to influence bodily and mental wellbeing. Information is provided to patients and communities, as well as other professionals, about appropriate behaviour, and interventions are made with medicines and medical equipment. Lives are dependent on these services.

Education: disseminates and reproduces knowledge through pedagogy. Information is provided to students in learning contexts. While creativity may be fostered (or suppressed!) at all levels of education, higher education puts more emphasis on directing creativity to the production of new knowledge, and extensive research is conducted in Universities and the like. Together with those of government laboratories, higher education institutions are seen as forming the “public science base”, producing fundamental knowledge with relative freedom from commercial pressures. But health services also often feature laboratory and R&D facilities, and knowledge is also produced in the following classes of KIS.

Financial services: process information about ownership rights, and about the current and expected values of money and monetised commodities. Information is provided to customers and investors about changes in these conditions, and exchanged as deals are negotiated for the transfer of property rights, with an increasingly sophisticated range of financial instruments (some of which are under criticism as contributing to the current financial instability). Research into market conditions and risks is a feature of the knowledge development undertaken in these sectors.

Business services: sometimes mainly produce knowledge and provide information (e.g. business intelligence services, management consultants, marketing consultancy), sometimes focus more on applying specialised knowledge to effect transformations (e.g. software development, architectural or industrial design, etc.). Some business services create generic knowledge as a major activity – for example, market research and Research and Development services, but in the case of many other business services too. Let us examine these KIS in more detail.

Business Services

Business Services (BS) contribute to the *business processes* not only of private sector firms, but also to those of public sector (and voluntary) bodies.⁴ Statistically, NACE section K (real estate, renting and business activities) contains many – but not all – of the specialised BS. Some financial services are mainly business-oriented, as are some training activities and others classified as “creative” (graphic design, etc.). BS have been the most rapidly growing services

⁴ Alongside the business services supplied to all industries, an important development is the “public service industries” that assist the state in delivery of public services. We shall not discuss these activities (many of them KIS) here, but see Julius (2008) for an insightful review.

subsectors in Europe in recent decade. As we saw in the working conditions data, BS are often aggregated together with real estate for statistical purposes, but we can examine BS in more detail in industry statistics.

Not all of the “classic” BS sectors are knowledge-intensive: NACE 71 (renting of machinery and equipment without operator) included many firms with few highly qualified staff. The other BS categories, though, are dominated by knowledge-intensive firms, comprising NACE sectors:

