PREST

# KNOWLEDGE-INTENSIVE BUSINESS SERVICES

## Users, Carriers and Sources of Innovation

A report to DG13 SPRINT-EIMS

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# Knowledge-Intensive Business Services: Their Roles as Users, Carriers and Sources of Innovation

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## EXECUTIVE SUMMARY

### 1 Services: A Cinderella Sector?

There is no doubt that the role of services has increased substantially in contemporary economies, in terms of their output, employment, and importance as inputs to other sectors. But the contribution that they make to innovation and competitiveness remains largely unexamined, by analysts and politicians alike. This is reflected in the images of services as a residual, tertiary sector, composed of firms who are laggards where it comes to developing new technologies and techniques. These images might be justified as regards some service industries - but it is certainly out of touch with the reality of others.

### 2 Services <u>are</u> Active In Innovation

This can quickly be demonstrated by a few items of evidence:

- A search for a partner for an EC R&D project through the CORDIS data-base provides more service contacts than it does manufacturing firms;

- Some service firms are within the worlds highest R&D spenders: consider Microsoft's budgeting $900million for R&D in the coming financial year.
- New US R&D data, designed so as to better represent services and small firms, suggests that 25% of R&D now takes places outside of the manufacturing sector - and this share is apparently growing.
- Services are intensive as both users and developers of IT systems and software.

## 3 The Nature of Knowledge-Intensive Business Services

Within the framework of the rising knowledge intensity of our economies some service industries figure as high tech and highly innovative. Characteristic of these services is that they:

- rely heavily upon professional knowledge;
- **either** are themselves primary sources of information and knowledge (reports, training consultancy etc.);
- **or** use their knowledge to produce intermediary services for their clients' production processes (e.g. communication and computer services);
- are of competitive importance and supplied primarily to business.

These industries constitute Knowledge Intensive Business Services (KIBS). Some of these are traditional professional services - others are new technology based services. We focus on the latter.

## 4 Goals of this Study

This report aims to:

- highlight the contributions of KIBS to innovation;
- provide the agenda for coherent analyses of KIBS innovation processes; and,
- draw recommendations for a consideration of KIBS in policy-making.

It draws on two main lines of work - a review of relevant literature (much of it dealing with services in general rather than just KIBS, which have received little attention as a group), and a small set of case studies of innovative KIBS.

## 5 KIBS, Innovation and the Knowledge Intensive Economy

There is much evidence that the knowledge intensity of all sectors of the economy is increasing. R&D becomes increasingly the basis of new techniques, and networks of innovators become increasingly the basis of accumulation of the knowledge that results in innovation.

## 6 The Knowledge in KIBS

The knowledge bases of KIBS represent more or less unique combinations of knowledge about:

- Particular domains. In the case of new technology-based KIBS these are technological domains; our case studies have focused on the domains of telematics, multimedia and environmental technologies).
- Particular applications of technical knowledge, for example to industry-specific problems or to functions which are more generic. Such applications knowledge will often have been accumulated in the first instance from their own earlier experience of being technology-intensive services.
- Client firms and sectors. This knowledge may be in part supplied by market research, but will normally have to be established through supplier-user interaction.

## 7 KIBS are not only Users of Technology

KIBS firms may be important users of new technology but, more importantly, they are often producers and carriers of new technology, often following aggressive innovation strategies. Issues of Intellectual Property Rights (IPR) are central to those strategies. Investment in knowledge depreciating rapidly through imitation, learning by networking, and appropriating the knowledge acquired through innovation, becomes an essential part of survival in the new economy. New technology-based KIBS are mainly associated with emerging generic technologies (or, as in the case of environmental services, generic problems which demand new technological solutions). They are fed by the demands for knowledge generated by the uncertainties surrounding the performance of new technologies and the developmental trends characterising them. Related phenomena such as the externalisation of functions by manufacturing and other service

firms play an important role in the growth of KIBS firms. In turn, this contributes to an amassing of technological capabilities in the economy. KIBS appear to be a necessary, although not sufficient, condition for economic growth in modern economies.

## 8 Innovation in KIBS

Innovation in KIBS is the result of fierce competition which has a great technological content. Regulation shapes this competition to a great extent: environmental regulations, technology-related rules (e.g. standards), and the liberalisation of trade (with its consequences for the globalisation of production). Sectoral trends are also important. Changes in the dominant management practices reveal themselves through phenomena of convergence between manufacturing and services. The `industrialisation' of services and the increasing emphasis on the service component of manufacturing, represent drastic changes in production, which often involve new technology and expertise inputs from KIBS firms. Despite convergence, innovation in KIBS retains many of the “peculiarities” of services’ innovation more generally - it is, for instance:

- rarely organised through R&D departments
- very frequently conducted on a project-specific basis
- liable to involve close collaboration with clients or other services
- highly influenced by issues such as regulation and appropriability.

## 9 KIBS’ Clients and Innovation

New technology-based KIBS are science-based, in the sense that their innovations rely heavily on knowledge generated by R&D, and/or specialised suppliers; and in the sense that they often operate within a very narrow spectrum of expertise. But though KIBS innovation is often associated with R&D, this is often organised on an ad hoc basis and involves wider features (e.g. market research) than much industrial R&D. The most important feature of KIBS innovation is that it is typically linked to satisfying client-specific demands. In this sense learning-by-networking and learning to learn are the most important characteristics of KIBS organisations.

## 10 Conclusions and Policy Recommendations

KIBS are essential elements in the ongoing rise in knowledge intensity of contemporary economies. They need to be given due weight in various aspects of policy-making that affect the function of the economy. There are three broad areas of policy where consideration of KIBS is essential. These are: standardisation, industrial and technology policy, and Intellectual Property Rights. Taking into account the literature and the case studies performed for this project the team makes the following recommendations:

**Recommendation 1)** KIBS should benefit from higher levels of professionalisation, in the form of collective fora that would allow them to articulate their points of view, to participate in standardisation processes, and to develop their own quality standards and quality control mechanisms. Stimulating the creation of such fora is an appropriate target for policy.

**Recommendation 2)** KIBS should also benefit from higher levels of professionalisation, in formulating their internal innovation strategies. Access to skills of innovation management should thus be encouraged, by, for example, dissemination of information on good practice, consultancy support, and specialised programmes of management training.

**Recommendation 3)** Action is needed not only to facilitate access of firms to public R&D programmes but also to familiarise KIBS firms with unfamiliar concepts of R&D and innovation support, and to locate them more firmly in innovation networks. This will result in better feedback from existing policy measures and consequently better policy design. At the same time a more level playing-field will be created for competition between KIBS firms, within the framework of industrial policy interventions. Such action will also provide for access of KIBS to networks of innovators generated by industrial policy.

**Recommendation 4)** Support should be forthcoming for programmes which demonstrate to SMEs the scope for their use of the services supplied by KIBS. This might involve schemes designed to introduce sectoral user communities to appropriate service providers, support in establishing the quality of such providers (thus reducing effort expended on searching for appropriate partners with whom to develop interactive relationships), directories and awareness schemes, etc.

**Recommendation 5)** The design of industrial policy has to take into account the peculiarities of KIBS, in particular the importance of user-supplier relations in this area. There is an urgent policy need for improved classifications of innovative activities and adapted innovation monitoring systems. Attention should be paid to ways of fostering quality assurance systems, self-regulation, and improved feedback to and between groups of actual and potential clients of these services. User groups have formed more or less spontaneously for some new technology services, but there may be a need for more action on a wider front.

**Recommendation 6)** Attention is required to the particular mixes of organisational, interpersonal and technical skills that are required by KIBS. Training and education systems need to be able to develop “hybrid” combinations and entrepreneurial attitudes. One type of skill which is required in these services involves a better understanding of the innovation process and its management; another involves the ability to work across conventional sectoral boundaries. Training programmes need to take account of the fluidity of these boundaries, and the new generic professional skills that are emerging in consequence.

**Recommendation 7)** High-level work is required to establish appropriate policy guidance on IPR issues as they affect KIBS. This work should involve substantial inputs from a broad spectrum of stakeholders. It should examine critical sectors first, without necessarily assuming that identical policy implications will eventually emerge for other sectors. It should be sensitive to changes that are liable to occur over time, since the pace of technological change makes this a very dynamic area.

**Recommendation 8)** Processes of regulation and standardisation are bound to have substantial impacts upon KIBS, probably varying by firm size and other features These impacts need to be taken into account, to ensure that advantages are not simply being conferred on the larger and better-established firms. Ways of redressing such balances need to be established - for example, by ensuring that it is not only the most established firms that are consulted in the regulation and standardisation activities, by widely disseminating information on likely rules and protocols, by promoting partnerships in which relevant knowledge can be exchanged, and so on. Standards bodies and industrial trade associations may be critical actors here. This is important not only for the competitive situation among these services, but also in terms of the rapid diffusion of knowledge of how to conform with regulations and standards.

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# 1. Chapter 1 Introduction

## 1.1 The Nature of Services

Services can be defined in many ways. But, however this is done, one outstanding development of the last half of the twentieth century is the rise of service industries - to the extent that many commentators use such (potentially misleading) terms as “the service economy” or “post-industrial society”. This rise is most prominent in the growth of the tertiary sector to account for roughly two-thirds of all employment in OECD countries by the beginning of this decade. (Table 1) This report focuses on the **sectoral** and **firm** levels of analysis of services. It is also possible to consider service **occupations** and **functions** in all parts of the economy - whereby even higher proportions of service activity will be noted.

Measured in terms of economic output (share of GDP) the same dominance of service sectors is apparent. The role of services in world trade (around 20%) is, however, much lower than might be expected from their prominence in national economies - but this is again believed to be underrepresented in statistics of trade flows. Furthermore, this share is evidently growing and increasing in strategic importance, and is liable to become yet more important as the new GATT arrangements are put in place. Around 50% of Foreign Direct Investment involves services - reflecting particular features of services trade.

Yet, despite this indubitable increase in the weight of services in contemporary economies, the tertiary sector remains the `Cinderella' of analytical and policy thinking. Its processes and economic contributions are not well understood, and, possibly as a result, policies by and large ignore it. Within the world-wide recognition of the importance of innovation for competitiveness and economic growth, services are by and large seen as laggards, users of technology which they buy off-the-shelf.

The grip of this picture is surprisingly strong, given how easy it is to cite counterexamples. For instance:

- In fiscal year 1995 Microsoft -a service firm- plans to spend US $ 900 million - more than the annual EU budget for Information Technology (IT) R&D.
- Microsoft is far from the only service firm in the world's league of highest R&D spenders - for example, it is joined by AT&T, British Telecom, Reuters, and many others.
- Around 25% of US R&D is now accounted for by nonmanufacturing industry (mainly services) - the figure has grown with improvements in the statistical methods, but in any case it was growing under the previous survey approach. The USA is far from exceptional among industrial countries in discovering this substantial role of services.[1]

**Table 1 Service Employment Trends: Services as Percentage of Total Employment**

| | *Producer Services* | *Distributive Services* | *Personal Services* | *Social Services* | *TOTAL SERVICES* |
|---|---|---|---|---|---|
| *France* | | | | | |
| *1960* | *3.5* | *16.8* | *7.9* | *16.0* | *44.1* |
| *1987* | *9.0* | *20.1* | *7.9* | *26.4* | *63.4* |
| *Germany* | | | | | |
| *1960* | *3.4* | *17.5* | *7.4* | *10.3* | *38.6* |
| *1987* | *7.7* | *18.1* | *8.1* | *21.6* | *55.4* |
| *Japan* | | | | | |
| *1960* | *3.3* | *18.5* | *7.5* | *8.2* | *37.4* |
| *1987* | *10.2* | *25.1* | *10.2* | *13.0* | *58.6* |
| *Netherlands* | | | | | |
| *1960* | *4.2* | *20.4* | *8.5* | *14.7* | *47.8* |
| *1987* | *10.8* | *21.3* | *6.5* | *28.4* | *69.1* |
| *Sweden* | | | | | |
| *1960* | *3.5* | *19.4* | *8.4* | *16.3* | *47.7* |
| *1987* | *7.2* | *19.2* | *5.9* | *35.1* | *67.3* |
| *UK* | | | | | |
| *1960* | *4.4* | *20.6* | *8.0* | *15.8* | *48.8* |
| *1987* | *10.4* | *21.3* | *10.1* | *25.3* | *67.0* |
| *US* | | | | | |
| *1960* | *6.4* | *22.2* | *11.3* | *21.2* | *61.1* |
| *1987* | *13.6* | *21.5* | *12.5* | *26.0* | *73.5* |
| ***AVERAGE*** | | | | | |
| ***1960*** | ***4.1*** | ***19.3*** | ***8.4*** | ***14.6*** | ***46.5*** |
| ***1973*** | ***6.5*** | ***20.3*** | ***7.8*** | ***20.2*** | ***54.8*** |
| ***1987*** | ***9.8*** | ***20.9*** | ***8.7*** | ***25.1*** | ***64.5*** |

Source: Elfring (1992), **Table 2.1**

- Not only giant service corporations perform R&D. The new US data reflect more attention to small firms as well as to service sectors. And in the EU, of the 13101 organisations in the CORDIS database, 25.86% of the CORDIS entries are service firms (20.82% are manufacturing organisations, and the rest consists of Universities and research organisations).

It would be surprising indeed if these firms were to be seen as laggards. Yet if such services are indeed important contributors to innovation and competitiveness, then this contribution needs to be recognised - and to be taken into account when policies are designed and implemented. So far, attention to the role of services in innovation, and to innovation processes in services, has remained quite limited. For example, the recent Handbook of Industrial Innovation (Dodgson and Rothwell, 1995) features just one short chapter on "Innovation in Services". Admittedly, a substantial specialist literature on services has developed in the last decade, which contains a number of significant contributions to the analysis of innovation within services, in particular. This report draws heavily upon this recent literature, as will be apparent from the extensive bibliography. But the role of services in innovation processes still remains marginalised in most research and policy analysis.

Thus, the task of the research team has been to investigate the contributions of services to innovation. The aim is to provide a starting point upon which a very important policy agenda can develop. Our focus will be on very specific types of services, rather than the whole of the tertiary sector. But we should preface our discussion with a brief introduction concerning the classification of services.

Some of the ascription of activities to the tertiary sector reflects historical circumstances that no longer apply; thus the classification features several anomalies. For example, publishing in electronic media is classified as a service activity, whereas print publishing is a branch of manufacturing. This might be justified on the grounds that software is different from printed text since it controls computer equipment rather than informs readers. But this is a post hoc justification: the classification reflects the fact that software was in the past mainly produced on demand for specific users as one of the "computer services" with which they were supplied. Furthermore, much of the electronic publishing that is proliferating on CD-ROMs and similar media is much more like traditional publishing than like software - consider electronic encyclopaedias and dictionaries.

There are many other such anomalies where it comes to the demarcation between services and manufacturing industry (not to mention the construction sector, and utilities such as the power industries, which might indeed be seen as having much in common with, say, telecommunications). But overall there seems to be a reasonable ad hoc distinction: manufacturing industries process raw materials to produce goods, while services are much more about effecting transformations in the state of goods, people or information.

The International Standard Industrial Classification identifies four categories of services:

- Trade, restaurants and hotels
- Transport, storage and communications
- Finance, insurance, real estate and business services
- Community, social and personal services.

Each of these groups contains a very mixed bag of different activities, and numerous researchers have sought to develop improved systems of classification to deal with the new realities of services. One relatively successful grouping is that featured in Table 1. Originally proposed by Singelmann (1988), this classification has been used by many researchers seeking to chart the development of services in the national and international economies. The framework is largely based upon the functions performed and markets served by different groups of services - are their operations designed to support private consumers or businesses, to distribute goods and information or to provide social services. The four groups in this approach, with examples of each, are:

- Producer services (finance, business services)
- Distributive services (trade, transport, communication)
- Personal services (entertainment, hotels and catering, domestic service)
- Social services (medicine, health, government)

Even this revision of the standard classification has its problems. For example, postal services are placed into the "social services" category (why are they not treated as a distributive service? On the other hand, does it make sense to include telecommunications along with physical transport in distributive services?). The producer services category includes many services that support consumers as well as businesses, for example banks and insurance companies; at fairly high levels of aggregation many services are "mixed" in terms of the markets they serve. Nevertheless, as Table 1 demonstrates, this classification does provide useful insights into the developmental trends of different classes of services, and thus throws much-needed light onto the growth of the tertiary sector.

It is apparent that much of the growth of services is to be accounted for, in particular, by the growing importance of the producer services and social services categories. Distributive and personal services have shown relatively little growth in employment terms overall in OECD countries - though there are exceptions to this rule (e.g. Japan).

Four important points arise from this discussion:

- First, such data undermine the simplistic notion that the growing role of services reflects a shift in final demand towards services. Some accounts of "post-industrial society" implied that such a shift reflected the saturation of consumer demand for material goods and an Engel's Law-like preference for superior (service) products, or Maslowian pursuit of higher needs. Yet the major areas of expansion of services employment (and output) do not reflect final demand for services. Rather, it is mainly demand from businesses and the state that has driven the growth in employment in services.

- Second, elaborating on the foregoing point, Gershuny (1978, Gershuny and Miles 1983) argued that the post-war tendency was actually for consumers to purchase increasingly cheap and convenient consumer goods and provide their own "self-services", rather than buying traditional services. Thus, the washing machine replaces the laundry, the motor car substitutes for public transport. This was interpreted as reflecting an inferiority of services in terms of technological innovation - though the prospects for applying new Information technology (IT) to services was seen as having the potential to offset this inferiority.

- Third, the trends clearly indicate that different groups of services are undergoing different courses of development. Though it is convenient to refer to the tertiary of service sector, this really consists of several distinct sectors. In the course of this study we will need to consider both the common features which many services share, and to examine features which differentiate various groupings of services.

- Fourth, this diversity of services means that caution is required in extrapolating Gershuny's argument about the technological sluggishness of consumer services to all categories of services. In particular, it was not until the later 1980s that much systematic attention was directed to producer services, whose substantial growth in the post-war period suggests that these might actually be innovative services, applying considerable technological and organisational creativity to finding new products to supply to other businesses.

This report deals with a particular class of business services, which are themselves a subset of this growing area of producer services. We will examine their role in innovation processes, and consider the implications for research and policy of their increasing importance.

## 1.2

## The Characteristics of Services

One facet of the way in which services have been the Cinderella sector of economic analysis and industrial policy-making is the way in which they have typically been defined in terms of what they are not. Services are not goods; they are not tangible, they cannot be dropped on one's foot; they are not products of the primary and secondary sectors; they are not (according to some views) even value-creating.

Working through the pages of text devoted to identifying characteristics that define services, a long list can be constructed of the "peculiarities" attributed to them. Table 2 organises these characteristics in a systematic way. Admittedly, this list of attributes is by no means adequate as a hard and fast way of demarcating services from manufacturing. While *most features apply to most services*, there are numerous exceptions. These are quite frequently in the more interesting business services, even though many of the services with which we are concerned n this report do feature several of the key "peculiarities". We should also note that some branches of manufacturing could equally well be described in terms of some of these characteristics. But the list provides a rough guide to major features in terms of which the grand sectors tend (or have tended) to differ. In general these are more a matter of quantitative rather than qualitative differences. Furthermore there is considerable (and, we shall later suggest, growing) overlap between the sectors in terms of these features..

This list of features is relevant here not only because such characteristics are in part responsible for the lack of attention given to the sector - e.g. the idea that intangible products are in some way less real than material goods. It is also likely that some of these characteristics do lead to innovation in services having "peculiar" characteristics, too. In particular, such features as close relations between service producers and clients in the production and consumption processes, and the intangibility of the service product are liable to be important for the service innovation process. Chapter 3 will take up issues of innovation in services in detail, but at this point it is worth examining the two characteristics just cited a little further.