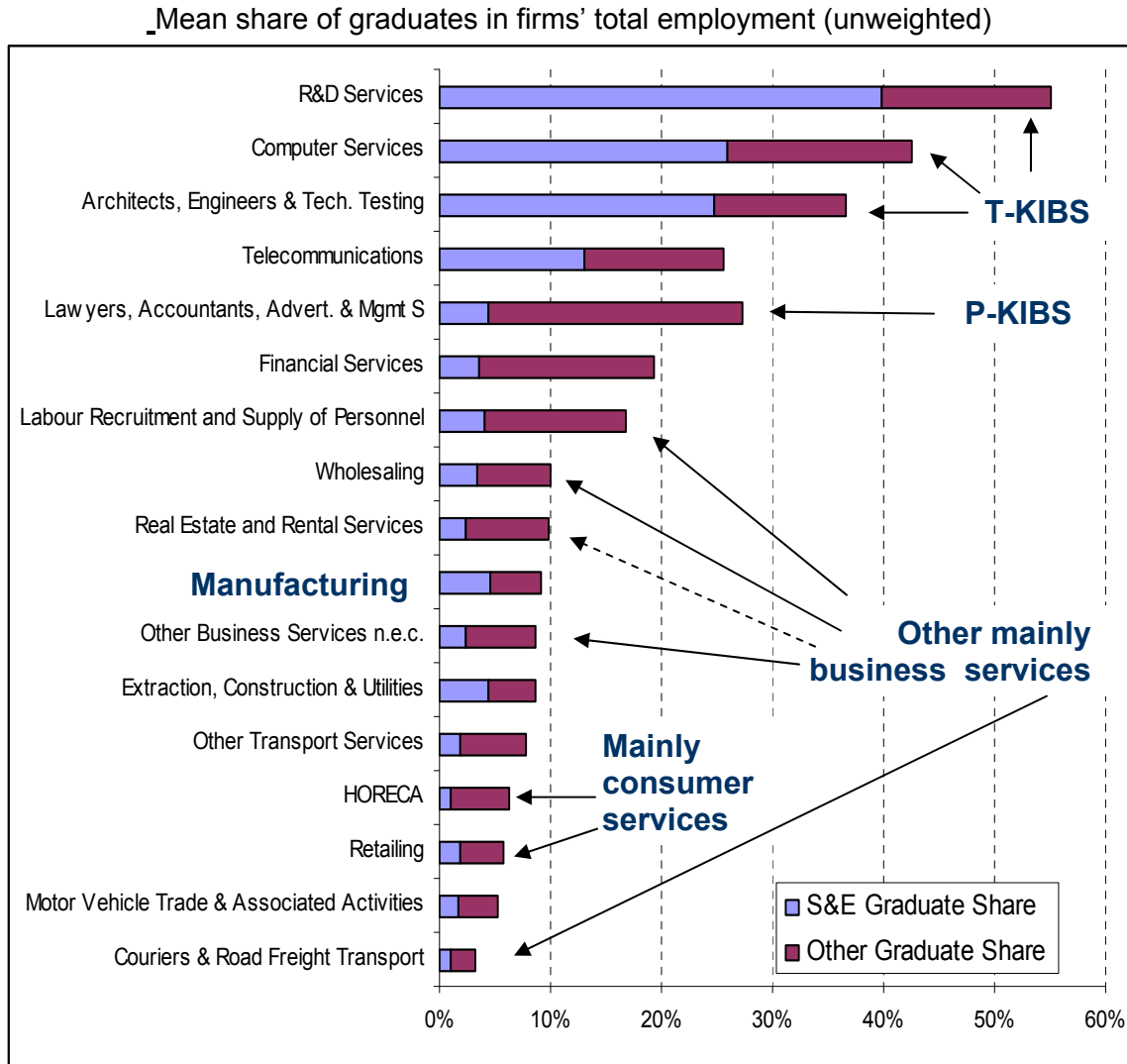
- 72. - Computer and related activities;
- 73. - Research and development, and
- 74. - Other business activities (including: Legal activities; Accounting and tax consultancy; Management consulting; Market research; Advertising; Architectural activities; Engineering activities; Technical testing and analysis; Labour recruitment and provision of personnel; Security activities; Industrial cleaning; Secretarial and translation activities; Packing activities).

NACE 74 is quite a mixture, ranging from highly professional services like architecture and engineering, to ones that involve more basic secretarial and clerical tasks, and to more physical and manual activities (e.g. industrial cleaning).⁵ NACE 72 and 73 are highly knowledge-intensive, as is confirmed by data from the Community Innovation Survey (CIS). The CIS asks managers as to the employment in their establishments of two sorts of graduates: Science and Engineering graduates (S&E) and Other graduates (OG). Here we outline UK data, in [Figure 4](#). The results are striking, showing that KIBS sectors are outstanding in terms of the shares of graduate employees in the workforce. In contrast, transport, wholesale and consumer services have fairly low proportions of graduate staff (like manufacturing and utilities, they of course have their share of highly professional managers, but they employ relatively many operatives who have lower level qualifications). (Services not covered in this survey include personal and entertainment services, which will present a mixed picture, and public services, some of which will have high shares of graduate employment.)

The data differentiate between KIBS focused on technological knowledge (TKIBS) and those professional services that draw more on knowledge of administrative and other institutional systems (PKIBS). These are the two basic types of KIBS, and these are among the fastest growing and dynamic sectors of the economy. (Miles, 2005) They play particularly important roles in that not only can they improve the efficiency of business processes, but they can also transfer knowledge to their clients and/or participate in the generation of new knowledge.

⁵ Among the BS that should probably be excluded from a strict definition of KIBS, apart from NACE 71, are at least parts of NACE 74.6 (Investigation and security activities); 74.7 (Industrial cleaning); 74.82 (Packaging activities); and 74.83: (Secretarial and translation activities).

Figure 4 Employment of Graduates in Major Sectors, UK 2004



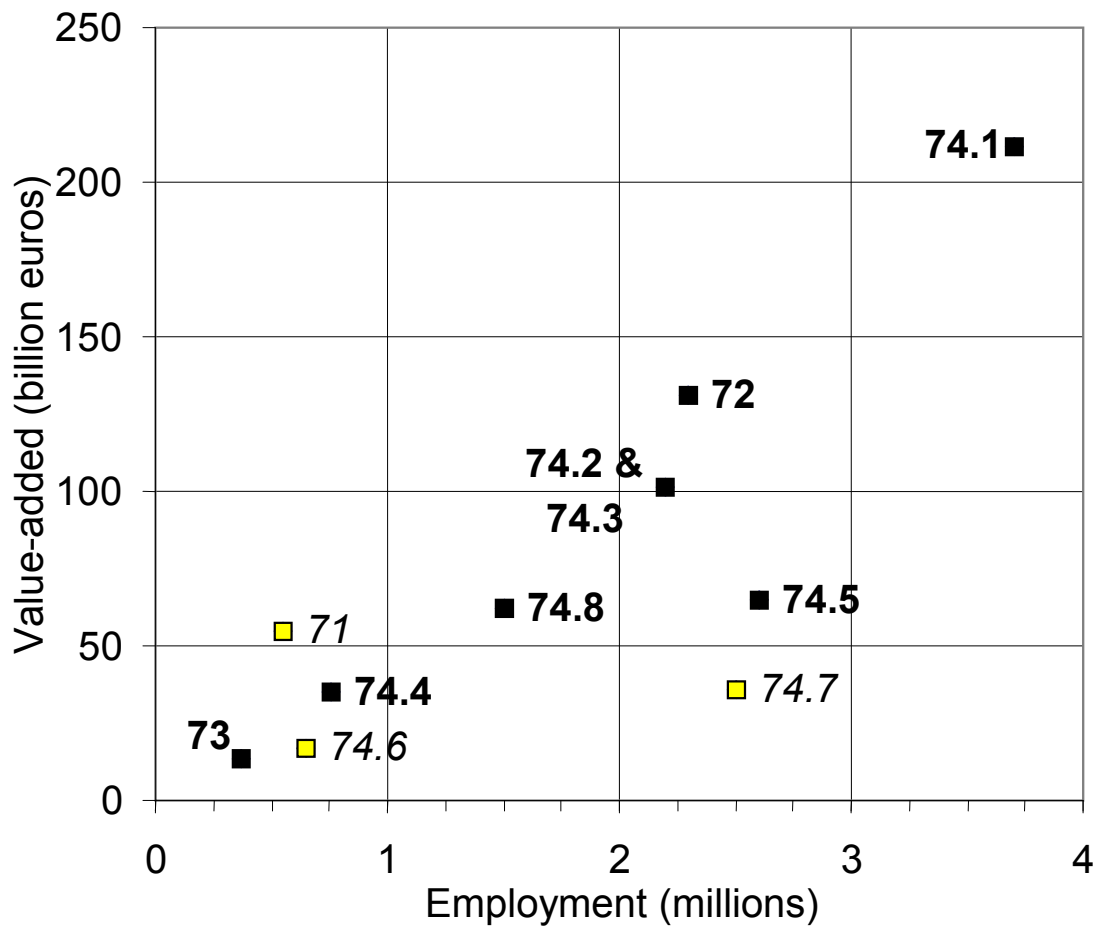
source: derived from UK CIS4 data, using approach presented in Tether and Swann (2003) for CIS3 data.

The technology-oriented KIBS actually employ both types of graduate intensively - computer services, architecture and engineering, and (mostly focused on S&E graduates) R&D and testing services. More professional KIBS sectors have high shares of OGs – these are legal and accountancy services (helping clients with knowledge about administrative and regulatory practices), informational services like publishing and market research, and (also with numerous S&E graduates) management consultancy. Telecommunications and financial services combine business and consumer services; they are also rather graduate-intensive, as compared to manufacturing (and even to high-tech manufacturing, though these results are not displayed here). These KIBS, then, are the outstanding KIS in the private sector.