The **close relations and high levels of interaction between service producers and their clients** is clearly something that varies from service to service. Even within a branch of services like computer software, there is a world of difference between the purveyors of packaged software (whose only direct contact with the mass of final users is liable to be when the latter phone helplines for advice on problems they are encountering, and the specialised computer service company that sends its systems analysts into a firm to examine just what the process is that demands computer support and the associated software.

## Table 2 Special Features typically attributed to Services

## (The "Peculiarities" of Services)

| | |
|---|---|
| **SERVICE PRODUCTION** | |
| **Technology and Plant** | Low levels of capital equipment; heavy investment in buildings. |
| **Labour** | Some services highly professional (esp. requiring interpersonal skills); others relatively unskilled, often involving casual or part-time labour. Specialist knowledge may be important, but rarely technological skills. |
| **Organisation of Labour Process** | Workforce often engaged in craft-like production with limited management control of details of work. |
| **Features of Production** | Production is often non-continuous and economies of scale are limited. |
| **Organisation of Industry** | Some services state-run public services; others often small-scale with high preponderance of family firms and self-employed. |
| **SERVICE PRODUCT** | |
| **Nature of Product** | Immaterial, often information-intensive. Hard to store or transport. Process and product hard to distinguish. |
| **Features of Product** | Often customised to consumer requirements. |
| **SERVICE CONSUMPTION** | |
| **Delivery of Product** | Production and consumption coterminous in time and space; often client or supplier has to move to meet the other party. |
| **Role of Consumer** | Services are 'consumer-intensive', requiring inputs from consumer into design/production process. |
| **Organisation of Consumption** | Often hard to separate production from consumption. Self-service in formal and informal economies commonplace. |
| **SERVICE MARKETS** | |
| **Organisation of Markets** | Some services delivered via public sector bureaucratic provision. Some costs are invisibly bundled with goods (e.g. retail sector). |
| **Regulation** | Professional regulation common in some services. |
| **Marketing** | Difficult to demonstrate products in advance. |

source: based on Miles (1993)

Furthermore, the interaction between service producer and client is liable to vary over time: in the software development case, for example, there may be intensive contact while the systems analysis is underway, and next to none while the preparation of software code is in hand. We can use a simple figure to illustrate both of these issues (Figure 1).

**Figure 1 User-Producer Relations across the Service Life Cycle**

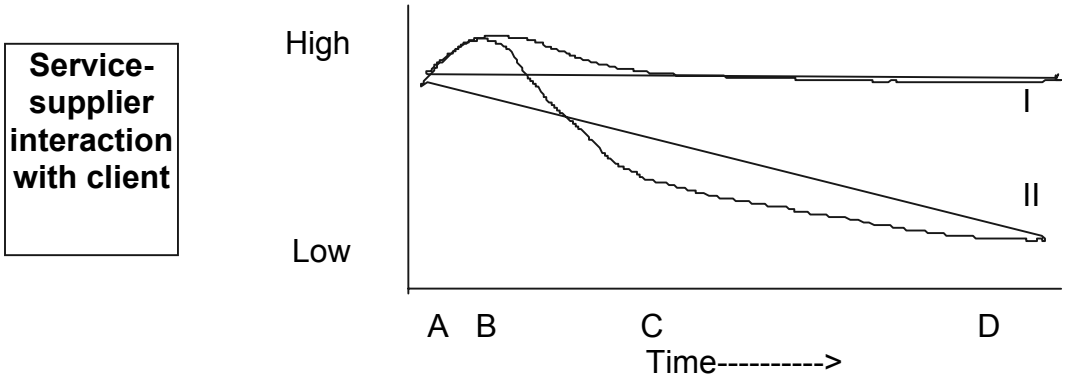



Figure 1 provides a schematic illustration of two different situations. First, it can be read as applying to the whole product cycle of a good or service. **Case II** is a typical good, or a service that is standardised (fast food, or packaged software, for example). Early on there is high interaction with leading or representative users (in the software case, "beta-testing" with samples of intensive users is common). This then declines as the product is standardised and production is industrialised. **Case I** in contrast is a typical service, or a customised (variable & complex) manufactured good. Here successive clients, and the nature of the good or service, still demand high interaction.

Second, the Figure can be read as applying to the course of development of a specific set of service transactions, in the frequent circumstance that the client is repeatedly purchasing the service from the producer. Many services are of type **II**, requiring high initial interaction to define client requirements, but then are effectively routinised with little interaction subsequently. In our case studies, for example, several of the services are ones in which there has had to be a period of more or less close consultation in which the service producer and client come to understand each other's capabilities and requirements better. (Some relationships never proceed beyond this stage, of course.) But many other services remain of type **I**, with continuing requirements for dialogue. (Among the case studies which we will shortly introduce, laboratory informatics and Product Data Interchange systems for architecture are of the former type, for instance, while Eco-design and environmental consultancy are of the latter type. We shall later

consider how the set of service providers in our case studies vary across the range of closeness to their clients.)

The **intangibility** of many services is related to the trends discussed above. A classic definition of services as “things that can be bought and sold, but not dropped on your foot” goes a long way toward expressing this intangibility - what is exchanged typically is information, or a set of physical operations which affect the state of a person or good. But often there is a tangible material medium serving to convey the information, even though this may not be the whole service being provided. We are thinking of such things as reports from consultants or test laboratories, discs which contain computer software or training programmes (course ware), and so on.

One important strategic issue that confronts both service producers and users is the extent to which the service can or should be embodied in artefacts. In some classes of service, the tasks involved are sufficiently well-understood, and the range of client requirements sufficiently predictable, that it is possible to design equipment or software which will perform much, if not always all, of the service function. The famous cases in Gershuny’s (1979) account of consumer self-services - washing machines replacing laundries, motor cars replacing public transport - are paralleled by business services. The computer services sector, for example, was initially predominantly a matter of providing access to computer facilities for firms who could not afford their own computers. With lowered costs, this sort of computer service has been largely replaced by purchase of minicomputers, workstations and PCs - though the software sector has grown accordingly as a computer service. Computer-continuity services retain some of the characteristics of the old-style computer service, but they now buttress in-house computer use, rather than providing an alternative to it.

Sometimes the challenge to a traditional service from new artefacts arises from another sector - public transport was not the source of the motor car, computer service firms did not (on the whole) generate the PC (our qualification here is that some of the manufacturers responsible for the success of the PC were also major providers of computer services). This is what one would expect if services are essentially passive with respect to technological innovation. But sometimes services are heavily involved in this type of innovation, and face strategic decisions as to whether to persist with traditional modes of service provision or seek to embody elements of the service into artefacts for customer self-service. Banks’ use of Automated Telling Machines (ATMs) is a case in point, though here the artefact remains on the service providers’ premises rather than being purchased or rented by the client.

The embodiment of services in artefacts need not necessarily mean an attenuation of supplier-user relations. We are inclined to think that this will often be the case, as in our earlier example of packaged computer software. Such a weakening of links is practically inevitable if a mass market is to develop for the service - otherwise operations will need to be extremely labour intensive (and a large fraction of the workforce would end up performing computer services). As a counterexample, however, take the case study of computer continuity (back-up for disaster) services.

Putting on one side completely do-it-yourself options, there are at last three types of service available. Some providers offer facilities management - they will take over IT systems and operate them with security provisions in place. This actually involves more contact with clients than does the provision of the "conventional" service of remote back-up - beyond initial configuration of the support services, this only involves close interaction when the client needs change suddenly (on account of major change in IT installations - or the disaster actually striking). The third case is the provision of back-up equipment to the client, for client self- service. In this case, fairly frequent and intensive contact is called for, on account of the very specific tailoring of back-up equipment to client requirements. Even Gershuny's self-services may require close user-supplier interaction, though the supplier here is unlikely to be the producer of the traditional service, and more likely to be services involved in the retail, repair and maintenance of the consumer good (washing machine or motor car).

We shall return to both of these features of services later in our discussion. Each has implications for the generation and transfer of technological knowledge, and each is important to the process of services innovation.

## 1.3 The Focus of the Research

The focus of the research comprises Knowledge-Intensive Business Services (KIBS). Recent approaches to innovation and economic growth emphasise the role of institutions that promote the generation, diffusion and accumulation of knowledge within economic systems.[2] KIBS are such institutions. They may be, and often are important **lead users** of new technologies - a position they share in common with other information-intensive services. But they are also **carriers** of new technology and/or important **producers** of new technology, although their added value may be provided in an intangible form.

The importance of KIBS is underlined by recent discussions of what some commentators term "the Knowledge-Intensive economy". (This was, for example, the theme of a major conference hosted by the OECD and the Danish government in autumn 1994.[3]) The Knowledge-Intensive economy is a phenomenon to which KIBS are closely linked, both as a manifestation of the trend and as a reinforcing factor. To date, analysis of the Knowledge-Intensive economy mainly deals with developments in the processes of production and ancillary activities such as design and distribution. The knowledge that is discussed here is mainly technological, or at most instrumental, knowledge. Thus, Knowledge-Intensification is seen as being demonstrated by such phenomena as the growing dependence of economic activity on high-level skills and training, and on Research and Development and marketing activities; a heightened pace of technological innovation is one consequence of these phenomena.

In line with this emphasis, Knowledge-Intensive services are expected to be primarily business services (hence KIBS). (In the future, consumption may also feature as an arena for knowledge-intensification, and there are some trends indicative of this.) Services which are fundamentally concerned with technology and innovation are evidently key elements of

the trend of Knowledge-Intensification. While these will be the focus of this report, we will also note below that there are other classes of instrumental knowledge that form the basis for some KIBS - for example, knowledge of legal, economic or administrative affairs and institutions.

## 1.4 Methodology

Our research has been comprised of two main blocks. One block involved a review of the literature on innovation and services, with emphasis on KIBS. We launched a survey of service researchers world-wide, taking advantage of existing contacts and assisted by the **World Services Forum**, who circulated the team's questionnaire and request for current material together with an edition of their newsletter. This helped us considerably in identifying and accessing recent contributions by the respondents to a survey of researchers and practitioners which we conducted. We are extremely grateful for this assistance, which brought to light important contributions we had not located by means of conventional literature search methods. This has allowed us to build up a database of researchers in this field, many of whom were kind enough to send us their recent publications on related topics.

The relevant literature was found to exist in a wide variety of disciplinary media, reflecting a "community" scattered across many disciplines, despite the existence of some specialist services journals, some research groups with long-standing interests in the field, and regular conferences dealing with services. To a certain extent the dispersion of publications is due to the multiplicity of activities grouped under the title `services'. (The need to differentiate among services has, as we have already seen, been a major topic of discussion among people attempting to deal with the sector in a systematic way.[4]) There are also particular lines of analysis that receive recurrent attention, and which tend to exist as fairly self-contained bodies of literature - management of hotels and tourist facilities, service marketing, and the geography of producer services are outstanding cases.

At the same time, the team carried out a number of case-studies in the Netherlands and the UK, aiming at gaining a first-hand picture of innovation processes in new technology-related KIBS. The case studies consisted of focused investigations of innovation in services associated with telematics, multimedia and the environment. (Box 1) Through interviews and the collection of written material, these aimed at highlighting the forms, determinants and effects of KIBS innovations.

Results of the case study work inform the report throughout, and are frequently specifically cited in the various Boxes embedded in the text. (We use these Boxes to outline issues in more depth than is appropriate for the main text of the report. The most frequent cases involve providing more detail about the light thrown upon the issues being discussed in the main body of the text by case study work.) The first Box depicts the set of case studies which were undertaken in this project - it gives some idea of the diversity of services that exist within our sample,.

Even so, we must point out that this is still a very narrow selection of KIBS. The rationale for our selection of case studies has several elements. First, we sought to conduct case studies in areas where we knew that innovation was underway - thus our sample mainly consists of highly innovative businesses. Associated with this, we wished to capture services connected with two of the major trajectories of technological change currently underway - the continuing development and diffusion of new IT, and the pressure to develop "clean" and environmentally sensitive technologies. These should present interesting contrasts.

The IT cases are ones where rapid evolution of "heartland technologies" are leading to a "swarming" of innovations - a situation often described as one of solutions looking for problems, i.e. new technological potentials being converted in opportunities as they are focused on application areas by innovators. In the IT area we selected two extremely active fields of development - multimedia and telematics services - which represent the convergence of computers, communications and media, and thus provide opportunities for substantial markets and considerable challenges for innovators in orchestrating the complex skill and knowledge requirements. (Incidentally, they are both areas where consumer markets are developing alongside business ones, though our focus was on services catering to the latter.) It would have been possible to develop case studies of other fields where there is rapid development of heartland technologies - for example, new materials or biotechnology. But it was anticipated that there would be more interest in examining an area where major technological changes are being promoted more by changes in attitudes and regulations than by discoveries and inventions (to put it rather crudely).

In the field of environmental technologies, the situation is much more one of problems seeking solutions, with a high degree of regulatory influence. There is recourse to a wide range of different technologies which are required to deal with the manifold problems of resource use and pollution. Our environmental case studies actually tended to have an IT focus, or at least strong IT elements featured in the new technological mix. This reflects the fact that the management of information is often a key element of achieving more environmentally sustainable ways of using technology.

In addition, the case studies were chosen to reflect some other aspects of the diversity of services innovation. We sought to span cases with a hardware and software focus, with product and process innovation, with cutting-edge versus more mature technologies, and where the innovation process involved different types of firm (e.g. small versus large) and network (e.g. innovations that are relatively stand-alone and those that require many actors to co-operate). They also represent different levels of interaction between service provider and client, and different types and degrees of "intangibility" - crucial features of services which we have already mentioned and to which we shall frequently return. The case studies are described in detail in the Annex to this report.

The case studies proved very important in helping develop the perspectives underpinning this report, which structure the literature review. Additionally, we have been able to draw upon earlier research carried out by our teams, which could often be fruitfully reconsidered

under the KIBS label; and through participation in meetings where it was possible to interact with other researchers and policymakers, we were able to derive further insights. We present our report in the form of an annotated essay rather than a bibliographic study, since it seems more important to us to enunciate the key messages of this research than to detail every byway which has been explored in the literature.

## 1.5 The Structure of the Report

Following this introduction, the report continues, in Chapter 2, by delineating the area of research implied by the term KIBS, situating it in the context of the Knowledge-Intensive economy. As a great deal of research in services has been typological in nature, and classifications are important for purposes of analysis as well as policy-making, establishing a definition of KIBS is essential for the purposes of our project.

Chapter 3 briefly reviews conclusions arising from the literature on innovation and services. Rather than be driven by the main lines of debate in this literature, which rarely deals explicitly with KIBS and which in any case is highly fragmented, we organise this discussion around major themes (and relegate most references to footnotes). In particular the chapter attempts to undermine some widespread myths about services and innovation. More positively, it sets out to provide a coherent perspective on the phenomena that have been identified as important in relation to services and innovation.

Within this general framework, Chapter 4 attempts to analyse and characterise innovation in KIBS, and to identify its determinants and its broader economic contributions. Evidence from our case studies is used throughout the text to add depth to, and to support or qualify the issues raised by the literature. This evidence also assists the development of an agenda for research and policy. The case studies are presented in full in a document accompanying this essay: the summaries here are illustrative.

Chapter 5 draws policy conclusions and recommendations from our analysis, as well as indicating directions for further research. Footnotes and bibliography follow, and an Annex describes the case study work in much more detail.

## Box 1

## Case Studies in this Project

| Service | Short Description |
|---|---|
| **Fleet Management Systems** | Use of mobile satellite data communication, global positioning systems, and routing and planning software for truck fleet management. |
| **Product Data Interchange (in architecture)** | Exchange of technical data between participants in building process. |
| **Computer Continuity** | Back-up and recovery services in case of computer system catastrophe. |
| **Teleworking Support** | Infrastructural and training support for teleworkers, employers and agencies. |
| **Multimedia in Corporate Training** | Use of multimedia (CD-ROM etc.) by firms providing training services. |
| **Videoconferencing** | Intrafirm communications. |
| **Multimedia marketing for pharmaceuticals** | Information for marketing pharmaceutical products. |
| **Multimedia in legal practice** | Electronic publishing of specialised legal information. |
| **Laboratory informatics and management systems** | On-line data from analysis of contaminated soil for continuous management. |
| **GIS-related environmental consultancy** | Resources for preparation and planning of site clean-up. |
| **Environmental Data provision** | Information services from maps to consultancy based on remote sensing data. |
| **Waste Exchange** | Consultancy and “marriage bureau” aimed at utilising or disposing of waste according to regulations. |
| **Eco-design of Products** | Support for design of products with low environmental impact. |
| **Environmental Feasibility Studies** | Auditing and impact assessment consultancy. |
| **Waste Reduction Services** | Total waste management services integrating reduction strategies. |

# 2. Chapter 2 Services in the Knowledge-Intensive Economy

## 2.1 Knowledge-Intensity

The growing Knowledge-Intensity of our economies and societies is a theme that has received increasing attention of late. We have already mentioned the example of the OECD Conference held in Copenhagen in November 1994, whose theme was "Employment and Growth in a Knowledge-Based Economy". Attention to Knowledge-Intensive Business Services (KIBS) is another manifestation of this.

The meaning(s) of "knowledge" requires some untangling. One useful distinction commonly employed in the innovation literature is that differentiating formal or explicit, and tacit or implicit knowledge.

**Explicit knowledge** is typically codified in books, reports, teaching programmes, patents, etc. There is much evidence for the growing importance of formal knowledge in the economy, as indicated in rising educational requirements and expenditures, and growing levels of expenditure on R&D and of patenting. Such evidence is cited in support of the view that we are moving into more Knowledge-Based Economies. The focus of such claims, of course, particularly concerns instrumental knowledge related to science and technology, and the appropriation and application of such knowledge. Explicit knowledge will extend to such features of the environment of firms as industrial relations legislation, administrative rules, and market intelligence.

**Tacit knowledge** is more difficult to identify - and in the context of innovation it has several dimensions. Tacit knowledge encompasses, for example, both those aspects of "know-how" which are hard to represent in books and reports, and are most often acquired through processes of learning-by-doing, and the so-called "routines" which firms pursue in their technological search activities - and which are held by evolutionary economists to underpin the development of technological trajectories. Trends in the development of tacit knowledge are more uncertain than for explicit knowledge. While there are many efforts - both IT-based and otherwise - to formalise tacit knowledge by extracting it from experts ("knowledge engineering"), it seems true that even high-technology activity involves much tacit knowledge. Being more often acquired by experience, and perhaps attached closely to specific firms and organisations, tacit knowledge remains the possession of those involved. Neglect of tacit knowledge has been seen as a reason for the uneven success or outright failure of many technology transfer projects. [5]

Knowledge-Intensity is often used as a synonym for Information-Intensity. (And the Knowledge-Based Economy is thus often seen as a refashioning of the idea of the "Information Economy". This is not surprising, given the tendency of breathless commentators on the "information age" to overlook the distinctions between knowledge, skill, data etc. They often rush to subsume all social affairs under the label of "information".) This is not strictly correct, and understanding the role of KIBS demands more consideration of the distinction between knowledge and information.

More information is not necessarily more knowledge, as any teacher - or production engineer - knows. The ability to parrot facts may help win panel games, but the evaluation of claims as to facticity, and the interpretation of evidence and data, is more important to economic activity. The dissemination of statistical tables and press releases may contribute to the flow of communication, but it takes knowledge to interpret such data (as well as requiring considerable knowledge to produce valid and useful material in the first place).

Often knowledge is described as organised information. This is a useful enough formulation. But it is rather static - knowledge is not just the content of books or databases. It is more helpful to see knowledge as an active process. It involves the **ability to organise information**, as well as the results of applying that ability.

Thus knowledge is a matter of learning - and of more than rote learning. Knowledge may be developed in a variety of ways - through learning by doing and by experimentation, communication, formal training etc. Knowledge transfer typically requires elaboration of knowledge bases on both sides of the transaction, though this is rarely symmetrical. *Knowledge transfer thus typically requires more interaction between the participants than does information transfer*.[6] Even less sophisticated information transfer, if it is to be successful, requires common understandings - shared knowledge bases, at least of a lowest common denominator kind - between supplier and user.