KIBS contribute over 15% of private sector employment in the EU-25, and over 25% of that in market services (Eurostat (2004b)). [Figure 5](#) illustrates the relative size in terms of employment and value-added of different KIBS (and related Business Services) in the EU-25. "Legal, accountancy and management services" is easily the single largest category (3.7 million employees), followed by "Personnel services" (2.6m), "Computer services" (2.3m), "Architecture, engineering and technical services" (2.2m); "Advertising" (752k) with "R&D services" trailing at one-tenth the size of the first group of professional services (366k). In absolute terms, the UK appears to be the largest employer in almost all classes of BS, followed by Germany and France. In terms of the KIBS share in the domestic economy, Luxembourg and the Netherlands are notably higher than the EU average. New Member States typically have smaller shares of KIBS in overall employment than is the case for the original EU-15.

Over the last decade, these sectors have almost all, and in almost all countries, shown rates of growth that are higher than those of the economy as a whole, and of those of other market services. Other features reviewed in Miles (2005) are briefly summarised. Like most services (financial services are an exception here), KIBS sectors, in employment terms, are more weighted toward small firms than are manufacturing sectors (R&D services are the exception in KIBS, being more oriented to large firms.) Often the subsectors feature a few large transnational companies, alongside a large number of small firms. The former often service transnational clients; the latter clients in specific localities (reflecting the geographical "stickiness" of knowledge and/or the importance of trust and personal contacts in service supplier-client relations), though some small KIBS are in specialised niches. The latter may service geographically wide markets with their highly specialised knowledge. Also in common with many other services, KIBS often have higher shares of women in the workforce than the economy as a whole. Finally, KIBS feature high foreign presence, with many foreign enterprises active in the EU.

Figure 5 Employment and Value-Added in Business Services, EU-25, 2001



Key to NACE codes:

71= *Renting & leasing*; 72 = Computer services; 73 = R&D services; 74.1 = Legal Accountancy Management; 74.2 & 74.3 = Architecture Engineering & Technical Services; 74.4 = Advertising. & Market Res.; 74.5 = Personnel Services; 74.6 = *Security Services*; 74.7 = *Industrial Cleaning*; 74.8 = Misc. Business Services. The italicised sectors (also with light bullets) are mainly business services that are less knowledge-intensive than the KIBS.

Source: based on data from Eurostat (2004b) European Business: Facts and Figures - Data 1998-2002, chapters 22 and 23.

The role that KIBS play has been attracting increasing attention. It is common to see them as problem-solvers for their clients. They deploy and sometimes develop generic knowledge; they fuse this with information they obtain from their clients, who come to them with problems. The KIBS play various roles. They may diagnose the nature of problems, provide relevant intelligence and advice, prescribe solutions and even to implement and manage facilities to generate these solutions.⁶ Sometimes the client is highly involved in the process of problem-solving, and there is a high level of *co-production* of the service: service quality will be very much a function of the combined work of both supplier and client. Sometimes the activity may be more arms length, though highly interactive relations are common.⁷

Different types of KIBS deal with different types of specialised knowledge, and apply this to problems of different types. For example:

- legal and accountancy services deal with problems associated with social systems and institutions, especially administrative rules and regulations;
- marketing and various consultancy services deal with less formally governed problems concerning social groups and markets;
- supply chain management and logistics services deal with communication and physical dimensions of interorganisational relationships;
- engineering services are concerned with construction systems, transport infrastructure and design of products and processes of many kinds;
- architectural services combine knowledge of construction and building, with that of the use of buildings and related aesthetic issues, and relevant regulatory topics, to design and plan built environments;
- laboratory testing services focus on the properties of materials, chemicals, and devices, and how these can be reliably measured;
- IT services deal with symbol-processing software and systems, with the configuration and integration of discrete items of hardware and software, and the application of such systems to the business processes of users;
- R&D services conduct research into natural or social science and engineering issues, with the aim of developing useful knowledge about systems, or about how to effect transformations in them;

Finally, while these are generally thought of as consumer and social services, there are business clients for medical and veterinary services, educational and clinical psychology and psychiatry, counselling, and other services that apply relevant knowledge to psychological and biological problems; likewise there are education and training services oriented to business users, and also specialised producers of visual and textual content.

⁶ Specific firms seem to be relatively specialised in these different functions - Kastrinos and Miles (1998), Miles (1998) found this for environmental services, for example.

⁷ Nahlinder (2005) presents data from a survey of around 1000 Swedish KIBS, asking them about their client relationships, and reporting a good deal of interaction.

The role of KIBS in innovation processes has attracted attention, since innovation is often a matter of overcoming problems – problems confronted in normal business processes, or those discovered when trying to turn a new idea into a commercial or socially useful application. Problem-solving may be a matter of applying routine knowledge, diffusing knowledge to a client for whom it is new, or generating new knowledge when a new problem is faced. The production of new solutions and new knowledge is commonplace in many KIBS, and the client is quite often a coproducer of the innovation in such cases. TKIBS generally assist in diffusing new techniques and systems to their clients throughout the economy, and are thus significant actors in innovation processes. R&D services are intimately involved with innovation, as they undertake knowledge-creation for their clients. But even PKIBS play roles in technological innovation. Some firms here apply strong competencies in specific technologies and techniques to inform their clients' technology strategies. This may take the form of direct support for technology choice (e.g. accounting and management firms providing IT consulting for clients); or the provision of intelligence on regulatory and market contexts for innovation (some lawyers specialise in IT or patent law, some financial advisors and market analysts in high-tech fields or markets for consumer innovation, and so on).

What are the broad trends behind the use of KIBS? Kox and Rubalcaba. (2007) have demonstrated a fairly strong relationship across the EU, such that Business Services are used more extensively in the more affluent countries. Thus there seems to be a tendency for higher levels of economic development to be associated with more use of these services, though the causality is not clear, Input-output analysis can identify the main users of BS, and Peneder (2000) explored trends in use of “knowledge-based services” (financial services, business services, and communications). Input-output tables confirm the rise of such services, showing their growing role in intermediate inputs to production across the economy. But Peneder and subsequent analysts have found considerable variations across countries and over time in the usage of KIBS. Service sectors (especially KIS) are the major users, with distributive services also being important. Such use patterns reflect in part the varying industrial structure of different countries. But some associations that commonly appear include:

Advertising is an important input for sectors oriented to final consumers (manufacturers and retailers); market research is often similar;

Computer services is important for computer and related manufacturing (office machinery and equipment) and communication equipment, and for publishing and printing,;

R&D services are important for the chemicals industry and, for precision equipment; in some countries the public sector is a major user of these services.

Architectural and technical consultancy, not surprisingly, is used by construction sectors and civil engineering, and also (probably the engineering services) by transport manufacturing (e.g. aircraft and space craft, other transport equipment), chemicals and pharmaceuticals.⁸

The use of KIBS reflects several distinct developments. On the one hand, there are ongoing socioeconomic developments, which create new challenges for organisations of all sorts, and where they find they lack sufficient internal knowledge. This is manifest in the growth of environmental and new technology-related services, for instance. There are also services which fulfil occasional requirements, and need highly specialised knowledge, such that it is efficient to acquire this from external sources: market research is a good case in point. Some services need to be performed by third parties in order to give legitimacy or meet regulatory requirements – some accountancy, auditing and testing, for instance. And, finally, some reflect *outsourcing* pure and simple – the desire to save on the costs associated with in-house provision of services. Outsourcing (which may or may not also involve offshoring) is often associated with management philosophies of focusing on core capabilities and hollowing out the organisation.

From KIBS to KISA?

The mention of outsourcing draws attention to another topic: knowledge-intensive services are not only provided by external KIBS firms. They can also be produced internally by the users of the services – and thus the idea of KISA (knowledge-intensive service activities) has appeared alongside that of KIBS.

Knowledge-Intensive Service Activities (KISA) have been defined as:

“the production and integration of service activities undertaken by firms or public sector actors in the context of manufacturing or services, in combination with manufactured outputs or as stand-alone services. Typical examples of KISA include research and development (R&D), management consulting, information and communications services, human resource management and employment services, legal services (including those related to intellectual property rights) accounting, financing, and marketing-related service activities. Most businesses and public sector organisations make use of such KISA in their daily operations, whether they provide them internally or source them from external suppliers in the private or public sectors.”⁹

⁸ This draws on unpublished work by Paul Baker and ECORYS.