The importance of knowledge stems from several sources. Technical knowledge is often the basis of production processes, and is required simply to maintain their effective operation. Furthermore, industrial innovation is increasingly based on science and R&D. Professional knowledge is demanded by an increasingly complex society - one with more economic agents and products, more rules and standards, more differentiated lifestyles, etc. Not only is the use of knowledge being driven by demands resulting from the greater complexity of modern societies. In many ways, we are also seeing the results of what Ellul termed “La Technique” being applied - as he anticipated - to all spheres of economic life.[7] Formal tools of analysis (e.g. cost-benefit methodologies), support systems (e.g. databases), and shared skills (e.g. systems analysis, statistics) themselves diffuse across application areas - and knowledge of their applicability itself spurs further use of such knowledge.

The consequence is that *all economic sectors are becoming more knowledge-intensive in their production processes*. Furthermore, it is not only production that is affected in this way: *other functions - service functions such as design, marketing, distribution, etc. - are also growing in knowledge-intensity*.

Thus, while knowledge-intensive activities are manifold, the definition of particularly knowledge-intensive sectors is a relative affair. They will simply be those sectors which are more knowledge-intensive at a given moment. This knowledge-intensity may result from various sources: for example, from the application of non-routine technology, or from the need to work in particularly complex social or technical environments.

## 2.2 Services and Technological Knowledge

So a first meaning of "knowledge-intensive" relates to the process of application of knowledge within the sector. *Many services are knowledge-intensive in this sense* - as crudely demonstrated by such indicators as their high numbers of professional and technical staff, or their unusually high levels of investment in new IT.[8] These services are applying knowledge in their activities. But this does not mean that they are necessarily contributing to knowledge-formation in the economy more generally. Indeed, the use of advanced technology may not require particularly high levels of knowledge concerning how the technology operates, or even of knowledge of how its operations might be aligned most productively with company requirements. (Though, as a general rule, intensive users of new technologies are liable to be motivated to understand what the potentials of these technologies are for their activities.)

Nevertheless, there is an important message. *Services can no longer be dismissed* en bloc *as retarded, low-technology labour-intensive activities.* Services as a whole are the major investors in new IT - taking over three-quarters of IT hardware (by value) in the USA and UK, for example. Practically all IT systems, other than those dedicated to particular extractive or manufacturing industries (such as numerically controlled machine tools), have been adopted at extremely rapid rates by services. Or rather, they have been so adopted by some branches of the services sector, notably the financial services. Some other service branches, to be sure, are lagging at present; but new telecommunications and low-cost computer equipment are expected to be profoundly important here.[9]

As well as being important **users** of new technology, certain services are also **carriers**, agents of transfer, of new technology - e.g. consultancies and training services. In practice, many services will play this role as a secondary function, even if it is not their primary mission. One feature common to many services, as noted earlier, is the close interaction between client and service provider in the course of service specification, production and delivery. The client may well learn almost in passing, as a by-product of the interaction, about the technology that the provider is employing. Inculcating such knowledge on the part of clients is also liable to be a feature of service providers' strategies, so that the interaction can subsequently be less demanding on their part. While an informed client may be less easy to satisfy (though this is not always the case), there will be fewer problems of "translation" into non-specialist language, and clients may be able to self-service some problems that are of minimal interest to the service provider. This clearly has resonance with the service provider's decisions as to whether to provide services more through human interaction, or through services embodied in some physical medium.

Yet others are also integral **producers** of this technology - the wide range of computer, software, telecommunications and telematics services in particular. New technologies in general, and new requirements for technology, have spawned new services that

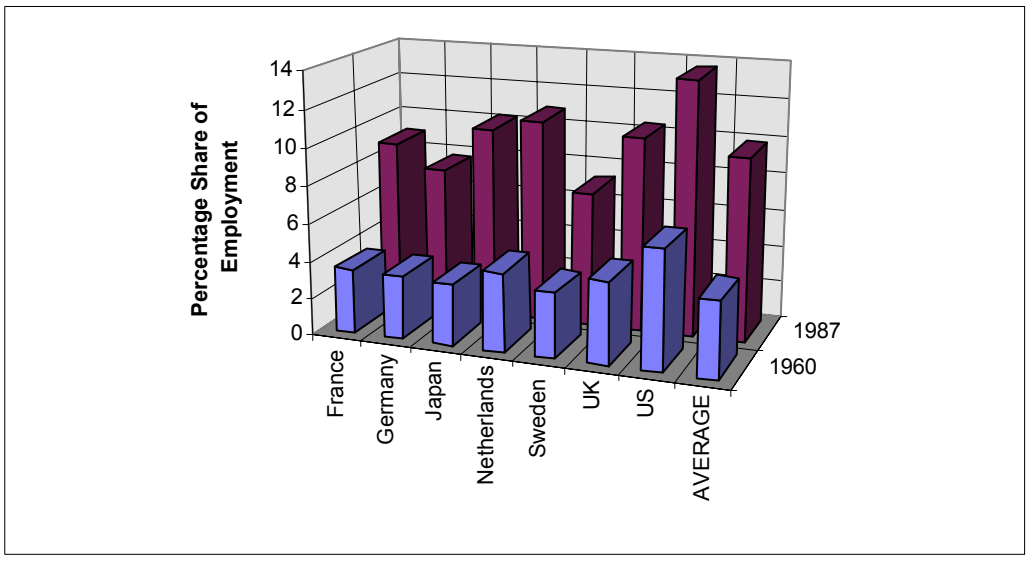
enable the further development and design of these technologies. Examples include laboratory, design, engineering and related services; and services may be connected with biotechnology and new materials, and with environmental technologies, as well as with IT.

Such services innovation is important not only for the dynamism of the service industries themselves, but also across the whole economy. Technology-intensive users play a role in innovation through intensifying user-producer relationships. And other services facilitate the adoption, diffusion and implementation of new technologies, through their provision of decision support (e.g. consultancies), training, repair and maintenance, facilities management, and so on.

## 2.3 The Rise of Business Services

Knowledge-Intensive Business Services involve economic activities which are intended to result in the creation, accumulation or dissemination of knowledge.[10] Knowledge may be developed in the course of all sorts of learning experiences, of course. But here we refer to deliberate efforts to establish knowledge - usually to establish explicit, formal and codifiable knowledge - which may be related to the growing economic importance of "learning-based competition". In the developing division of labour, specialised economic agents arise to produce, nurture and disseminate knowledge. KIBS are important examples of these agents.[11] Figure 2 (based on data from Table 1) displays information on the substantial growth, in employment terms, in producer services, among which KIBS number.

**Figure 2 Producer Services Employment in Selected Industrial Countries**




source: as Table 1

Despite considerable problems with available statistics, it is easier to chart the growth in producer services than to be definitive about their contribution to growth and innovation. Some studies have thrown light on the strategic choices which lead to firms' use of such services,[12] but there is limited evidence as to the eventual results of this use at the micro-level. (Clearly, however, the services' clients do anticipate that advantages will be gained from employing the services.) The strongest case for the role of KIBS comes from geographic analysts of the contribution of producer services to regional development. Producer services are associated with regional growth, though the causality has been subject to some debate. The general consensus seems to be that, while KIBS do not seem to be a sufficient condition to guarantee regional dynamism, they do emerge as a necessary one.[13] How far this is cause or effect is a less important question than this general conclusion.

The long-run growth of services as a source of economic output and employment is well-established: discussions about the "service economy" or "post-industrial society" were taking shape in the early 1960s.[14] Then, as now, there were many commentators who tended to treat services at best as a residual (what is left over after the important parts of the economy have been considered), at worst as an unproductive burden (a product or even a cause of "de-industrialisation"). Early views of the growth of services tended to attribute this to (rather numinous) shifts in consumer demand, which have not been clearly substantiated in detailed statistical studies. Later research suggests that the shaping of services via consumer demand is a complex affair, and that the major sources of service growth in the post-war era - with the exception of certain consumer services like fast foods and broadcast information - has involved the expansion of the

public sector providing collective services - and the rapid emergence of business services as a substantial part of the economy.[15]

Business services, of course, are our focus here. Their growth is a major indicator of what can be seen as an **intertwining** of different business activities. This involves the growing **interdependence** of sectors (e.g. manufacturing using more producer services, services using more technological products from manufacturing), and a growing **interpenetration** of sectors (e.g. production and patenting activities falling "outside the industry of origin", new products that critically depend upon combined hardware and software, industrial alliances spanning the two sectors as in much computer-telecommunications activity).

Two related strategies are being adopted by many companies (especially large firms). Moves towards **specialisation** involve an effort to focus on the companies' core business activities and shed the diversified activities acquired in earlier decades - which have created problems of management and integration for the firms. Moves toward **flattening** (or delayering) involve an effort to reduce the number of layers in the organisation by compressing management hierarchies (and shedding middle management). IT and new organisational structures are introduced in an effort to *integrate* the functioning of the firm, while *networks* are established to co-ordinate internal and external relationships.

Such factors are shaping and generally stimulating demand for services. Furthermore, they are increasing the knowledge-intensity of services and the knowledge requirements of their clients; and they are locating services into emerging innovation networks.[16]

Another tendency that is of considerable relevance to the present discussion is the **convergence** of sectors, pointed to by several analysts. In many respects traditional demarcations between services and manufacturing industry are being eroded. (Table 3). Put simply, both sectors are evolving to new forms. These are not simply an averaging out of the two original types.

The *industrialisation of services* is a process whereby many previously "craft-like" processes within services are subjected to the same sorts of discipline and organisation as is typical in much manufacturing. This typically involves injections of technology, though often it is not the most advanced technologies that are involved here. The latter - especially IT - are used both in services and manufacturing to provide more flexibility of production and customisation of products.[17]

## Table 3 Convergence between Services and Manufacturing

| **FEATURES OF THE INDUSTRIES** ***[services' "peculiarities"]*** | **CHANGES IN SERVICES** | **CHANGES IN MANUFACTURING** |
|---|---|---|
| **FEATURES OF PRODUCTION** | | |
| **Technology and Plant** ***[services low-tech]*** | Increasing levels of capital equipment in new technology (IT). | Use of IT similar to services'. |
| **Labour** ***[services workforce professional or unskilled]*** | More technical labour like other sectors. | Production in general becoming more knowledge-intensive and requiring higher skills, with more white-collar staff. |
| **Organisation of Labour Process** ***[services labour often craft-like]*** | Standardisation of tasks in some services through new technologies and organisational techniques. | New forms of work organisation (inc. mobile work) |
| **Features of Production** ***[services often produced non-continuously]*** | Economies of scale and "industrialised" production sought in many services. | Increased flexibility with reduction of stocks and inventories with "just-in-time" methods. |
| **Organisation of Industry** ***[services often small-scale]*** | Increasing prominence of large services companies, including global service companies. | "Hollow firms" focusing on core specialisms and subcontracting other activities - but also globalisation of business |
| **FEATURES OF PRODUCT** | | |
| **Nature of Product** ***[services usually immaterial]*** | Many new services embodied in IT media. | Shorter product life-cycles (e.g. more ranges, held in stock for shorter periods) |
| **Features of Product** ***[services often customised]*** | Standardised products for some services. | Flexible production allows customisation of largely standardised products. |

(continued overleaf)

## Table 3 Convergence between Services and Manufacturing (continued)

| **ASPECTS OF THE INDUSTRIES** ***[services' "peculiarities"]*** | **CHANGES IN SERVICES** | **CHANGES IN MANUFACTURING** |
|---|---|---|
| **FEATURES OF CONSUMPTION** | | |
| **Delivery of Product** ***[services production and consumption coterminous]*** | Use of new media for delivery (especially information services) | Closer linkages between production, design and market information using new IT systems. |
| **Role of Consumer** ***[services are consumer-intensive]*** | In self-services and new technology services consumer is interacting with technology rather than service staff. | In some sectors, more input into design and into R&D. |
| **Organisation of Consumption** ***[services production and consumption bound together; self-services]*** | Use of new media to separate production and consumption. | Some leasing. |
| **SERVICE MARKETS** | | |
| **Organisation of Markets** ***[services often public sector]*** | Privatisation of public services. | Some marketing of in-house services by manufacturing companies. Privatisation of some state companies in manufacturing and utilities. |
| **Regulation** ***[services often regulated]*** | More explicit regulatory structures; GATT rules. | Growing environmental regulations. |
| **Marketing** ***[services' difficulty demonstrating products]*** | More marketing effort, including trade shows and demonstration efforts (e.g. for software etc.). | Similar problems with complex and customised products (esp. new consumer products)? |

The *tertiarisation of manufacturing* usually refers to the growing white-collar share in manufacturing (and other sectors), which has increased enormously over the same period of time that the contribution of producer services to manufacturing industry was also growing (which undermines the argument that the growth of these services simply reflects the externalisation of functions previously performed on an in-house basis.) Manufacturing has come to resemble services in other ways too, for example in the shortening of product life-cycles and the increased role of the client ("customisation"). The growing role of "service" in products is underlined by a growth in attention to service strategy in manufacturing companies, and a recognition of the role of customer services as important elements of competitiveness. Other service functions, like design, are also given more weight, and decisions as to whether to internalise or externalise services are now the subject of much discussion.[18]

Thus, manufacturing and services are coming to acquire elements and characteristics which were previously regarded as distinctive features.[19] There are still major differences from sector to sector, but there is much more overlap than was traditionally assumed. Likewise, the sectors are increasingly intertwined. These factors alone would be good reason for paying more attention to innovation in business services. It is clearly time for services to stop being treated like Cinderella, and to be accorded their due in economic analysis and innovation theory.

## 2.4 What are Knowledge-Intensive Business Services?

### 2.4.1 Three Broad Classes of Service Process

Despite the use of a plethora of terms to describe similar phenomena, such as the "quaternary sector", "high-tech services", "the advanced services sector", and despite the wealth of proposed classifications for service activities, little effort has been devoted to a definition of KIBS.[20]

In our earlier research[21] we have fruitfully classified services in terms of their *main processes* - whether they are involved in processing

- people,
- physical goods and other such resources, artefacts and commodities (e.g. buildings, parks),
- or information (which includes, but is broader than, knowledge).

This classification, as we shall see later, has proved useful for explicating the technological trajectories and innovation dynamics of different groups of services. It moves away from a view of services as homogeneous, and universally and inherently poor in terms of innovation, to a picture which highlights diversity and change. It is notable at this point that there are two main types of business services - those featuring physical functions (e.g. storage, transport, repair and maintenance) and those providing information and knowledge functions (computer services, R&D, design services, consultancies, etc.) Our case studies are mainly of this latter type. Some are adjuncts to physical processes such as transport (fleet management services) and waste disposal (waste exchange services), but the main value-added from the service activity is knowledge-based and involving information systems.

**Figure 3 A Classification of Services along Two Dimensions: Types of Production Process and Type of Market Structure**

| ***Market Type*** | ***Production Type*** | | |
|---|---|---|---|
| | **PHYSICAL SERVICE** | **PERSON-CENTRED** | **INFORMATION SERVICE** |
| ***STATE*** | | *Welfare*<br>*Hospitals*<br>*Health, medical education* | *General government*<br><br><br>*Public Broadcasting* |
| ***CONSUMER*** | *Domestic service*<br><br>*Catering*<br>*Retail trade*<br>*Post* | *Barbers etc.* | *Commerical Broadcasting*<br><br>*Entertainment* |
| ***MIXED*** | *Laundries*<br>*Hotels*<br>*Laundry*<br>*Repairs* | | *Real estate*<br>*Telecommunication*<br>*Banking,*<br>*Insurance*<br>*Legal services* |
| ***PRODUCER*** | *Wholesale trade*<br>*Physical distribution & storage* | | *Engineering & architectural services*<br>*Accountancy*<br>*Miscellaneous professional services* |

source: based on Miles (1987)

**2.4.2**

## Information and Knowledge Services

The distinction between **knowledge** and **information** is helpful in further distinguishing between services. Not all information-processing services are really in the business of producing or supplying knowledge. Basic telecommunications and broadcasting services, and financial transactions in general[22], are mainly involved in storing and transporting data and information. They are effectively information and communication rather than knowledge services. They may be knowledge-intensive in their internal processes (along with many other economic sectors), but fostering knowledge development elsewhere in the economy is not a major function of theirs. (That being said, we should note that some of their users may build and develop knowledge through their use of these services' informational activities and products. Furthermore, as is the case for many economic activities, specialised knowledge services may be developed within the firms and networks involved in these activities - selling on intelligence gained about their processes, technologies, or markets, in the main.).

A rather strong implication follows that *KIBS will require more supplier-user interaction than many other information and communication services* (such as packaged software, broadcasting, telephony, standardised financial services). KIBS thus conform more closely to the traditional notion of services as involving high levels of interaction, than do many other new services, or services that are evidently undergoing rapid technical change. This is one reason why it is helpful to review the literature on innovation in services in general - many of the factors highlighted there as shaping the innovation trajectories of services may have relevance to KIBS.

In the case of many information and communication services, telematics can be applied so as to reduce the need for human-to-human interaction (for example through the use of ATMs in banks). But KIBS involve more than just networking. One way to describe this is to say that *KIBS involve learning through networking, rather than networking alone*. The distinction between knowledge development and information transfer may be a difficult one to precisely operationalise in terms of statistical analysis; but it is nevertheless extremely significant in practice as well as in theory.

**Box 2**

**Learning through Networking**

The importance of learning through networking is demonstrated in a number of our case studies. Perhaps the clearest demonstration comes in the case of Van Holsteijn en Kemma, an industrial design firm, which has accommodated the idea of learning through networking in its strategic thinking. This firm seeks competitive advantage through:

- access to knowledge about the environmental effects of materials;
- access to knowledge about the process of product design inside its clients; and
- experience in combining the two.

The first two factors refer to learning through networking, while the third one refers to the firm's internal organisation and processes of service production.

According to the firm, the importance of the first capability is diminishing, because of the development of such knowledge within public institutions, such as universities and industrial associations. It is the second capability - namely its knowledge about the frame of mind of industrial designers - which provides the firm with competitive advantage. This knowledge is derived from the firm's accumulated experience in dealing with such people, and is qualitatively different from - and strategically synergistic with - technical information about the effects of materials on the environment. Networking is useful for `learning' in the sense of acquiring information, for this firm as for others. But in gaining competitive advantage, learning through networking implies `learning to learn'.

**2.4.3**

## New KIBS Compared to Traditional Professional Services

Many services rest upon knowledge of various specialised kinds. Traditional professional services such as accountancy and legal services, market research and personnel services, are of this kind. Such traditional professional services have been based upon specialised knowledge of administrative systems and social affairs, and of how to apply such intellectual techniques as logic and arithmetic, and skills that range from courtroom debating to statistical analysis.

A typical purpose of **traditional professional services** is helping users navigate/negotiate complex systems. These complex systems are traditionally not so much technical systems as:

- social systems, especially administrative rules and regulations (legal and accountancy services), but also less formally organised material on social groups and interests (marketing and issues consultancy services, for example);

- physical systems, as in architecture and building services (here they may be considerable technical content, but the focus will only be on new technologies for a few leading edge services);

- psychological and biological systems, as with medical and veterinary services, educational and clinical psychology and psychiatry, counselling, etc.

Other instances of traditional professional services may be distinguished, but the main point is that their relation to new technology is typically that of users rather than as agents in development and diffusion. This is the current state of affairs, at least. We expect these services to be increasingly influential shapers of new technology as their professional experience grows from what is already a fairly advanced position.

But the current interest in KIBS relates in particular to the development of various new services connected with technology, and with the production and transfer of knowledge about new technology. The knowledge requirements for technology users are bound to be more challenging where new technology is involved, and where firms are thus less likely to have already acquired the knowledge necessary to understand, master, and utilise the new product and process opportunities.[23]

KIBS are thus related to emerging technologies and technological challenges:

- generic technologies like IT (and possibly biotechnology and new materials),

- other technologies whose scope may be less pervasive scope but which still present large and daunting knowledge-requirements (for example, radiology),

- and yet other technologies associated with emerging problem-driven issues (like environmental or so-called “clean” technology).

To a large extent the new KIBS can be identified as new professional services - and some of them are well on the way to professionalisation, with their own professional societies and qualifications. However, some services associated with new technology may be less professionalised, such as some repair and maintenance activities. The definitional boundaries of KIBS will determine just how far such activities are to be taken into account.

As a first approach to a definition, we understand KIBS to be services that:

- Rely heavily upon professional knowledge. Thus, their employment structures are heavily weighted towards scientists, engineers, experts of all types. Many are practitioners of technology and technical change, Whatever their technological or professional specialism, they will also tend to be leading users of Information Technology to support their activities.

- **Either** supply products which are themselves primarily sources of information and knowledge to their users (e.g. measurements, reports, training, consultancy);

- **Or** use their knowledge to produce services which are intermediate inputs to their clients' own knowledge generating and information processing activities (e.g. communication and computer services). These client activities may be for internal use or supplied to yet other users in turn.

- Have as their main clients other businesses (including public services and the self-employed). Indeed, knowledge-intensive activities will frequently tend to be business-related, since as labour-intensive activities they will be relatively costly. (Educational and medical services demonstrate that delivery to final consumers often has to be mediated through collective service organisation.)

According to this definition, KIBS as a group does include two main sets of services, consisting of large parts of the service branches outlined on the following two pages.

**KIBS I:**
**Traditional Professional Services, liable to be intensive users of new technology**

- ◊ Marketing/advertising;
- ◊ Training (other than in new technologies);
- ◊ 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;
- ◊ Environmental services (not involving new technology, e.g. environmental law; and not based on old technology e.g. elementary waste disposal services).

**KIBS II:**
**New Technology-Based KIBS**

- ◊ Computer networks/telematics (e.g. VANs, on-line databases);
- ◊ some Telecommunications (especially new business services);
- ◊ Software;
- ◊ Other Computer-related services - e.g. Facilities Management;
- ◊ Training in new technologies;
- ◊ Design involving new technologies;
- ◊ Office services involving new office equipment);
- ◊ Building services (centrally 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 services;
- ◊ R&D Consultancy and "high-tech boutiques".

According to this definition KIBS does not include large components of the list of services on the following page. However, many of these branches feature some emerging activities which 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. Specialised information services may well arise for any of these branches, too, whose status may be debatable.

## Non-KIBS Services

- ◊ Health/medical services;
- ◊ Post, Transport and Distribution (although some specialised services may be included - e.g. priority delivery services, and transport logistics);
- ◊ Consumer Financial and Real Estate services;
- ◊ Education services (other than specialised training for industry);
- ◊ Broadcast 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);
- ◊ Retail and wholesale;
- ◊ Social welfare services;
- ◊ Hospitality (i.e. hotels, etc. - **not** hospitals!) and Catering;
- ◊ Leisure/tourism;
- ◊ Personal consumer services;
- ◊ Entertainment.

## 2.5 The Growth of Knowledge-Intensive Business Services

### 2.5.1 KIBS and Producer Services

KIBS are an exemplar of, and mover in, the general process of knowledge-intensification in industrialised economies. The growth of KIBS reflects not only the increased demands for knowledge in the economy, but also trends in the division of labour which lead to specialised services emerging and playing prominent roles in knowledge accumulation and transfer. The growth of business services in general is easy to chart using available statistics. As Table 1 showed, these have been the fastest growing group of services in the OECD area.

Knowledge-Intensive Business Services have rarely received attention as a group, though particular branches have done so (especially certain IT services). However, a great deal of attention has been given to the growth of producer services in general. A first point that needs to be made is that these producer services contain two extreme types:

- Professional services and KIBS - that is, high skill-high complexity services of the sort discussed earlier.

- Lower skill services (such as catering, cleaning and security) which are typically characterised by 'flexible employment patterns', with a predominance of female and part-time or temporary work.

Such a dichotomy of services illustrates the problems of generalisation about the service economy. In this case, there are evidently difficulties in making overarching statements about the dynamics and innovation trajectories of such different groups of producer services. Some general points can be made about the growth of producer services, and the discussion which follows makes these points as well as concentrating on those relevant to the more knowledge-intensive cases.

Research[24] indicates that this growth results from such factors as:

- “Spin-off” of producer services from firms in other sectors, as their competence at supplying (especially technology-related) services has grown (see Howells, 1989 and Elfring, 1994 for discussions of this issue). (See Box 3). One of our case studies, for instance, the computer-continuity company Istel, was such a spin-off. It originally served as the vehicle manufacturer British Leyland’s in-house computer services group. (This case study is also interesting as featuring the acquisition of a European firm which was making considerable headway in supplying new telematics services by an American telecommunications giant -AT&T.)

- Structural changes in industry (downsizing, concentration on core activities) which have led to the externalisation of activities which were in the past provided in-house. Many of our case studies reflect this trend, but since our focus was on innovative firms, they are typically supplying facilities which are far in advance, technologically speaking, of clients' original in-house activities.

- Similar contracting-out of services has been undertaken by public sector bodies, usually under political imperatives. We made no particular effort to capture such cases in our case study research.

- The impacts of "re-regulation" on such sectors as financial and telecommunications services, where new entrants and heightened competition have led to new product offerings and market segmentation strategies. This is of considerable importance for telematics and financial services in particular. The Istel case mentioned above reflects the reregulation of UK telecommunications, for example.

- Other regulatory challenges, most notably those connected with environmental issues, are also requiring that a broad spectrum of firms deploy new technical and organisational knowledge, which is often accumulated and marshalled by producer services. Our environmental case studies are all heavily influenced by this feature.

- Firms' requirements for highly technical or complex services which are too new for firms to have yet internalised, would be too costly to maintain in-house given that skills or equipment are only occasionally needed or that the firm cannot achieve a minimum efficient scale, or which demand co-operation with other members of a network. This theme is the subject of a very interesting study by Tordoir (1993), which we will draw on later. Many of our case studies feature such demands - multimedia, Product Data Interchange, Geographical Information Systems development, etc.

- The emergence of many self-employed professionals shed from firms that are "downsizing" and seeking to establish themselves as small service suppliers. We did not explicitly design our case studies to capture this group, although we have come upon numerous individuals of this type involved in fields such as IT consultancy.

Research also indicates that a surprisingly wide range of functions may be contracted out to producer services. Even activities which were usually regarded as a part of the core business, and which analysts normally assumed could not be delegated to outsiders, are being treated in this way. (Among our case studies, Eco-design services are a case in point.) There is a strong element of firm strategy in this, with different firms taking different decisions - and with perspectives changing over time as experience accumulates on the part of both potential suppliers and potential clients for services.[25]

Tordoir (1993) has advanced a number of provocative analyses concerning the utilisation of professional services by business (his work spans both technological and

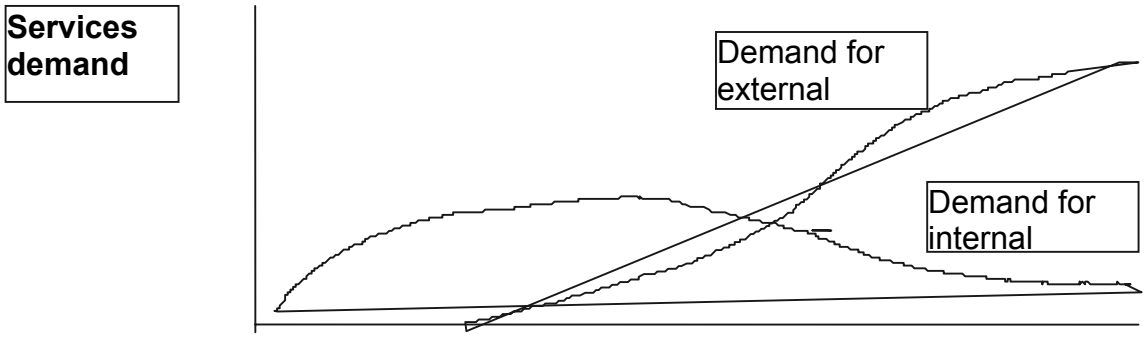
non-technological KIBS, with a case study emphasis on consultancy). Figure 4 represents his general model of the product cycle for professional business services in which demand for in-house services is related to the demand for KIBS..

Essentially the picture is one in which the service functions are first developed in-house within client companies - it is hard for service firms to arise to provide new functions for which there is as yet no demand. (But we must qualify this: telephone companies arose independently, and there are other instances of services being spun off from manufacturing firms who at first supplied these services as part of a package to clients rather than using them for in-house purposes.) As demand for the service functions grows, the scope for external provision increases; and as KIBS firms emerge, they substitute for some of the internal demand. (Contrary to this illustration, however, we often find continuing growth of both internal and external demand, when requirements for the function are themselves expanding sufficiently rapidly. A case in point is computer services.)

Tordoir notes that the emergence of a thriving professional services sector marks a break with the traditional way of providing professional functions, within corporate bureaucracies. The growth of producer services means that horizontal mobility is offered to professional workers, and entrepreneurial structures accompany the bureaucratic systems which previously organised these functions. While in principle this makes for more rapid diffusion of professional knowledge, the growing complexity of the markets for services may limit this potential to some extent.

We shall examine some of the conclusions of his case study work shortly, but he also provides a survey-based analysis of US and Dutch firms' use of professional services. Statistically, the use of these services is influenced by company size, diversification, technology- and R&D-intensity, market orientation, and decision-making structures. As a rule, greater complexity leads to more demand for professional support. However, an analysis in terms of f five types of firm suggests that small hi-tech firms have often developed relatively support structures. (It is interesting to note that these usually remain intact when incorporated into a large firm).

**Figure 4 Tordoir's Product-Market Cycle for Professional Business Services**




Source: Tordoir, 1993, p126

### 2.5.2 Professional Services, New Technology-Based KIBS, and Supplier-User Relations

We distinguished above between new technology-based KIBS, the focus of this study, and traditional professional services. The latter are, strictly speaking, also knowledge-based services, and often business services (though there are substantial consumer markets for legal and some other professional services). But where we refer to KIBS, from now on, we will be focusing on new technology-based KIBS unless otherwise specified.

(That being said, before we continue with the specification of the role of these services, we should note that there may be some cross-over from traditional professional services to KIBS, just as was previously noted as happening from information and communication services more generally. This is indeed to be expected, as part of the general process of knowledge-intensification. We are in this case thinking of the "spin-offs" and new firm formation which occur where KIBS emerge from traditional professional services. What typically happens is that professionals with experience of new technology - in particular IT - establish vertical niche markets promoting the application of technology into their old specialisms (or sometimes to their old clients), and often generating new applications and elaborations of basic technologies. Examples include specialised training companies heavily utilising computer-assisted training, and firms selling software and database applications to building service companies. The processes of spin-off from professional services into technology-based KIBS are probably little different from spin-offs from other sectors into KIBS.)

We can further explicate different types of service arrangement now, by combining our earlier discussion of the nature of the interaction between service producer and client, with ideas concerning the relation of the service to technological change. Figures 5 and 6 locate services again in terms of two dimensions, but now we focus on these two attributes, which have little correlation with the two attributes of service function and market type as examined in Figure 3.

Figure 5 suggests examining services in terms of four groups as far as use of new technology is concerned. First are labour-intensive services with relatively low use of new technology. We might expect to find some of the low-wage, low-status business services (e.g. office cleaning) here. Second are services who are users of new technology only in processes of production of non-technological services. This category will include many traditional professional services, as discussed above. Two further groups are more of interest from the standpoint of technology-based KIBS. The third group consists of users of new technologies to accomplish technology-based functions for their clients, and the fourth group is explicitly involved in transfer of technology-based knowledge to clients.

As for the horizontal dimension of this Figure, this depicts a continuum of producer-client relationships, ranging from low to high interactions. Matters have been simplified somewhat by conflating together here such interaction and customisation of the service. There are cases where these two attributes are fairly independent: a “customised” service can be supplied sometimes by simply assembling the chosen components from a large set of subservices - just as a fast food restaurant may actually offer more menu choices than a traditional high-interaction restaurant. This may particularly apply to some telematics services, for instance.

Figure 6 goes on to provide a rough location of our case studies in terms of this framework. It proves necessary to be much less hard and fast about this location than might have been expected, for two reasons.

First, as Figure 1 indicated in our preliminary discussions, the client-intensity or level of interaction involved in a service is liable to vary over time. To some extent, the location of our case studies on this dimension reflects their current maturity of development. In some cases, such as computer-continuity services, we also find several different cases within the set of firms studied.

Second, the distinctions between cases in terms of relations to technology are less marked than suggested in Figure 4. This again reflects the variety of cases within each case study, but also derives again from variation over time. Two elements are involved here.

A first element is that there may well be technological learning on the part of service users, even if this is not the primary function of the service transaction. Clients may be explicitly taught some parts of the technological knowledge in order to help them utilise the service effectively, to be able to solve minor problems themselves, and to better

communicate with the service provider. Such training may be the subject of strategy on the part of the service provider, or happen more informally. In either case, we see that the service transaction can involve not just the service supplier learning about the client's operations and requirements, but the matching process on the part of the client - learning the service provider's routines, capabilities and technological base. In principle, this should put clients in a better position to understand suppliers' problems and contributions - though there may also be elements of lock-in here, as specific technologies are understood at the expense sometimes of a more general understanding. (For example, in our case studies, CD-i and CD-ROM multimedia share many generic elements, but there are also specific features to the production of each which will require investment of resources and time to master.)

The second element is that learning may occur "spontaneously" in the course of interaction with a service providers' technologies. At the very least this may be a matter of raising awareness. But it may also allow clients to explore technological possibilities by observing how the provider operates, and discovering what lessons the provider has already drawn as to successful operation. (Thomas and Miles, 1989, note that many businesses utilising British Telecom's Prestel public videotex services later moved into creating their own private services, for example.)

Tordoir's work (1993) also throws light on the role of client-service provider relations and the transfer of knowledge from KIBS. In his view, professional knowledge typically represents a practical integration between explicit (scientific and documented) knowledge and tacit (undocumented) knowledge of the routines and practical requirements of companies. KIBS thus represent intermediaries between scientific and technological development ("invention") and practical innovation (including diffusion and application, and leading to the change of routines in companies). The functions of such services (drawing on Tordoir) include:

- Facilitating clients' communications with their environment (external relations but also Mediating flows of knowledge into the company).

- Reducing complexity and risk. Tordoir distinguishes between what he calls "mechanical complexity" (technical, administrative and market complexity), and "voluntary complexity" (reflecting problems associated with "organisational cultures" and "organisational politics" - uncertainty, ambivalence and conflict related to the variety of human interests, intentions and cognitions).

- Co-ordination of tasks.

- Standardisation, adaptation and improvement of routines.

## Figure 5 Services' Use of Technology and Interaction with Clients

| | | **Typical Relation between Service Provider and Client** | |
|---|---|---|---|
| | | Low interaction <----------> High interaction<br>[Low customisation <----------> High customisation] | |
| **Service Providers' Typical Relation to Technology** | Labour-intensive services with relatively low use of new technology | Retail, hotels, tourism | Higher education<br>Personal services |
| | User of new technology only in processes of production of non-technological services | Technology-intensive traditional services - e.g. airlines, railways, banks. | Non-technological KIBS - i.e. traditional professional services |
| | User of new technologies to accomplish technology-based functions for client | Producers of software packages.<br>Some telematics services (e.g. EDI).. | Facilities management, bespoke software. |
| | Involved in transfer of technology-based knowledge to client | Providers of large scale training seminars and conferences. | Providers of customised training packages.<br>R&D and design services. |

source: this is inspired by a similar Figure in Schemmer (1986, p25), but replacing his dimension of labour-intensity with ours of relation to technology.

## Figure 6 KIBS' Use of Technology and Interaction with Clients

| | | **Typical Relation between Service Provider and Client** |
|---|---|---|
| | | Low interaction <----------> High interaction<br>[Low customisation <----------> High customisation] |
| **Service Providers' Typical Relation to Technology** | User of new technology only in processes of production of non-technological services<br>^<br>¦<br>¦<br>¦<br>¦<br>¦<br>¦<br>¦<br>¦<br>¦<br>User of new technologies to accomplish technology-based functions for client<br>¦<br>¦<br>¦<br>¦<br>¦<br>v<br>Involved in ongoing transfer of technology-based knowledge to client | Multimedia in legal practice<br>---Videoconferencing----<br>PDI in architecture<br>--------Teleworking services--------<br>-------Computer-continuity services-------<br>Waste exchange services<br>---Multimedia in training--<br>Laboratory informatics<br>GIS consultancy<br>--Multimedia in pharmaceuticals --<br>marketing<br>----Fleet management----<br>Environmental information<br>Environmental feasibility<br>Eco-product design<br>Waste reduction |

Professionals deal with complexity, and shorten the learning curves for their clients, by dissecting new challenges (where possible) into familiar problems. But this may well involve close relations between KIBS and clients, as we have already noted. Tordoir proposes a "compatibility hypothesis", that firms can only externalise professional work if they have adequate internal professional capabilities to make appropriate choice and use of KIBS and their outputs. (This throws further light onto Figure 6 , with its depiction of a simultaneous development of demand for internal and external professional services.) He also suggests that there are two types of motive involved in the use of KIBS:

- **Economic motives.** These are particularly strong where it is mechanical complexity that is predominant. Here the role of compatibility is clear, according to Tordoir's case studies: users with developed internal professional support structures are much better at reaping benefits from external support. This successful use of KIBS is underpinned by the clients having articulated strategies and policies for dealing with service suppliers, including decisions to "invest" in particular suppliers.

- **Non-economic motives.** Such motives are more mixed, ranging from search for outside views on internal matters, the desire for inputs which legitimate particular factions or points of view, and the need to deal with general or local crises that may well have a strong human relations dimension. External consultants may here function as sparring partners: the supplier-user relationship is liable to be highly interactive, to involve a long gestation time, to require high personal involvement and to be underpinned by trust and similar factors.