⁹ Definition from <http://aegis.uws.edu.au/KISA/main.html>, which draws on OECD (2002). The OECD studies on KISA are available at: http://www.oecd.org/document/43/0,3343,en_2649_34273_15709675_1_1_1_1,00.html

OECD (2006 p8) suggested that different roles in innovation are played by different KISA, and that we can fruitfully differentiate between:

Renewal services Directly related to innovation, for instance R&D and strategic management consulting;

Routine services Contribute to improvement of maintenance and management of various subsystems within organisations, e.g. accounting;

Compliance services Help organisations to work within the legal framework and regulatory regimes, e.g. auditing and some legal services;

Network services Facilitate communication, knowledge exchange and flexible resource allocation, e.g. informal personal networks and production related networks.

The OECD study also stressed the point that it is liable to be the integration of internal and external KISA and KIBS capabilities that is likely to be most important in determining the impact of use of these services. Other studies have demonstrated the role of KIBS users, but there is limited statistical evidence as to such capabilities. It is possible to examine the scale and nature of KISA work across the economy. For most KIBS sectors we can find similar KISA professionals – for example IT hardware and software professionals, Data processing and Database managers , R&D personnel, Skilled legal workers, Accountants and auditors, Market research, marketing, and advertising professionals, Architects, Engineering and engineering design professionals, and so on.

Detailed analysis of these categories is complicated, but it is possible to summarise data in terms of standard classifications – in this case the International Standard Occupational Classification (ISCO) system. There are three ISCO categories that seem to correspond to KISA employees, in particular:

1: legislators, senior officials and managers;

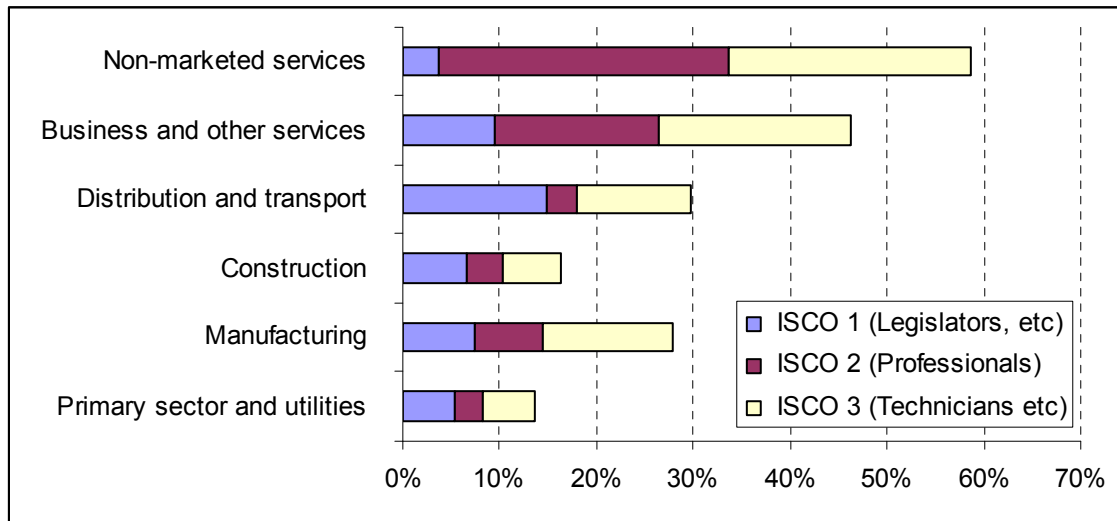
2: professionals (in 1 Physical, mathematical and engineering science; Life science and health; Teaching; and Others);

3: technicians and associate professionals (as in group 2),

(The other major groups, include 3: clerks; 4: service workers and shop and market sales workers; 6: Skilled agricultural and fishery workers; 7: craft and related trades workers; 8: plant and machine operators and assemblers; 9: elementary occupations, together with group 0: armed forces.)

Figure 6 illustrates the distribution of these three occupational groups across major sectors of the European economy. Overall, almost two-fifths of Europe's workers are engaged in such activities - 8.7% in ISCO 1, 13.0% in ISCO 2 and 16.1% in ISCO 3. Though these sorts of work are clearly most prevalent in public services and BS, they are distributed across all sectors.