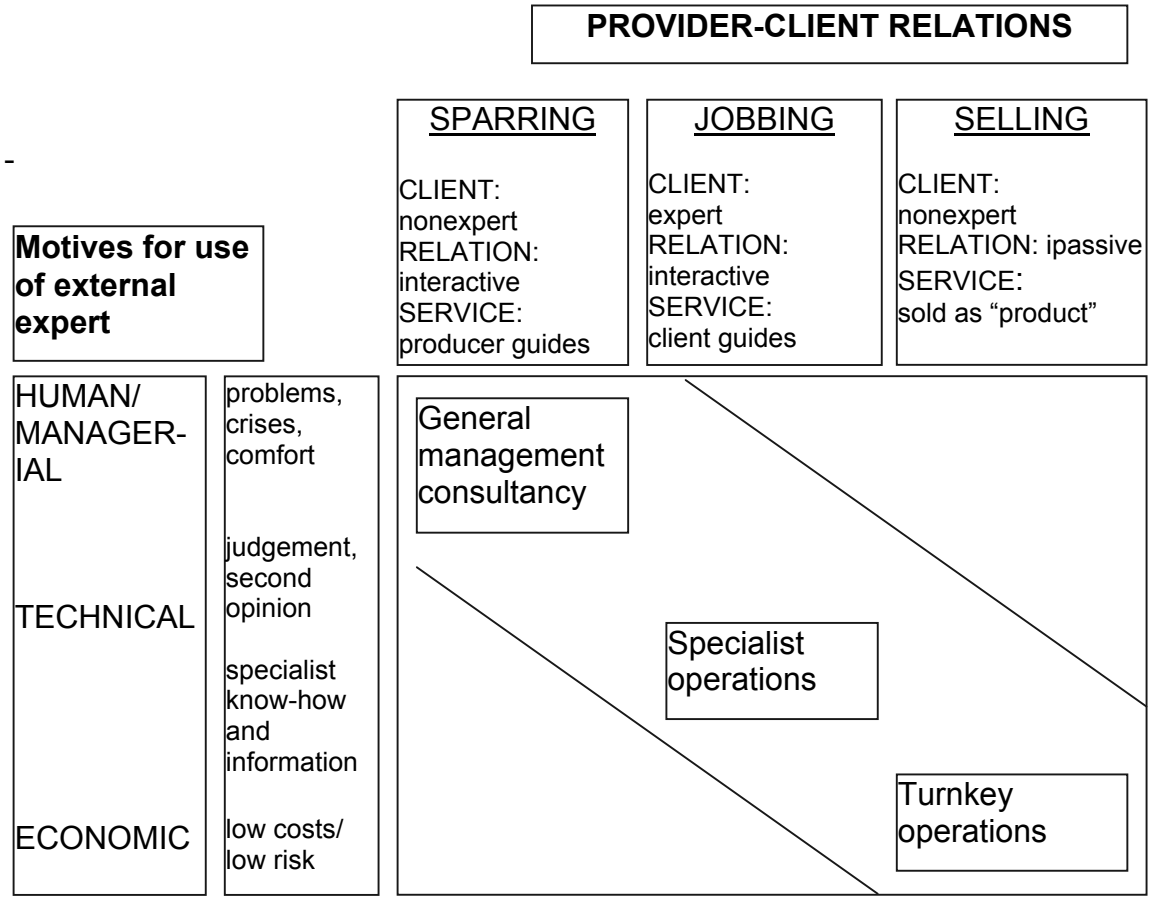
With a focus on consultancy services, Tordoir extends his compatibility hypothesis to suggest that there tends to be a correspondence between motive, service and interaction. When the three do not correspond as indicated in Figure 7 , there is a high risk of failure. The Figure, which we present here for the further light it sheds on service provider-client interaction indicates three modes of supplier-user relation:

- **Sparring Relationships.** These are the most interactive - both specification and production of the service involve co-operation between supplier and user.

- **Jobbing Relationships.** In these cases, the client (usually a compatible professional) provides specifications for the service, while its execution may involve greater or lesser client co-operation.

- **Selling Relationships.** Here, the service provider sells a predefined service, usually for a fixed price.

**Figure 7 Client-Provider relationships in Professional Business Services**




Source: Tordoir, 1993 (Fig s-3 p200)

### 2.5.3 Technological Capabilities

KIBS are important agents in the development of new technologies. This especially applies to the development of applications of these technologies to the specialised requirements of particular businesses or groups of businesses. KIBS assist in the widening of this technical knowledge, as their interaction with clients leads to greater client understanding of the technical choices and solutions they may undertake. This contributes to an amassing of **technological capabilities** in the economy.

## Box 3

## KIBS as "Spin-Offs"

There has been considerable discussion of the role of "spin-offs" as a mode of formation of new technology-based services, with numerous examples being cited of IT service firms that emerged from in-house departments of large companies.[26] A "stages model" has been proposed, which can be summarised in very blunt fashion as follows: such departments initially provide services in-house on a utility basis, then they move into being profit centres, then begin to trade some of their services externally, and finally they spin out of the parent corporation.

In our case studies we encountered two firms that had spun-off from larger corporate bodies. One of these, however, which spun off from a manufacturing firm, was taken over by another large corporation (though this time a service firm) after only a few years as an independent firm. The incidence of spin-offs in our studies is lower than might have been expected, and we are as yet unable to reach firm conclusions as to whether this reflects peculiarities of our sample or more general tendencies in KIBS - and this is echoed by a debate in the literature on the relative importance of spin-off strategies.

While externalisation of functions and spin-offs may be very important in releasing technological capabilities in the market, our case studies indicate that it is competition between KIBS which creates pressures on the firms to continuously try to enlarge their functional domain through continuous innovation

Thus innovations concerning videoconferencing, multi-media, telematics, Geographical Information Systems and environmental services are all the focus of intense activity on the part of new KIBS. These KIBS are promoting their technologies to new categories of users, and in many cases further developing the technologies at the same time. In virtually all of our case studies, innovation was linked to such an effort to enlarge markets, irrespective of whether the firms were independent or subsidiaries of other firms.

## Box 4

## Internalisation and Externalisation of Knowledge-Intensive Functions

The complexity of internalisation, externalisation and outsourcing arrangements is demonstrated in our case study of computer-continuity services. These services provide companies with assurance that they will be able to maintain their computer operations in the face of disaster at their own computer centres, typically by storing considerable quantities of data on back-up machines. This is a highly critical activity for firms in several sectors.

Computer-continuity services can be provided in various ways, however. Specialised capital intensive disaster recovery centres compete against facilities management companies, and against suppliers of specialised disaster recovery hardware and software. All three approaches actually have a high service component, since each requires customised design. Furthermore, the three types of suppliers are often involved in vertical value chains, with facilities management firms often purchasing services from disaster recovery centres, which in turn use systems developed by specialised systems suppliers.

## Box 5

## Innovation in Networks

The activities of Waste Exchange Services Ltd are exemplary as regards stimulation of innovation in networks. WES acts as a (in their own terms) “marriage bureau” for waste generators and potential users of the waste products. WES often develops, or plays a role in developing, the technologies needed for effective marriages.

Another example of the role of services in enabling the diffusion of technologies comes from our case study in teleworking. Teleworking has been heavily promoted by the PTTs (British Telecom in particular, but also Mercury) in the UK, as well as by certain public sector actors; the private sector has also played an important promotional role in the Netherlands. These actors soon realised that training was essential in the promotion of teleworking. As a result, telework agencies in the Netherlands and telecottages in the UK have structured their operations around telework training services.

One reason for the use of business services is to avoid the costs of acquiring and maintaining such up-to-date knowledge in-house. (Box 4). KIBS such as facilities management are specifically designed to relieve clients of the burden of understanding the technology they are employing - the task for clients is then to ensure that they are correctly specifying the services and functionalities they require. For good practice, this will also require close interaction with the service supplier to understand the emerging technical potentials, of course. Experience with facilities management and other types of outsourcing of key technical operations has been a very mixed one in practice, suggesting that the problems of knowledge generation and acquisition in such arrangements can be very challenging ones.[27]

Despite some continuing concerns about "deindustrialisation" and "unproductive activities", there is now fairly broad agreement as to the positive contributions of producer services to economic development and dynamism, though this has proved hard to quantify.[28] These contributions include stimulation of innovation in networks, and the services would seem to play an enabling - but not sufficient - role for the diffusion of technology and technical capabilities. (Box 5)

However, poor quality services may play a negative role. There has been much critique, for example, of "cowboy firms" in computer and environmental services. (Box 6). Substantial sums of money have been wasted as a result of decisions taken on the basis of bad advice. This highlights the need for trust and quality assurance in services. One of the "peculiarities" of services mentioned earlier is the problem that clients have in establishing the likely performance of the supplier.

Again, we should note that not all services - not even all KIBS - face this particular problem. Mathé and Shapiro (1993) consider that both goods and services have a spread along the continuum of ease of demonstration: their distributions overlap, though typical goods are easier to demonstrate, typical services harder. They suggest that the qualities associated with the transaction are liable to vary across the continuum - easily demonstrable products are ones where **search** is important, moderately demonstrable ones involve more use of prior **experience,** while hard-to-demonstrate ones involve more **credence.** In this case, evidence as to the expertise and capability of the service provider is utilised as a selection mechanism on the part of the client. Our case studies are mainly located at this end of the continuum, though those whose products are at least partly embodied in technology (e.g. the multimedia services) are closer to the middle.

This problem is particularly acute when the client is new to the function which the service supplier is to perform, and is thus often poorly-informed as to the problems and pitfalls on the way. Experienced clients will often have built up a relationship with trusted suppliers, and are liable to use other methods of establishing credentials - from word of mouth to quality standards. Many service firms are ascribing to quality management standards - indeed, there is a "Quality in Services" movement (c.f. Gummerson, 1993), but our case studies (which did not involve systematic analysis of

clients) suggest that participation in trade shows, gaining publicity, and the like are more important, at least as a first step in bringing awareness of the service to the client.

## Box 6

## Service Quality Problems

As part of our case study in "waste prevention at source" the managing director of an environmental services firm told us that :

> "The environmental consultancy industry has made a mistake in the past in not using suitably qualified people in order to accommodate the explosive demand. As a result a lot of firms are not performing very well at the moment, and a lot of people are looking for new jobs."

His firm was still performing well but it was considering the adoption of the ISO 9004 quality assurance system.

This experience is echoed in many other quarters. The cover story of the spring 1993 issue of Environment Today featured "cowboy consultants", and interviews we have conducted with environmental managers of a number of large companies suggest that they are often disillusioned by their experiences with firms who offer to carry out environmental audits and to design environmental management schemes. There is a feeling that these services are often not acting in the really knowledgeable way demanded of KIBS - for example, that a rote checklist is being used to identify and list potential environmental problems which masks a lack of real understanding of the issues, or of the firm in question. (In one case, we were told of environmental consultants who did a thorough job of counting the lightbulbs that were in use, but failed to notice the rubbish skip leaking noxious fluids that stood outside the door through which they had passed.) In some cases this had led to a re-internalisation of the activity, but in others this was impossible - for instance, because external auditing was seen as politically necessary. In such cases, the search was on for better consultants.

**3.**

## Chapter 3 Innovation and Services

There is a substantial, but highly scattered literature on services and innovation. This literature is largely concerned with the processes of innovation and diffusion within the service industries, in ways in which the specificity of service innovation as opposed to innovation in other sectors is established. Rather than document each minor contribution to the literature, we shall take a more structured approach. In this chapter we demonstrate that:

- the `specificity' of service innovation is more a matter of quantitative than of qualitative differences;
- there is considerable variety among services (as there is within other sectors too), and apparently among services in different countries, which makes generalisation often suspect;
- there are ongoing technology-related and other developments which are leading to change in services' innovation - and probably also to change in other sectors as well, leading to some convergence of characteristics.

Apart from the much discussed developments related to IT, which will be dealt with further on in this report, two sets of developments seem extremely important for innovation in services.

First are the processes of **globalisation**, **liberalisation** and **internationalisation**. These have been closely related in practice, as deregulation of "protected" national markets, especially in areas such as telecommunications, has been associated with the extension of global service firms. While services have often been thought of as generally hard to trade, it has always been apparent that some services are tradable. Technological and organisational innovation is making more services tradable, and the GATT Uruguay round featured moves to liberalise international services trade rules. Growing competition is thus liable to be confronted by many service firms, as well as new international opportunities. Technological innovation has helped create this situation, and will be part of the response to it.[29]

Second, **Environmentalism** and the challenges of achieving **Sustainable Development** are liable to pose increasingly serious challenges to businesses in coming years. It is often thought that services are relatively unaffected by these issues, but this is far from accurate. Some services have heavy and politically sensitive environmental impacts - e.g. transport services. More generally, many office-based services are implicated in high levels of consumption of energy and paper. There is also a role for a rapidly growing type of KIBS - environmental services suppliers- in helping to deal with these problems.

The full scale of the challenge has yet to be widely appreciated, and even those firms who have undertaken to place the environment on their corporate agenda have typically

not gone very far in integrating this policy issue into their innovation strategies. We expect this to change under the impetus of political and consumer pressure, and the introduction of new management approaches.

## 3.1 Services and R&D

One of the main areas of argument about the specificity of service innovation is R&D. Several points emerge from our review of this theme (see also Box 7):

- Some prominent authors have, wrongly, concluded that services' R&D does not exist. This even includes some researchers into services' innovation, who have suggested that service innovations thus have an ad-hoc or a supplier-driven basis. But the evidence reveals clearly that some services are extensive investors in formal R&D, and to have their own R&D divisions and strategies. Some of the world's largest R&D spenders are service companies - mainly KIBS. For example Microsoft plans for $900 M R&D expenditure in the coming year. The recent statistics for several OECD countries now indicate that services are responsible for substantial amounts - over 20% - of R&D. In the USA, for instance, this is now accepted to be the case by the official statisticians of the National Science Foundation. [30]
- There is also evidence that many service managers do not easily relate to the concept of R&D. Even when their firms are carrying out activities which outsiders might well describe in this way, they prefer to think of it in other terms. This is one reason why services' R&D is often understated. There are grounds for thinking that more subtle approaches to assessing R&D and innovation activities would yield much higher figures.[31]
- Official statistics, have apparently substantially neglected services' R&D, even in this restrictive if standard definition.[32]
- We have noted that recent efforts to assess services' R&D, using standard (Frascati) definitions as applied to manufacturing, demonstrate that services R&D in aggregate is considerable, and certainly deserves to be recorded. Nevertheless, services firms are less likely to engage in R&D than manufacturing firms of comparable size, and to have formal R&D departments. The R&D-intensity of service firms that do admit to such expenditures is usually lower than for comparable manufacturing firms. However, several new technology-based KIBS are extremely research-intensive, and rank alongside the most research-intensive sectors of manufacturing.[33]
- It has often been suggested that software development is an R&D-like activity which should be examined alongside traditional R&D. One Dutch survey did address software activities and found that services on average were less likely to develop their own software than manufacturing.[34] But some services - notably public services, finance and "other commercial services" - were quite different, with more software development than was found for manufacturing average firms. In terms of software-intensity indicators, the average for services is above that for

manufacturing. However, this does not compensate for the low level of R&D-intensity displayed by services as a whole - though again, variety is the rule.

- The increasing technology-intensity of services, the increasing reliance on IT hardware and software to give competitive edge, and the growing role of KIBS, are all likely to mean that services' R&D is liable to become more prominent in coming years. This includes, but goes well beyond, software activity.

## 3.2 Services Innovation

The relatively low level of formal R&D in services tends to lend weight to the view that there are specific attributes of services' innovation processes. It has long been claimed that services are relatively poor at innovation and that this accounts for a relatively slower rate of productivity growth in the sector. As a result, in taxonomies of innovative processes services are often lumped together as "supplier-driven" sectors.[35] Their innovative impulse is seen as being provided by more sophisticated manufacturing firms. The nature of service innovation is reduced to issues of technology transfer and diffusion of new goods.

Several analyses of the specificities of service innovation indicate that such conclusions are quite inadequate. Three important approaches develop rather different directions of analysis where it comes to the characterisation of services as different from other sectors.

### 3.2.1 The Reverse Product Cycle Approach

The "reverse product cycle" model[36] accepts that services have predominantly been supplier-driven, undertaking process innovation in response to opportunities provided by manufacturing industry - but that this is not a permanent state of affairs. The argument goes that with increasing competence in the use of new IT, services are beginning to move from efficiency-driven process innovation to more quality-driven and product innovations. It is in the latter phase that formal R&D-type processes are most likely to be prominent. The model appears to be most readily applicable to such KIBS as financial and professional services, which are seen as being at the vanguard to such IT applications as networking, but it has been suggested that it will in the future apply to many more services.

## Box 7

## Services' R&D

Virtually all the KIBS firms in our case studies performed R&D projects. However, none of them had an R&D department. This lack of R&D departments corresponds with the findings of most earlier studies, which find that with very few exceptions, only the largest service firms organise such departments at present.

Our studies did differ from some previous research in the willingness of quite a large proportion of our interviewees to describe what they were doing as R&D. The point was made, however, that the boundaries of R&D are hard to draw - where does customisation or market research end and R&D begin?

Often the R&D which was undertaken was part of consultancy projects. R&D was strictly tied to specific projects and intended products. But in some cases it was also driven by the firm itself in order to acquire expertise in new areas.

For example, National Remote Sensing Centre Ltd (one of our Geographical Information Systems -GIS - case study firms) have a budget for `private ventures' . Funds are hereby made available for promising R&D projects, performed by existing business divisions, which cannot be funded by consultancy contracts . Consultants in Environmental Sciences Ltd have similarly spent considerable internal development effort in a software package that automates the estimation of diffusion of pollutants in the environment. CSO in the Netherlands, also working with GIS, also developed innovative software. But in their case this was described to us as involving "grey hours' work which was not registered in company accounts.

Problems which have inhibited service innovation from this perspective are identified as the difficulty of maintaining property rights over service innovations (they are often easily copied and hard to protect by patents and similar means), and the frequent dependence of the innovations on infrastructure which is difficult for most firms to establish unilaterally.

### 3.2.2 The Servuction Approach

A somewhat different approach to the specificity of service innovation suggests other reasons for the apparent lagging role of services. All products are seen as featuring some combination of physical goods and immaterial services, but the latter are more important for service industries. These features of the product have particular production processes - or "servuction" in the jargon of some researchers - which has made innovation relatively more difficult.[37] The relationship between service provider and client is the critical factor, and this may be mediated through technology, but requires in addition to technical tools a panoply of tacit operating procedures, understandings and social relations. Innovation is thus liable to be extremely complicated, and to be difficult for the service provider to carry out unilaterally. This is an argument which could well be taken to apply to KIBS, given the high level of supplier-user interaction which they often require. However, this does not mean that KIBS are not innovative. Quite the reverse, it implies that KIBS have to be innovative to convince customers that their investment in the required interaction is well spent.

### 3.2.3 The Self-Service Approach and Organisational Change

Another feature that has been attributed to much services innovation is that it very frequently involves organisational innovation alongside technological innovation "Self-service" developments are examples in point (even though the organisational innovations here frequently demand associated technological innovations - from supermarket trolleys to automated teller machines (ATMs)). Many collective services have experienced high levels of social innovation - consider the numerous control systems (zoning, etc.) that have been imposed upon the transport infrastructure. There is also widespread introduction of "management innovations" ,such as quality systems, into services. Much of the innovation associated with the uptake of new IT involves substantial organisational change, and has generated a lot of discussion in the managerial literature about new types of firm structure.[38]

The ability to systematically address organisational change remains relatively limited. This may pose problems for measuring innovation processes in services (and more generally). The literature on these topics is again a scattered one, with most attention to work organisation and related issues of management structures and skill requirements.

One conclusion that comes from this literature is that the pattern of use of new technology is very much conditioned by the nature of the innovating firm. There is no inevitability in the organisational response to the potentials of new technology. Different structures of implementation are common, across countries, industrial sectors, firms with different histories. Some of this diversity may be a matter of experimentation with use of new systems, and this process may lead to a winnowing down of alternative structures as experience is gained as to effective solutions. But with the current pace of change, and the likelihood that what is "best practice" is determined as much by one's history as by the current conjuncture, diversity is at the very least likely to persist.[39] It is thus important to bear in mind the diversity of organisational outcomes, even while we stress the "convergence" of many aspects of businesses in different sectors.

### 3.2.4 Challenges to Service Innovation

The three approaches outlined above attempt to explain why service innovation is less formalised than manufacturing innovation - and to draw out the lessons for management in services firms that emerge from this. But they all tend to imply that services innovation has tended to lag behind that of manufacturing. Innovation may be a matter of design, of marketing, of customer relations; its locus is hard to pin down and often transitory; the innovative product is often immaterial and client-specific. As usual in the case of services, there are numerous exceptions that spring to mind, but these general characterisations are still a source of insight and a helpful starting point.

However, the analyses also suggest that there is a wide variety of experiences across different services, as indeed there is in manufacturing. There is undoubtedly overlap between the two grand sectors, with some services - notably KIBS - being much closer to the "ideal" innovative and dynamic organisation than are many manufacturing branches. We shall shortly turn to the variety of experiences within services. But accepting that the bulk of services are "peculiar" in terms of innovation, what lies behind this? Many of these "peculiarities" that have widely been used to characterise services as a whole (recall Table 2) are likely to impact upon the innovation process. Later we will indicate which we believe to be the critical determinants of the specificities of services innovation. Here we wish to stress that the "peculiarities" as a whole are also now associated with distinctive efforts at innovation. Examples of this are indicated in Table 4.

A wide variety of innovations is currently being introduced into services, and this is, in part, the result of a widespread desire to overcome the obstacles which have historically confronted services' innovation. The characteristic features of services are thus acting as a spur to innovation, and to the diffusion of new technologies and techniques.

The result may well be that services innovation will come to resemble that of manufacturing to an increasing extent.[40] One way in which this is already apparent is through services intensifying the division of labour type by undertaking a process of "modularisation".[41] In this process, discrete task elements are distinguished, re-

examined, subject to technical change where appropriate, and incorporated in new combinations of service-product bundles, with production being allocated across agents in new ways. This combines features of traditional mass-production manufacturing with elements of the newer strategies for "flexible specialisation" which emphasise economies of scope.

**Quality** is another issue which has sometimes been seen as of little relevance to services. But there is now an extensive managerial literature on quality in services, and the development of quality standards for service businesses is as advanced as that for manufacturing.[42] Little of this literature, however, deals explicitly with the topics of technological and organisational innovation, though innovation is frequently associated with quality programmes. Such programmes almost inevitably require attention to some of the steps involved in modularisation (differentiation and examination of sub-tasks, for example). Often they result in organisational change and/or minor technological change - but the ground is also being laid for more substantial application of technology as the structure of service tasks becomes better-understood, and as complex tasks are decomposed into elements which are usually more amenable to automation.

The quality literature is almost the only body of work which has considered a topic that is dealt with more frequently in the general innovation literature - **design**.[43] Numerous case studies and practical guidance are reported, but there is still little systematic evidence on the organisation of design functions, and the operation of design processes, in services. There is one major exception to this: the software industry.

Efforts to introduce software engineering and formal methods have been motivated both by productivity requirements (the "software crisis"), and by the immense problems for software maintenance that are associated with systems produced by traditional craft-like methods. Massive gains in the productivity and quality of the software production process (assessing product quality is another matter) have been reported, but for a variety of institutional reasons the formal methods that have been heavily promoted have been slow to diffuse. Innovations from within the software profession are now seen as likely to diffuse fairly rapidly, possibly resulting in a minor revolution in performance.[44]

## Table 4 Innovations and the Features of Services

| FEATURES OF SERVICE | INNOVATIONS USED TO TACKLE PROBLEMS |
|---|---|
| **SERVICE PRODUCTION** | |
| **Technology and Plant**<br>Heavy investment in buildings. | Reduce costs of buildings by use of **teleservices, toll-free phone numbers,** etc. |
| **Labour**<br>Some services highly professional (esp. requiring interpersonal skills); others relatively unskilled, often involving casual or part-time labour. | Reduce reliance on expensive and scarce skills by use of **expert systems** and related innovations; relocation of key operations to areas of low labour costs (using **telecommunications** to maintain co-ordination). |
| **Organisation of Labour Process**<br>Workforce often engaged in craft-like production with limited management control of details of work. | Use IT to monitor workforce (e.g. tachometers and mobile communications for transport staff; aim for 'flatter' organisational structures, with data from field and front-office workers directly entering databases and thence Management Information Systems. |
| **Features of Production**<br>Production is often non-continuous and economies of scale are limited. | Standardise production (e.g. 'fast-food' chains), reorganise in more assembly-line -like feature with more standard components and higher division of labour. |
| **Organisation of Industry**<br>Some services state-run public services; others often small-scale with high preponderance of family firms and self-employed. | Externalisation and privatisation of public services; combination of small firms using **network** technologies; IT-based **service management systems**. |
| **SERVICE PRODUCT** | |
| **Nature of Product**<br>Immaterial, often information-intensive.<br>Hard to store or transport.<br>Process and product hard to distinguish. | Add material components (e.g. client cards, membership cards). Use telematics for ordering, reservation, and if possible - delivery. Maintain elements of familiar 'user-interfaces'. |
| **Features of Product**<br>Often customised to consumer requirements. | Use of **Electronic Data Interchange** for remote input of client details. In general use of software by client or service provider to record client requirements and match to service product. |

(continued)

## Table 4 Innovations and the Features of Services (continued)

| FEATURES OF SERVICE | INNOVATIONS USED TO TACKLE PROBLEMS |
|---|---|
| **SERVICE CONSUMPTION** | |
| **Delivery of Product**<br>Production and consumption coterminous in time and space; often client or supplier has to move to meet the other party. | **Telematics**; **Automated Teller Machines** and equivalent information services. |
| **Role of Consumer**<br>Services are 'consumer-intensive', requiring inputs from consumer into design/production process. | Consumer use of standardised 'menus and new modes of delivering orders (EDI, fax, etc.). |
| **Organisation of Consumption**<br>Often hard to separate production from consumption. Self-service in formal and informal economies commonplace. | Increased use of self-service, utilising existing consumer (or intermediate producer) technology - e.g. telephones, PCs - and user-friendly software interfaces. |
| **SERVICE MARKETS** | |
| **Organisation of Markets**<br>Some services delivered via public sector bureaucratic provision. Some costs are invisibly bundled with goods (e.g. retail sector). | Introduction of 'quasi-markets' and/or privatisation of services. New modes of charging ('pay per' society), new reservation systems; more volatility in pricing using features of **EPOS** and related systems. |
| **Regulation**<br>Professional regulation common in some services. | Use of **databases** by regulatory institutions and service providers to supply and examine performance indicators and diagnostic evidence. |
| **Marketing**<br>Difficult to demonstrate products in advance. | Guarantees; demonstration packages (e.g. 'demo' software, shareware, trial periods of use). |

## Box 8

## Strategies for Maintaining Advantage

Service firms often try to protect their innovations from imitation by attempting to lock-in their customers, by making them dependent upon the particular form of service that is being supplied. For example, one supplier of specialised financial information services whom we encountered in earlier studies supplied a package including a particular terminal and interface, rather than supplying the service via a standardised format. Users of software will be familiar with the ways in which suppliers seek to maintain customers by encouraging them to invest time in learning the specific interfaces and commands employed in their applications. Our case studies suggest that lock-in strategies are quite common. But it is even more common for service firms to seek to gain continuing custom from users by demonstrating that they can supply a quality service that is responsive to the clients' needs.

Another competitive strategy encountered in some of our case studies involves the service firm seeking to embody innovations into software that is protected by copyright. This strategy may involve selling on the software to the client, so that a greater element of "self-service" is involved.

However, at least among our sample of case studies (who were selected since they were believed to be innovative), it seems that continuous innovation is the dominant strategy for sustaining competitive advantages. In addition to demonstrating technical prowess with a stream of new service offerings - which can indeed lead to bewilderment and uncertainty on the part of clients - other means of demonstrating this prowess may be adopted. For example, in one case (CES) dissemination of important competitive technological knowledge was seen by the firm as a way of increasing its credibility with actual and potential customers. This firm, together with some others we examined, accordingly seeks to acquire relevant new knowledge by almost any possible way.

## 3.3 Diversity in Services Innovation

There have recently emerged a number of attempts to understand the variety of services experiences, rather than to focus on identifying features common to all services.

### 3.3.1 Beyond Supplier Domination

Soete and Miozzo have sought to elaborate on taxonomies of innovative performance, moving on from the classification of all services as **supplier-dominated sectors.**[45] Some services are treated in this way, but others are believed to be very different.

Among these other groups of services are:

- First, **production-intensive scale-intensive sectors**. These involve large scale processes such as major back-office administrative tasks, or the operation of physical networks (e.g. transport, wholesale trade and distribution). These services in particular are suited to the application of IT, initially, at least, with the aim of reducing costs.

- Another group, **network sectors**, comprises services which depend on elaborate information networks - such as banks, insurance, broadcasting and telecommunications. Both of these two groups utilise technological innovations whose origin may well lie in industrial sectors, but their applications are much more determined by the users than in supplier-driven sectors. User-producer relations are very important, and in some cases the services are highly involved in defining and specifying innovations.

- Finally, and this is where we find many KIBS, there are **specialised technology suppliers and science-based sectors**, such as suppliers of software and specialised business services. An increasing number of business services closely linked to R&D, software and the use and application of IT have emerged over the last two decades. In these case, the main source of technology is the Research and Development, and Software, activity of firms in the sector itself.

Missing from this approach is the group of Knowledge-Based Services whom we have earlier discussed under the rubric of traditional professional services. These use, promote the development of, and supply specialised knowledge. While this may be called “technical” knowledge, it is typically not knowledge about technologies or their applications, but about complex social systems, etc. But some of the professional services may be seen as being to some extent **science-based** in the sense that they make extensive use of knowledge developments within scientific (often social scientific)

communities associated with such areas as law, economics, accountancy, architecture and medicine.

Many of these traditional professional services (or non-technology KIBS) are intensive users of new technologies - some for information storage and retrieval of more or less complex kinds (e.g. legal services), some for augmenting their processes in more substantial ways (e.g. computer-aided design in architectural services). New delivery systems (e.g. CD-ROM publishing and instructional tools) are being utilised by some specialised training services. As these examples suggest, these KIBS span a spectrum ranging from "supplier-dominated" features at one end to "science-based" features at the other. Systematic statistical surveys of business services are required to confirm and chart out these impressions in more detail.

Another way in which this approach should be qualified concerns its application of the characterisation "supplier-dominated" to many services. These include most public or collective services - education, health care, administration - and personal services - food & drink, repair businesses, hairdressers, etc. - together with retail trade. We would caution that while this characterisation may well apply in aggregate as a description of these sectors, it should not be taken to apply to all firms or organisations. It is our view that most of these service branches do feature substantial numbers of more or less highly innovative firms and public sector organisations; and that even within the lagging bodies there is quite often one or more outpost of innovative activity.

### 3.3.2 Service Processes

The taxonomy just presented draws heavily on classifications originally developed to portray innovation processes in manufacturing industry. A complementary approach helps explain the location of services branches in this taxonomy, and also in the "reverse product cycle". This simply examines the nature of the service product and production process, distinguishing between those services mainly concerned with **physical transformations**, and those with changing the state of **human beings** or **information products and relationships** (this latter groups includes property relationships, and treats money as a form of information). The three categories have already been introduced as Figure 3.

As Figure 8 goes on to demonstrate, the three groups have experienced very different histories as successive technological revolutions or techno-economic paradigms have emerged. Physical services have been challenged by, and themselves transformed through, the use of motor power; information services have been reshaped by the use of successive generations of electronics and now IT; and human services have been influenced by a variety of innovations (e.g. pharmaceuticals, classroom IT). All sectors have experienced "back-office" IT innovation, but the nature and scale of their back offices varies and this too affects the pace of innovation.[46]

Figure 9 suggests emerging trends associated with IT use. In line with several other analyses, we anticipate substantial application of new IT - especially cheap and portable PCs, telematics, and mobile communications - across services. Just as earlier generations of IT have been particularly applicable to certain services - especially the more “information-” and “knowledge-intensive” services, so new IT promises to be applicable to a wide range of service activities. This includes reaching out to non-professionals, and to the clients of the service firms. One consequence is liable to be considerable experimentation with new modes of service delivery (and supplier-client interaction during service production and after-sales support). Another consequence is the likely emergence of many more services as clients for technology-based KIBS, as these services become more technology-intensive. Continuing technological change - associated with IT in particular - is likely to mean that many services will continue to adopt innovation characteristics similar to those of dynamic manufacturing firms, in other ways too.

## Figure 8 Services Innovation during earlier Technological Revolutions, along Two Dimensions

| Market Type | *Production Type* | | |
|---|---|---|---|
| | **PHYSICAL SERVICE** | **PERSON-CENTRED** | **INFORMATION SERVICE** |
| **STATE** | | *Social innovations associated with welfare state dominant. Health and medical services heavily affected by specialised innovations in surgery, pharmaceuticals, etc.* | *Large scale data processing requirements of government led to much pioneering use of back-office computers.* |
| **CONSUMER** | *Services challenged by the introduction of goods utilising cheap motor power. In domestic service and transport this has led to client self-service using washing machines, automobiles, etc. (Associated with specialised distribution, repair, garage services, etc.)* | *Little innovation, except in cosmetic and pharmaceutical products.* | *Use of innovations in consumer electronics to support many new broadcast and recorded services, with some substitution of traditional entertainment and information services.* |
| **MIXED** | *Customer self-service has also been used to reduce labour requirements in laundries, hotels, and wholesale and retail trade.* | | *Large scale data processing requirements of "network services" led to much pioneering use of back-office computers.*<br>*and other*<br><br>*Telecommunications major source of innovation, but mainly for processes (e.g. exchanges).* |
| **PRODUCER** | *Specialised wholesale trade and physical distribution & storage firms have used new technologies to provide advanced services.* | | *Limited innovation in professional services and KIBS, except that related to specialised knowledge bases.* |

## Figure 9 Services Innovation in the IT Revolution, along Two Dimensions

| Market Type | *Production Type* | | |
|---|---|---|---|
| | **PHYSICAL SERVICE** | **PERSON-CENTRED** | **INFORMATION SERVICE** |
| **STATE** | | *Use of, for example, "smart cards" and telematics services as ways of simultaneously providing client-specific services and allowing for new modes of delivery (open learning, telemedicine, etc.)* | *Experiments with "teledemocracy" and networked public administration.* |
| **CONSUMER** | *Application of IT within exiting consumer goods for control and communication purposes. Home automation systems (especially for energy management, security, etc.).* | *Little innovation, except in cosmetic and pharmaceutical products.* | *New consumer electronics and telecommunications.* |
| **MIXED** | *Much use of IT for enhancing self-service on-premises innovation, for supplying ancillary services (communication, entertainment, etc.) Use of bar codes and similar tracking and transaction-monitoring systems.* | | *Many new product and delivery innovations (e.g. ATMs and self-service banks).*<br><br>*Telecommunications source of product innovations, such as mobile and data communications.* |
| **PRODUCER** | *Introduction of partial or thoroughgoing automation (e.g. warehouses); major use of IT planning systems for logistics, route scheduling, locating and tracking goods, etc.* | | *Major process, product and delivery innovation in professional services and KIBS, associated with use of PCs and networks.* |

3.4

Social Determinants of Services Innovation

The various accounts outlined above indicate something of the specificity of services innovation, as well as pointing to the diversity that exists among different services. Let us return to the question of what accounts for the "peculiarities" of services innovation - and whether these will continue to be important factors.

Our literature review indicates that there is little systematic evidence to determine how far various factors have influenced services innovation as compared to manufacturing, nor whether these factors are evolving over time. Authors seem to pull out particular factors for attention on a very ad hoc basis. Ideally, we could envisage comparative case studies and surveys which would address the role of the "peculiarities" outlined in Table 2.

But our reading of the literature and case study research does suggest that a prominent role is played by relatively few of these factors. A tentative identification of the key factors includes the following:

- **User-Supplier interaction or Client-intensity.** This is a major feature of innovation in many services, and applies strongly to most KIBS. This makes the locus of innovation fairly hard to specify (as well as further undermining the much criticised linear model of innovation). It means that many innovations are liable to be seen as the "customisation" of products for specific clients, which is usually defined as not falling within R&D activity, for example. (In practice it can require considerable attention to detail to establish how far the development of, say, a CD-ROM training system is involving substantial technical innovation on the part of the supplier - or even substantial innovation in the more aesthetic elements of design. The uptake of such products, of course, can be a major innovation for the clients.)

- Specific properties of services, such as **intangibility and co-production**, mean that they are hard to protect through established means of Intellectual Property Rights (IPRs). Even when we are dealing with a piece of dataware, like CD-ROM, there is considerable scope for imitators to appropriate ideas about the format, organisation and presentation of information. This can advantage large suppliers with access to libraries of images and other content material, as against the smaller suppliers who may champion innovative ideas as to the structuring and use of such material. In some services, problems are reported associated with uncertainties in the IPR regime - this is most acute in software, where continuing litigation about interfaces (the "look and feel" issue) is having major impacts on the course of innovation. The evidence is far from systematic, but it appears that deepening ties with users - in some, but far from all, cases the less euphemistic phrase "customer lock-in" may be appropriate - is the resulting strategy for service suppliers. This in principle should be expected to reduce competition and thus limit innovation, though deeper and longer-term knowledge exchanges may offset this to some extent.

- **Information Technology** is particularly important for many services innovations. This means that the rapid pace of change in IT, and associated skill shortages, may inhibit innovation - especially in less lucrative markets. Continuing uncertainty about IT infrastructure and standards may also deter the introduction of new services. Proprietary standards, and conflicts as to who should bear infrastructural costs, have certainly posed problems for the introduction of some services. It is well-known, for example, that the introduction of various types of payment cards (including most recently "smart cards" have been delayed by arguments about standards and disagreements as to whether costs should be borne by retailers or banks. Proliferating EDI standards have delayed rapid uptake of these services, to take another example.

- **Scale problems.** Many service firms are small or medium-sized enterprises (SMEs) and/or family firms. They frequently suffer the usual problems of SMEs, such as poor access to information and capital resources, vulnerability to changes in market conditions, limited opportunities to develop or acquire new skills, and so on. While many innovative services are SMEs, and some of these have shown outstanding rates of growth, many more are under-performing (or succeeding only as a result of heroic self-exploitation). This is bound to restrict their levels of uptake and development of innovations, as well as their capacity to transfer innovations across the economy more generally.

- **Social and Historical Factors.** Perhaps as a consequence of late entry into formal innovation processes, and perhaps as a result of other (sometimes historical?) specificities of services innovation, services are frequently poorly integrated into innovation networks, and they are slow to take on board the importance of knowledge management strategies. The evidence is scattered, but there are some suggestions that innovation policies are beginning to address services more fully, and that the role of services in networks is beginning to increase.

- **Regulation.** Many services have been affected by changes in regulatory regime (see Box 9). Traditionally, many areas of service activity were effectively protected from international competition by virtue of regulations based on notions of national strategic interests and/or natural monopolies (e.g. finance, telecommunications), or concerns about the need to govern quality (e.g. health services, some professional services). The "deregulatory" impulses of the 1980s, the Uruguay GATT round, and European integration have reduced these barriers, making for intensified competition and for erosion of boundaries between sectors in some cases. At the same time, regulations concerning environmental issues in particular (but also other areas - health and safety, standardisation, etc. - have made the regulatory environment more complex for firms, and promoted a demand for inputs of knowledge from specialist services.

## Box 9

## Innovation and Regulation

The issue of different regulatory regimes was often raised in our case studies. However, we must treat the arguments of our interviewees with some caution, since there may sometimes be an element of special pleading involved here.

For instance, video-conferencing developments, we were informed, take place largely in the USA mainly because of its liberal regulatory regime. There may be much truth in this, but we should not forget that the US is in the lead in many areas of IT use which are not so heavily regulated as telecommunications - and certainly desktop video-conferencing is facilitated by the existence of high levels of competence with PCs and Local Area Networks. (There is also the argument that telecommunications liberalisation reflects the strength of telematics, as opposed to traditional telecommunications, interests in the national economy.)[47]

Developments in computer continuity related technologies take also place largely in the US. The case here is that this does not reflect only differences in the level of R&D spending in the particular technologies but also related differences in patterns of complementary investment, e.g. optic fibre networks, which are directly affected by regulatory regimes.

Differences in environmental regulations do certainly make a difference to the growth of environmental services. These services are largely propelled along by the need to comply with regulations - whereas regulations are held up as inhibiting service developments in the telematics area. Thus CSO in the Netherlands has been developing pioneering GIS applications through projects stimulated by environmental regulations. As an example of the complex role of environmental regulations, consider Waste Exchange Services. This firm set up its business by importing an American idea and making it work despite UK regulations rather than assisted by it.

We shall now turn to the question of innovation in KIBS, where these factors will also emerge as relevant ones.