Figure 6 KISA professions in the EU 25+, 2006

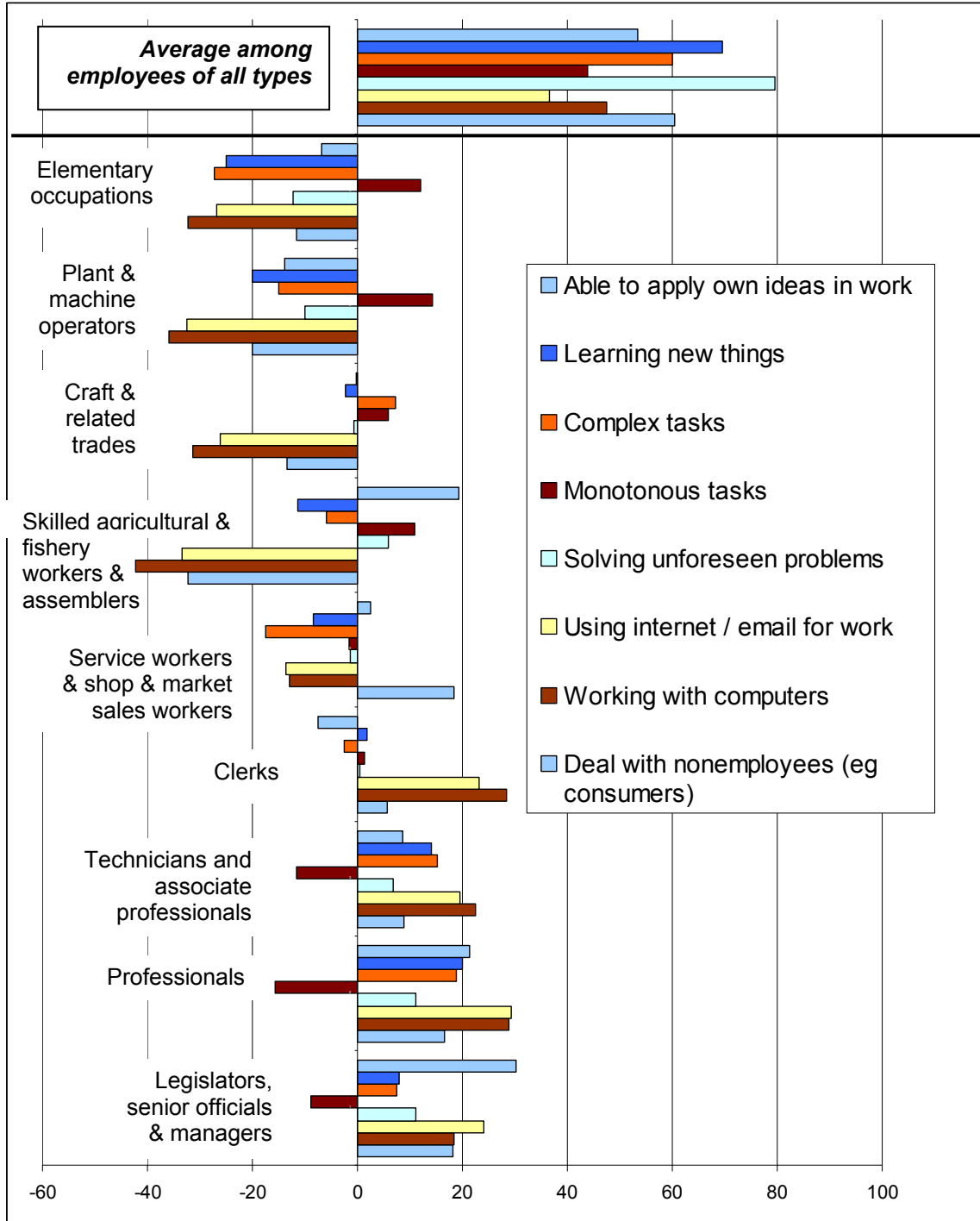


Source: data from CEDEFOP (2008), Tables 34a and b.

The three ISCO KISA categories, not surprisingly, feature higher shares of more highly qualified employees than do other occupations (CEDEFOP, 2008). We can also examine the working conditions of KISA, in a way similar to that which we did earlier for services. [Figure 7](#) presents these data, which confirm that KISA professions are engaged in the more complex, demanding, and knowledge-intensive forms of work. The CEDEFOP (2008) study suggests that these types of occupation will become more prevalent in future years, as a result of structural change in the economy (growing importance of services) and in industries (growing importance of KISA work).