**4.**

# Chapter 4 Innovation in KIBS

## 4.1 Introduction

**Although there is considerable diversity among services, some unusual features are common to a good deal of services innovation - even in the areas** that are most prominent in formal and recognised R&D, such as KIBS. Many of the factors discussed above as promoting these unusual features do apply quite forcefully to many KIBS - issues of user-supplier relations, intangibility and client-specificity of products, IPRs and the problems of SMEs are unavoidable when undertaking a systematic discussion of KIBS. Thus, the broader research literature dealing with producer services, and even with services as a whole, offers much that is of relevance to the appraisal of innovation in KIBS. This is a point to bear in mind when taking further steps - it may often make most sense to institute innovation surveys, for example, spanning a broad range of services, and to formulate policies with similar wide scope.

There can be no doubt that KIBS, as well as being subject to much innovation in their own right, do play a particularly important role in wider innovation processes. For example, it was not until the advent of the desktop PC, with user-friendly software, that the new technologies began to find major implementation in traditional professional services. And these technologies, with their vastly expanded base of end users, provided the markets which underpin much of the expansion of new (information) technology-based KIBS.

Thus it is of value to consider their particular features, and the policy issues raised in this area. Even so, we will need to bear in mind the diversity among Knowledge-based service activities, in addition to those features that are common (in two of the three main senses of the word - they are commonly encountered, and/or they are shared in common).[48] The earlier distinction between traditional professional services and new technology-based KIBS is one important distinction here (we focus on the latter). Other distinctions others are implied by the examples we gave under each heading. Further important parameters distinguishing firms include firm size, the markets serviced, the services' technological and applications specialisms and knowledge bases, the intensity of user-supplier interactions, etc.

However, available research does not provide a very balanced picture of KIBS. Much of the literature on service innovation is concerned with IT-based services, and our review inevitably reflects this bias. Our own case study research involves many KIBS with IT foci, and the environmental services we consider also have a high IT component in their innovations.

It must be said, however, that IT-based KIBS do cover a broad range of activities in their own right. The explosion of new IT services (and professions) is one of the big headaches for those attempting to develop statistical systems appropriate to business services. There are specialised IT **training and consultancy** services; second-, third- and now fourth-party party **equipment (repair) services**; **facilities management and outsourcing** of computer and telematics services; **software** production and maintenance of various kinds; **dataware** services with CD-ROM and now multimedia adding to established on-line database services[49]. Some IT services are highly standardised and supply products as packaged commodities, others are highly customised to clients and involve much interaction. Thus something of the diversity of services and KIBS as a whole is captured here, though the rapid pace of technological change which pervades IT, and has done for decades, is almost certainly unique.

## 4.2 R&D and KIBS

We have already noted that our case study firms do not organise their research within conventional R&D departments. Our case studies throw some light on the organisation and content of R&D, as we have already demonstrated in Box 7. The main issues which we would highlight are:

### 4.2.1 The "Wider" Scope of R&D in KIBS.

Some of the firms involved conduct "technical" research - e.g. research into environmental technology and automation in the laboratory informatics case; development of hardware, software and data services in GIS services; development of materials recovery and recycling processes; and calculating technical options and removing technical obstacles in fleet management. But most cases display wider - or fuzzier - versions of R&D. This may include market exploration and market research - for example teleworking services were conducting research aiming at identifying firms willing to hire teleworkers, while computer continuity services were exploring new markets which could employ their existing technical capacities.

### 4.2.2 The Project-Based Nature of Most R&D

Typically, R&D activities in the case studies were conducted within the framework of ongoing projects. In particular, where there were "knowledge based" innovations (e.g. Eco-design, waste management), further knowledge development emerges as an immediate spin-off from ongoing projects: this is their "R&D". In some cases R&D tends to be hardly separable from the actual work aiming for the development of a particular service. In the case of multimedia applied to pharmaceutical marketing, the development activities primarily focus on conceptualising the structure of the multimedia product to be produced. In the videoconferencing case, development concentrates on

further elaboration of services based on videoconferencing, during the course of implementation of services.

### 4.2.3 The Importance of Clients' Roles in R&D

One consequence of this is that R&D in KIBS tends to be client-led to a considerable extent . The exceptions involve non-project-bound knowledge development, is oriented towards selected, rather specific strategic areas. We found informal R&D taking place in "grey" hours, however, in KIBS involving high elements of consultancy, where the (financial) room for non-client-led and/or non-project-bound R&D seems to be limited. In general, there is a complex relationship between client inputs and the R&D activities of KIBS. There is liable to be much more input from clients as to the form of the final product and the way in which it is delivered, than there is about how the KIBS are producing it or how the service "works" (in terms of the fundamental principles underlying it - e.g. the algorithms incorporated into software). However, technically sophisticated clients may have demands concerning software and hardware platforms for services.

### 4.2.4 R&D Networks

In most of the case studies, R&D was found to be performed primarily or exclusively in-house by the KIBS firms. In the PDI (Product Data Interchange) case, however, R&D was outsourced to industry and research organisations for the branches concerned. In one of the multimedia case studies, expertise on development of CD-ROMs was acquired from outside the publishing company providing the new information service. However, exclusively in-firm R&D was not the dominant form of organisation, though it was displayed, in our case study sample, particularly among environmental services. While this might simply reflect the sample that we chose, it might also derive from the important role of consultancy functions in these KIBS, the size of the firms involved (in particular the availability of existing R&D facilities within the firms or their mother companies). External support for R&D was prominent alongside in-house R&D in most of our cases. This mainly involved software and hardware companies, with other cases including technical engineering and multi-media consultancy. Typically, such external support is also involved in a highly interactive user-supplier role, sometimes moving towards co-development and partnership with the innovating KIBS firm.

## 4.3 Features of KIBS Innovation

Our case studies suggest that KIBS innovations have several typical features which distinguish them from "traditional" innovation processes (see the Annex for further documentation):

- **Lead times** seem typically to be long ones - normally more than 6 months and in most cases more than a year of development is involved before getting introduced and applied in their final form for the first time. However, in some cases, after having learned the trick, it is possible to speed up the innovation process quite considerably, especially in those cases in which the production of a tangible product is included, e.g. CD-ROM's or GIS-applications.

- Both **supply and demand factors** are important in innovation processes. In practice it was difficult to label the innovations in our sample as being predominant either demand or supply-driven. Even in those cases where one or other characterisation seemed to fit, strong interaction between supply and demand factors was apparent - reflecting in part the next item on our list.

- **Co-development and interaction with clients** are extremely important in developing new services in most of our cases. Clients are especially likely to be closely involved in the process of service innovation when they are themselves advanced in their field and able to team up with the service provider. (Recall Tordoir's compatibility hypothesis.) Services like computer continuity, multimedia in corporate training, GIS-related environmental consultancy, and so on require substantial customer-specific information and customisation of the service. Thus often the services are actually developed and provided within the working processes of the client: for example, GIS-related environmental consultancy, Eco-design and waste reduction services were sometimes actually provided on the customers' premises - with impacts the way in which other activities of the customer are organised. A further point to note is that additional actors may also be involved in the process of service innovation - ranging from software houses and multimedia studios, through intermediary organisations, to other companies in the production chain. Strategic alliances can be one part of a strategy to enhance the appropriability of innovations (see below) by deterring newcomers.

- **Process innovations**, related to new organisational structures and interaction patterns, are particularly important in the KIBS we examined. There are definitional problems here, of course - a service may be sold as a new product, even if it is no more than an externalisation of an existing process from a client. But we found our innovation cases to nearly always involve process innovation, in about half of the cases are combined with product innovations. Most process innovations were a matter of organising existing activities in a new way, with new service delivery systems. Examples are fleet management systems, computer continuity services, multimedia in legal practice, laboratory informatics and management systems

services and environmental feasibility systems. (We shall later consider whether delivery innovations firm a group in their own right.) Only three out of fifteen cases could readily be labelled as radical process innovations (PDI in architecture, teleworking services, videoconferencing) leading to totally new service processes. The combination of process and product innovation often involved a complete package of services e.g., a database, a multimedia CD-ROM, or a specific computer application, specific (Eco-)designs, on-line services and consultancy advice.

- Much service innovation requires substantial **organisational change;** new work patterns and routines were often associated with the KIBS innovations. Such changes cannot as a rule be realised rapidly: the introduction of PDI systems in architecture was a protracted affair, the implementation of multimedia similarly required much adaptation. This is undoubtedly a factor in the long lead times of many of our innovations. However, estimation of service innovation lead times is rendered difficult by the fact that what is often taking place is the gradual development of the service package in a more or less continuous process of innovation, over a long series of interactions. This seems to apply particularly where incremental innovation processes are involved, for instance in the cases of computer continuity case, the laboratory informatics and management systems and waste reduction services. Case studies drew attention to the importance - and sometimes the neglect - of training and availability of suitable skills (especially very basic IT skills). Another organisational factor echoes results from many earlier innovation studies - the need for management support (product champions), and the benefits of employee commitment to the innovation (e.g. in fleet management systems).

- **Appropriability and intellectual property** problems were experienced very unevenly across our cases. With the exception of PDI in architecture, and waste reduction services, all of our cases involved at least one way of securing the service innovation and hinder imitation. Frequently, services were at least partly embodied in tangible goods, preventing easy imitation and increasing the opportunity to appropriate the value of innovation. Examples include proprietary software, CD-ROMs, and designs. Another strategy is to embed the service within a delivery system - for example a telecommunications infrastructure for on-line exchange of data (as in the soil analysis case study, and the telework case). The more process-oriented and organisational types of innovations are both more difficulty to protect by patents, copyright etc. and by nature more difficult to copy. High barriers to entry were experienced where there were substantial investments required in infrastructure or equipment (e.g. computer continuity): this prevented competitors readily imitating the service. In several of the cases the trend was observed that when an innovative service emerged which involved a software application (examples here include laboratory informatics and management systems services, GIS-related environmental consultancy services, and multimedia in corporate training services) -- there was discussion of whether this service should be further standardised and distributed and maintained by specialised software houses.

- In some cases **standardisation** is needed for a service innovation to develop. In our case studies the role of standardisation in allowing networks to develop was clearly

apparent in the development of PDI and videoconferencing systems. Likewise, the development of multimedia applications which can readily run on widely-available basic equipment is facilitated by the availability of standards (CD-ROM and CD-i). We shall discuss the problematic situation of standards in more detail in the next section; for now, we note that it was the most frequently noted in our case studies of a number of "technical" factors in the success of KIBS. Other such factors include user-friendly interfaces, security and reliability in IT-based systems. Privacy is particularly critical in computer-continuity services.

## 4.4 The Knowledge Base of KIBS

KIBS represent more or less unique combinations of knowledge about:

- particular domains (in our case studies we have focused on the domains of telematics, multimedia and environmental technologies);

- particular applications of technical knowledge (which will often have been accumulated in the first instance from their own earlier experience of being technology-intensive services); and

- clients (this knowledge may be in part supplied by market research, but will normally have to be established through supplier-user interaction).

The prime knowledge base is driven from the core business of the KIBS firms involved; as a rule this is sector- or even firm-specific knowledge. (For instance, in our case studies,. transport planning & logistics expertise are central in fleet management services; building process know-how is critical to PDI in architecture, , etc.) Additionally, some firms have developed their own software or hardware expertise, equipment and telematics know-how (including, for instance, knowledge of value added network services development). As some of our case studies also demonstrated, this "additional knowledge" base can alternatively be obtained through outsourcing(rarely), co-development or even partnerships with other firms (often other services), and (frequently) in close collaboration with clients.

The weaker the appropriability regime[50] in which KIBS work, the more important each firm's unique nature becomes. Uniqueness can be sought by acquiring any of the three types of knowledge which they combine. But we would anticipate that, the weaker the appropriability regime, the more likely it is that KIBS will seek competitive advantages in client-specific knowledge.

The competitive importance of client-specific knowledge also increases with the levels of uncertainty surrounding technologies, their performance, and the ways they interface with one another and with the organisations that use them. As a result, KIBS *can be* supported

by the absence of standards. Since this may be a somewhat controversial point, let us briefly elaborate. Lack of standards may facilitate lock-in, of course - where standards are well-established, a service firm will have to have a very strong selling case in order to persuade clients to accept non-standard systems, which will typically involve them in learning and other investments. But it goes further than this. The establishment of standards can have a negative influence on the value of one of KIBS main competitive assets: their ability to get `inside the skin of their clients', to acquire client-specific knowledge, and to transform this Knowledge-Into functionality in the services they provide for their clients. Standards can make it easier for competitors to acquire this knowledge - and, indeed, for there to be moves towards greater reliance on commodity-type products in the service (or self-service) production.

On the other hand, the uncertainty as to the directions of future development, implied by the absence of standards, poses barriers to economies of scale, and affect the levels of investment in the particular domains which may involve KIBS. As implied above, it may effectively limit the competition in the field, by lock-in or by rendering knowledge of clients less readily appropriable. This may also be expected to limit innovation. Finally, such uncertainty has important implications as to the role of KIBS in technological trajectories, their strategies towards standardisation and their involvement in standardisation processes. For example, we find cases of firms who have to invest in several alternative technologies so as to keep their options open as to which standards users will demand when markets mature. (An instance is dataware production, where CD-i, CD-ROM and other formats may need to be supported.)

High levels of competition are one of the main factors driving along services' innovation in our case studies. (In part this may have represented the difficult time that many firms were having at a time of economic recession, as well as the proliferation of local and overseas competitors.) Innovation was treated as a way of developing new products and opening new markets. The service innovation process ranges from the evolutionary development of a new service product out of an existing product, to radical new service products. (An example of the latter is the development of completely new service products using applications of videoconferencing systems. ) More evolutionary patterns of service innovation were more frequent, in our - limited - sample of case studies. Where it came to expectations for the future, computer continuity services are expected to develop more tailored services development to the needs of specific market segments, e.g. banking and insurance companies; suppliers of legal data on CD-ROM expect to improve the service quality by making existing information easier accessible and more up-to-date through on-line provision (such service quality improvement might eventually result in a completely new product); and a process of professionalisation of waste companies could lead to a development into broader environmental service providers, offering various packages of services.

The introduction of new service products and the opening of new markets may contribute to the further development of existing economic sectors, or even to the emergence of completely new sectors. For instance, the development of an advanced sector of small companies specialised in developing multimedia training packages,

courseware and related services, may contribute to the consolidation and further development of a multimedia service industry as a whole. Further growth of environmental services is anticipated in such areas as value added, customised environmental data services, and in further penetration of such GIS-based services into (soil) clean-up projects where large volumes of data on soil samples are to be processed; and in waste minimisation and recycling consultancies and related value added, customised services. [Completely new economic sectors might eventually result from the emergence of new specialised firms for re-using and recycling sustainable products [as in our Eco-design case]; likewise, the software houses' contributions to the environmental services industry might lead to emergence of an environmental software industry. Office services that are currently carried out in-house in companies may be spun-off through telework services.

## 4.5 Product, Process and Delivery Innovation

It is a commonplace in accounts of the services that it is hard to distinguish product and process. Likewise, it can be hard to distinguish **product and process innovation** - one frequently necessitates the other. Furthermore, the **delivery** of the service to the client can also be a site of innovation. A particular innovation may well contain elements of all three classes of innovation, making it hard to disentangle the primacy of the different elements. Nevertheless, the tripartite distinction makes a good starting point for our discussion. (See Box 10.) We shall consider first process, then delivery and finally product innovation.

## Box 10

## Product, Process, and Delivery Innovation

The distinction between these modes of innovation can be illustrated with the case of technology-based training systems.[51]

**Product innovation** might be the introduction of interactive multimedia packages for teaching skills in the repair of a certain class of equipment. (This could involve innovations ranging from those involved in new dataware, such as product manuals and instructions on disassembly, to those involved in new interfaces and systems for self-assessment on the part of the trainee.)

**Delivery innovation** might concern the medium on which the electronic "publication" is supplied - videodisk or CD-ROM or an on-line service, for example. We would regard the move from face-to-face tutorial to electronic delivery means as a product-plus-delivery innovation. Typically the move to more sophisticated or more powerful media allows for - and even demands - product innovation: for instance, clients are unlikely to be impressed by a CD-ROM that only contains the volume of information and the functionalities of a floppy disc system.

**Process innovation** might involve the use of new knowledge elicitation systems, of new authoring software, or of in-house CD-ROM production on the relatively inexpensive publishing systems that have become available in the last few years. The move from face-to-face to electronic media almost necessarily involves such process innovation alongside the product and delivery innovation mentioned above. However, once this move is in place, it is possible to see cases of process innovation, for example as new upgrades of authorware become available.

**4.5.1**

## Process Innovation

Process innovation utilising new IT is effectively universal in KIBS, and our case studies provide further evidence of this. Traditional professional services have typically used IT systems to automate their access to primary information (e.g. on-line databases in legal and financial services), and increasingly to augment expert processing of the information they access (e.g. financial modelling systems, computerised guides to regulatory compliance, etc.). These have usually started as supplier-driven innovations, with impetus coming from the publishing world or from telematics services. Some specialised suppliers emerge out of the professional services, to foster and further develop such innovations; other services begin to undertake their own innovation on an in-house basis, or jointly with suppliers (or sometimes key clients), as the strategic centrality of the IT resources becomes apparent to them.

Rather similar trends are evident in other technology-based KIBS, including those whose critical area of technological expertise is not so much IT as other new and challenging technologies - e.g. in the environmental arena. However, these KIBS are also often active in developing their own technologies for process purposes - for instance, designing and even assembling instruments for monitoring pollution, establishing new types of laboratory test facility, etc.

In this they resemble the IT-based KIBS, where process innovation is a particularly complex affair. These branches are typically having to respond continually to the rapid pace of change in IT hardware, which creates new process and market opportunities for them. New "platforms" for services[52] are continually being introduced, and there is an atmosphere of continual discussion about the trajectories of change and the timescales within which particular developments will take place. There is much attention paid, too, to the competition between different hardware suppliers to provide new platforms, and the conflicts that frequently arise over standards and the scope for interoperability and portability of services. A similar situation arises in respect of software - which IT services typically use to produce their own software, dataware, or other services. The pace of change here too is dramatic (with major new "releases" of some key software taking place on an almost annual basis), and involves much competition and conflict between alternative ways of providing similar functionalities. The consequences of this uncertainty and change are numerous. One important implication is that there are clear advantages to firms who have strong linkages upstream with suppliers of critical hardware and software - especially if these are the market leaders! (In terms of product innovations, too, such links can mean vital opportunities to be the first in the market with applications tailored to the new platform.)

Attempting to draw some lessons of more or less general significance from a literature that is far from systematic in its coverage of KIBS, we can make a number of points:

- There are significant forces promoting certain kinds of process innovation in these services, in addition to the continuing challenge of new hardware. Software innovations and management models are being generated in an effort to speed the service production process. We have already mentioned the effort to develop formal methods and apply engineering models to software production; even if there had not been pressure in this direction from large purchasers, the development of tools and libraries to aid software writing and maintenance would have happened for obvious commercial reasons. In the dataware field, “authoring systems” have been developed as specialised tools to aid the development of these applications. There are even tools to aid knowledge-elicitation in the development of expert systems.

- Service `product innovations’ often form the basis for process innovations in services, and KIBS are very much involved in both sides. This includes some established software houses generating tools for other software and dataware users and developers, together with some specialised firms who have established particular proficiency in developing solutions for KIBS.

- The origin of some of these specialised services is within KIBS themselves, and the reason for this is that KIBS (and other users of such software tools, who may be companies in other sectors utilising in-house services) are themselves originating process innovations. For instance, authoring tools as provided by other firms - even those with whom one is collaborating on new multimedia products, to take a specific example - may prove inadequate to the demands of one’s application, or to be cumbersome for one’s own experts to utilise. Although such tools are now sufficiently well-established and elaborate that an outsider might not expect it to make much sense to develop them on an in-house basis, this is precisely what has happened in some recent cases. In the long term the tools may become sufficiently standardised that many users will be able to “tweak” them to their requirements as a matter of minor innovation. This still often demands a great deal of effort, which means substantial innovative effort on the part of some of the KIBS who use them. Process innovation around these tools, then, is sometimes (probably most often) just a matter of acquiring the tools and the expertise to use them; but it is also not infrequently a matter of innovating around the tools or in-house creation of new tools. This is one way in which process innovation in IT-based KIBS is an extremely active affair.