Finally, we should note that not only are firms of all sorts producing their own KISA – some deliver or sell these services on to consumers of their products, or to other business firms. “Product services” are the services that accompany manufactured goods, for example aftersales, end-of-life disposal, repairs, training. But many firms also offer KIBS-like services – for example, an automobile manufacturer that sells services from its laboratory or testing services. This is part of a general trend in the economy known (ugly) as “servicisation” or “servation”: firms across all sectors move into the business of producing services and seeing *service* as their core product. This implies that analysis of service dynamics and features of KISA is of central importance to modern economies.

Figure 7 Features of Work across Different Occupational Groups, Europe 2005



Source & Notes: as [Figure 2](#); jobs classified according to ISCO system (groups 1 to 9)

Conclusions

The growth of “knowledge-intensive services” in the forms both of KIBS and KISA, is a central feature of the emergence of both the “knowledge-based economy” and the “services economy” of the twenty-first century. KIBS and KISA are at the intersection of these two aspects of change: the growing role of advanced knowledge, and the rise of services. Specialised knowledge is needed to deal with complex organisational environments, and powerful technological innovations. Specialised services and occupations, applying high levels of technical and professional knowledge also reflects the ongoing intensification of the division of labour. A proliferation of specialists necessarily demands new capabilities for coordination, integration and synthesis of this knowledge.

These processes are clearly extremely important for economic development and innovation. But it should be noted that they represent a substantial change in the way in which knowledge is produced and used. The “new production of knowledge” thesis (Gibbons et al, 1994), which has received a great deal of attention, is relevant here. This thesis asserts that we have been moving from a world where generic knowledge was typically produced by the public science base, and was tackling problems that were more or less discipline-determined. We are, it seems, moving to one where the norm is much more for generic knowledge to be created by a variety of actors, confronting problems that are more rooted in practical dilemmas than in disciplines. “Strategic research” has come to supplement the traditional dichotomy of “pure” and “applied research”. Industrial research facilities – especially in new technology fields like computer science, bioscience and nanotechnology - may be undertaking such research, creating knowledge that is just as fundamental as that pursued in Universities (who themselves may be struggling to deal with practical as well as disciplinary problems). KIBS are a particular class of specialised knowledge provider, and when these are active in knowledge creation they can be seen as a kind of private service analogue to the public science base. When their mission is more the diffusion of knowledge, they resemble educational services more, though the ways they deliver knowledge are very different from those of schools and colleges.

Mode 2 knowledge production in KIBS remains poorly understood. Mode 1 production of knowledge, through the public science base, has evolved over a lengthy historical period, in which there has been a steady consolidation of rules of practice in knowledge production and ownership. (Rules, for example, concerning the balance between, for example quality control versus the desire for rapid dissemination of results, intellectual property rights versus the provision of public goods, academic freedom versus social responsibility, and so on.) These rules may often be poorly suited to the twenty-first century – in some countries they inhibit collaboration between Universities and industry, in some circumstances they act against interdisciplinary studies, and so on. In contrast, the framework for KIBS and KISA is much more complicated. Arrangements for

professional association and self-regulation are in place in some instances, but questions arise as to quality control, the private ownership of knowledge, intellectual freedom, whistle blowing and related ethical issues, and so on.

KIBS and KISA are bound to remain important, so we can expect that such questions will be repeatedly posed, and need to be addressed on a regular basis (and not just when things go wrong, as in the accountancy and financial scandals of recent years).¹⁰ This will be necessary to see that long-term social and environmental interests, as well as shorter-term economic ones, are served by the new configurations of knowledge-intensive services, and the innovations they promote. We may well be in a knowledge economy, but even so, knowledge is neither solely a matter of economic property, nor is it something that can be fully grasped by economic analysis.

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¹⁰ To take just one example: there is substantial underreporting of the results of clinical trials of pharmaceuticals – cf Ramsey and Scoggins (2008) – with only a fifth of registered studies being published (2/3 with positive results), and only 6% of industry-funded trials published (3/4 positive results!).

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