- Two extremely important trends in services’ process innovation are the application of **engineering** models, and the use of **quality management** techniques. A third development, related to the above, is the introduction of **modularisation**, where elements of the product are separated from each other: production of each can then be broken down into specific tasks and be subject to further innovation along the lines established in manufacturing industry in the industrial revolution.[53]

**4.5.2**

**Delivery Innovation**

Delivery innovation also predominantly means the application of new IT, as medium or media for supporting interaction between service supplier and clients(s), and for delivering service products. Such innovation is less universal than process innovation: practically all new KIBS are employing IT in their processes, but fewer are extending this into their delivery systems. It is plausible that a major reason for this is that such forms of delivery innovation are liable to require change on the part of clients as well as from the service suppliers.

This change may require that the service's users acquire new hardware of their own - data terminals or multimedia equipment, for example. As well as the costs in purchasing and learning to use such systems, clients may be confronted with uncertainties related to (1) the range of alternatives promoted by different service providers and (2) the prospect of future changes in the platforms. There are dangers of lock-in and/or redundancy associated with each area of uncertainty.

This much is common for many services, and in large part accounts for the fact that teleservices have typically taken off much more slowly than industry forecasts suggested. An additional factor in the case of KIBS is the client-specific nature of the product. Its knowledge-intensive nature is liable to imply a need for high interaction at the place and time of delivery of the core product (as well as in earlier phases of the production process). In effect, this can range from a fine-tuning of the service product by applying knowledge at the point of delivery, to a major reconfiguration of the service product in the light of client inputs. In neither case is it easy to automate the practice, and thus IT-based delivery systems can at best augment person-to-person interaction.

Such product delivery also involves more "social" issues of trust and confidence. These interlinked factors must be important reasons for many professional services to continue to use highly traditional modes of delivery, such as reports and "live" briefings. Such modes are liable to contain only relatively marginal IT-derived features, such as Desktop Publishing, impressive graphics, and, more recently, the use of IT-based presentation technology to support face-to-face briefings.

But there are certainly many cases in which final delivery does involve an IT system or medium. This is particularly evident for software and dataware, where CD-ROM publishing, videotex, audiotext (in some "helpline" cases) are prominent alongside traditional on-line and floppy disc delivery mechanisms. In these cases we have either a fairly a standardised service, or a service where customisation can be automated (and is typically very limited - e.g. to compiling abstracts in a bibliographic database according to simple search criteria, to giving advice in a predictable set of problem situations). In such cases the client can interact with (parts of) the knowledge base accumulated by the service provider through a Human-Computer Interface of some sort.

In the long term expert systems promise to enable automation of more challenging tasks, and the industry picture is one of clients sending their software "agents" out into

the IT infrastructure to gather the information they require, to arrange their transactions and the times for person-to-person meetings, and so on. (Serious doubts can be raised about the capability of expert systems to deal with tacit knowledge of the sort that is so important to professional services, whether new technology-based or not, however.) Current practice is much more mundane, it need hardly be said. The most developed applications of telematics interfaces are in highly standardised and routine applications like cash withdrawals, journey planning, and ticketing and booking.

KIBS, by nature, are rarely about standardised or routine activities - except insofar as they provide support to businesses who are prominently engaged in these activities. Person-to-person interaction remains crucial. There is uptake of new technology to augment this - physical contact and telephony are beginning to be supplemented (and perhaps at the margins replaced) by fax, voice and E-mail messaging, and speculatively by video methods. To the best of our knowledge, while small KIBS may play a supporting role, the more advanced applications are almost entirely pursued **within** large organisations, with little outreach. (Note however that Tordoir (1993) implies that some hi-tech small firms may be exceptions here.) An exception is the emergence of experiments in using telematics systems in education and training, where experience is being gained that may be applicable to many more services in the future.[54] In our case studies, the multimedia and laboratory informatics cases may also generate such generic knowledge.

### 4.5.3 Product Innovation

Several features of product innovation in KIBS follow directly from points already made about the nature of the knowledge involved in these services. Thus the point has already been made that IT-based KIBS, product innovation is often critically influenced by developments in the core technological “platforms”. The same is also true of other new-technology-based KIBS, where competitive advantage will depend on up-to-date knowledge of developments in, for example, biotechnology, membrane physics, and other areas of specialised expertise. But as with process innovation, not all of the activity of these services is “simply” a matter of jumping onto a hardware bandwagon, and profiting from the potentials of technological leaps being made by other parties. Again there is a significant element of original innovation, going beyond tailoring existing applications to new platforms, sometimes going beyond making the obvious incremental improvements that can readily be seen to be facilitated by the evolution of the core technology.

Product innovation, like delivery innovation, may sometimes emerge as a consequence of process innovation. It may simply be that the product now exists in an electronic form within the service firm, and can be delivered in this form; it may be that the use of IT in the process makes it possible to start extracting new value from a previously moribund database, and to sell new services from it (as some on-line databases grew out of traditional bibliographic publication systems). for service development often requires interaction with clients in any case.

Products are frequently tailored closely to the requirements of specific clients: to the sorts of need for knowledge which they have. This involves the service supplier possessing or acquiring a pool of relevant knowledge which the client does not have (or know that it has), and possessing or acquiring sufficient knowledge about the client (and its knowledge base) to establish appropriate means of packaging and delivering knowledge, or of co-producing new knowledge. This will involve both explicit and tacit elements, and often each of these will include both technical and social types of knowledge.

The fact that many services do not regard their activities as containing what is usually described as "R&D" should come as no surprise, then. It reflects the intimate nature of these activities, with their considerable reliance on knowledge of specific clients and/or market circumstances. This also implies that practically every product may be an innovative one, but that much of this innovation may be close to "customisation"; nevertheless, across a series of products, evolution both in design and functionality is likely. Likewise, applications may evolve out of their original market niches, in a process that is not simple diffusion of a standard product, but an active reshaping of the service across different sets of clients.

Presently KIBS product innovation appears to be subject to two important and interrelated tendencies, both of which have already been mentioned:

- **Commoditisation** is the process whereby a craft-like, client-specific product (and process) becomes transferred into a much more general-purpose one. As indicated at several points above, the software sector is currently witnessing a rapid growth in importance of "packages" as compared to bespoke products. The shift that is involved is one from deep knowledge of a few clients' requirements to an understanding of the functionality that is required by a mass market of users, and the development of appropriate interfaces, delivery, marketing and after-sales services to support this.[55]

- **Modularisation** is the ability to split service products into component elements. (A similar disaggregation of processes is involved in much quality-oriented innovation). These components can then be combined in novel ways to create new products, or to supply the optimal combination of functionalities for specific clients. Simply combining pre-existent modules in new or client-specific ways is not generally regarded as a matter of producing substantial technical innovations, and this is a reasonable position to take. However, such a strategy may of course represent the emergence of an innovative organisational practice (typically supported by new technology).[56]

Both commoditisation and modularisation tendencies have been noted in many services, and not solely those which are based on IT.[57] (Fast foods are a consumer non-IT service case in point.) They are important processes that may affect the level of interaction between specific clients and KIBS: instead of the conventional close

supplier-user interaction in product development, we may see a shift to the sort of "usability testing" employed by large software and dataware companies, for example.[58]

We would anticipate that the conversion of existing client-intensive KIBS to such commodity packages and combinations of modules is a process which will grow in prominence. This will probably be important in bringing some KIBS-type activities to SMEs, and even to consumers. However, alongside this we anticipate also a continuing development of new KIBS which are not yet subject to such processes. It is arguable that the extension of commodity packages will eventually be limited by the extent to which reasonably large groups of users share similar requirements for these services.[59]

## 4.6 KIBS' Contribution to Their Clients

Our case studies concur in many respects as to the benefits of using these services. In general, innovation in KIBS is expected to contribute to strengthening the user firm's competitive position. In our case studies, for instance, the smooth exchange of product data information between outsourcing and subcontracting firms in the PDI case was hoped to prove a major competitive factor for clients; in multimedia-based training, the intention was to gain improved efficiency in the use of time and a reduced need for tutors to lead mundane training sessions.

One reason for the high importance of IT innovations across our case studies was the tendency for the innovations to contribute to information exchanges. They may have focused on improving the efficiency or quality of these exchanges (e.g. more detailed and well-defined information in the PDI and fleet management cases; better presentation of material in the multimedia cases; more customised information as in the GIS and laboratory informatics cases; inputs of knowledge based on an appreciation of emerging issues for production engineering in the Eco-design and waste reduction cases). More continuous communication is also a feature of the telematics-based cases. The interchange may be between service provider and the client or, in some cases between the service provider and other actors. In the PDI and videoconferencing cases the service is essentially one of facilitating other parties' communications, and the same is more or less true of several other cases (e.g. the multimedia applications).

The consequence of this improved utilisation of information - i.e. the enhancement of the user's knowledge, through the application of knowledge on the part of the service provider - is to enhance the competitive position of the client. Often the advantage provided is a "first mover" one, which is only important as long as competitors are not yet as far advanced. However, the overall impact of this should be cost reduction, quality improvement, and greater efficiency and effectiveness and, in principle, better

co-ordination of activities across production chains. Box 11 outlines some of the increases in user competence associated with the application of environmental services, while Box 12 sets out some more general information on technical and economic impacts of the use of the KIBS featured in our case studies.

This is not to say that the future is problem-free. Competition breeds losers as well as winners. And even the cleverest competitive strategies can encounter failures and even potential disasters. For instance, fears are being expressing that the “flattening” of organisations and outsourcing of services may be weakening some traditional management controls which were ale to ensure system security and reduce the risk of fraud, even if this be at the costs of bureaucratic rigidities.

Further into the future, KIBS innovation may lead to further integration of activities, on both the firm level and the branch of industry level. Once new services have proven their viability, they tend to be absorbed into the regular, normal activities (routines) of innovating firms.

Thus, it is anticipated that computer continuity services will be further integrated into the regular facilities management and computer services contracts; data from laboratory informatics and management systems might be routinely integrated into the information management systems of client companies; Eco-design services will hopefully in the longer run lead to ecological and energy factors being adequately integrated into the designers' everyday practice (and training); waste reduction services might result into the further incorporation of strategies of waste minimisation in the overall planning strategy of client firms. Comparable integrative effects may also occur at a branch or sectoral level. For instance, the more or less unhampered exchange of product data could facilitate further integration between partners in the building process - possibly leading to greater concentration in the building industry; expansion of teleworking could promote some fusion of established education and training services and employment bureaux and job centres; future GIS applications may involve on-site data capture and computer equipment to acquire and process new data during clean-up and other operations, with clients rapidly retrieving up-to-date maps and information on progress via telecommunications, and further integration of activities between service provider and client firm.

## Box 11

## Services and the Enhancement of Competencies

Our case studies include users of new environmental technologies and IT. The innovations that these users provide are clearly competence-enhancing for those who purchase their services.

Most of our case studies involve also producers of new technologies, whose technological inputs create new competencies. For example:

- Video-conferencing services have allowed for drastic cuts in the development time and travel budgets of global manufacturers (and such services as software production);
- Eco-design services have assisted the development of environmentally friendly products and production processes;
- Waste Exchange Services Ltd has stepped beyond its “marriage broker” role to take a leading part in the development of a patented recycling process for one of their clients.

## Box 12

## Technical and Economic Impacts in the Case Studies

| *Case study* | *Technical impact* | *Economic impact* |
|---|---|---|
| *TELEMATICS CASE STUDIES* | | |
| Fleet management systems services | Better information control about status and position of goods and carriers (information logistics). | More efficient fleet size planning and routing. Improved drivers' safety, especially in "exotic" areas. First mover advantage: temporary competitive advantage in specific (long-distance) market segment. |
| Product Data Inter-change in archi-tecture (PDI) | Better exchange of technical specifi-cations and working drawings. | Better and earlier match of required building material and equipment with technical and quality standards. More structured, integrated, cost and time efficient building (planning & design) process. Changing co-operation patterns between building project participants. Potential threat to architects refusing to adopt PDI. |
| Computer continuity services | Continuous availability of computer facilities. | Guaranteed computer operations as a form of risk reduction, especially for firms heavily dependent on computers (e.g. high volume financial transactions). Reduced dependence on large computer companies by providing services for all "platforms". |
| Teleworking services | Providing improved teleworking equipment and technological infra-structures to facilitate teleworking. Changing work organisation patterns between teleworkers and clients. | Creating new telework based service sectors and related services. Opportunities for improved organisational flexibility and productivity, for development in peripheral and rural areas. Less congestion in cities and savings in office space. Widening possibilities for off-shoring back-office activities. For teleworkers extra costs for creating "home office"; less communication with colleagues. |

**Box 12**

**Technical and Economic Impacts in the Case Studies**

(continued)

| *MULTIMEDIA CASE STUDIES* | | |
|---|---|---|
| Multimedia in corporate training services | Better quality, more customised and more effective computer -based training programmes. | More cost-effective training of employees because of reduced need for tutor-led training, training at the place of work (reducing the number of working days lost). Easier adaptable training programmes to individual preferences and abilities. |
| Videoconferencing services | Better opportunities for multi-point video-conferencing using e.g. ISDN and standardised bridging technology. PC-based video communications. | Changing intra- and inter-firm communication patterns. Reduced business travelling claimed. Opportunities for upgrading business services and creating new audio-visual business services (tele-consultancy, teleworking and remote training services). |
| Multimedia in pharmaceutical marketing | Development of CD-i software for marketing purposes. | Upgrading medical (pharmaceutical) services quality. Better informed clients. Intensifying interaction with (potential) client-pharmacists, thus strengthening competitive position. |
| Multimedia in legal practice | CD-ROM as a medium for off-line electronic publishing. | Upgrading service quality, creating new products and services based on already available information. Professional users (law offices) benefiting from efficient information retrieval, accurate, permanently accessible and up-to-date information. |

**Box 12**

**Technical and Economic Impacts in the Case Studies**

(continued)

| *ENVIRONMENTAL TECHNOLOGIES CASE STUDIES* | | |
|---|---|---|
| Laboratory informatics and management systems services | Better management of large flows of sample data. On-line transfer of analysed samples data from lab to customer. Dedicated soil data management software package. | More cost-efficient lab analyses, higher service quality. Strengthened position in a price competitive market. Better opportunities to develop long-term relationships with customers. |
| GIS-related environmental consultancy services | More efficient sample data analysis and prioritisation; higher quality maps. Customised GIS applications. | New environmental technology business service development. Upgrading consulting services. Diversification in software service market on basis of GIS-application. |
| Environmental data provision services | Improved resolution in remote sensing technology. | Higher quality environmental data in - added customised GIS services, |
| Waste exchange services | Developing new recovery and recycling processes for materials and wastes. Data provision on wastes, services, process capabilities, raw material and recycling options. | Increased efficiency and attainment of regulatory provisions from new services in waste minimisation, waste recovery and waste recycling. |
| Eco product design services | Minimising the amount of energy-intensive and toxic raw materials, reducing the energy-content of products and increasing opportunities for re-use and recycling. | Emergence of new, advanced environmental consultancy. Strengthened competitive position for firms successful in adopting Eco-design principles. |
| Environmental feasibility studies services | Modelling environmental pollution for impact assessment and related consultancy. Developing software package based on the models. | New application areas established for service's core technical knowledge and experience. |
| Waste reduction services | Reducing toxicity and volume of waste streams. | Reduction of waste handling costs. Provision of full-range, high-value, knowledge-intensive service package to clients. Potential threat to waste handling businesses. |

# 5. Chapter 5 KIBS, Research and Policy: Conclusions and Recommendations

This study has demonstrated that at least some categories of service firms are essential elements in the rising Knowledge-Intensity of the economy and the associated high pace of innovation. KIBS are at the forefront of such developments. This suggests that a services **versus** manufacturing viewpoint is obsolete. It is time to face the challenges of an intertwined economy.

It is our impression that the differences between services and manufacturing innovation tend to be more qualitative than quantitative ones - the typical innovations of each sector are quite distinctive, but there is a great deal of (and probably increasing) overlap. Our recommendations follow from the most important features of KIBS innovation as discussed in earlier chapters - the lack of traditional R&D organisation and expenditure, the high levels of customisation and supplier-user interaction (and even co-production), the questions concerning the appropriability of services' innovations, and the complex combinations of professional skills that are typically required. We will consider, in turn, the challenges that such issues pose to research and to policy, and make appropriate recommendations.

## 5.1 Requirements for Research and Methodological Development

Combining a review of existing material with a case study approach has generated, almost inevitably, more questions than answers. One thing that the literature review makes evident is that despite the increasing attention they are receiving, services are not well understood. There is not even agreement as to the extent to which they are understood. Thus, more research is needed, although that research can be more constructive. In particular, both to improve social research and to guide policies in the area of innovation, the concepts of R&D and innovation need to be revisited, and the definitions used in this field need to be restructured to take into account the activities of service firms.

Better official statistics on producer services and on KIBS in particular would be a valuable tool for researchers and policymakers alike. There is undoubtedly difficulty in keeping statistical systems up to date when the sectors under consideration are undergoing rapid change, with new (and possibly transient) specialisms emerging. But it has long been recognised that many new business services have been consigned to a "not elsewhere specified" category, and that other important areas have been unhelpfully merged with established groups (e.g. telematics services with computer services in the UK).

The neglect of services in innovation studies - and especially surveys - needs to be addressed. While it would make a good start for services to be consistently sampled in surveys which use established methods and definitions, it is important that research into services innovation be undertaken which would allow for broader or alternative definitions to be used where appropriate. For instance, we might suggest more attention to innovation collaborations between service suppliers and users.

Finally, we note that research results in this area are not widely disseminated. Though a community of like-minded researchers does exist, we find that communication flows are rather poor. We ourselves have been surprised both by discovering lines of work of which we were ignorant, and discovering that similar ignorance of each others' efforts is common in this field of study. Mechanisms for enhancing communication are thus important, if the field is to mature at a reasonable pace, and if its conclusions are to be well-grounded and widely diffused.

The European Commission and the OECD are two international bodies with particularly important roles to play in fostering appropriate research and enhancing the communication of research findings. It is important for these bodies to take a lead in advancing the policy-relevant study of services innovation, for example by constituting working groups to design appropriate statistical instruments. Some work on this front is underway in the OECD; past OECD work on innovation indicators has been closely related to SPRINT-EIMS efforts in the EC, and this should be extended to the services problematique.

## 5.2 Towards a Policy Agenda for Services' Innovation

### 5.2.1 Professionalisation of KIBS Innovation

This issue underpins many of the other topics which we take up below. It is our conclusion that many service firms have "unusual" innovation structures which in part reflect the "peculiarities" of the service - in particular high customisation and provider-client interaction - but which also in part reflect the fact that innovation strategy is a relatively new issue for services. Thus their organisation of the innovation process remains ad hoc as a consequence of historical conditions which no longer apply so forcefully. This is apparent in the lack of formal R&D organisation, the work that is varied out in "grey hours", and so on. It is also apparent in the poor linkage of many services into wider innovation networks - though we did find our innovative KIBS firms were frequently active in this latter respect. The extent to which KIBS function within broader networks of innovators has important implications for the diffusion of innovation and the broader contribution of these services to economic growth.

A lack of professionalisation of the innovation function may seem a paradoxical charge to level at professional services, but it is apparent that many of the firms involved have little time and resources to devote to developing their innovation management

processes and long-term innovation strategies. This affects not only in-house activities, but also the impact that they can have on processes of standards-setting and innovation policy formation more generally. Two recommendations follow from this, and related issues are taken up in later subsections.

**POLICY RECOMMENDATION 1**

KIBS should benefit from higher levels of professionalisation, in the form of collective fora that would allow them to articulate their points of view, to participate in standardisation processes, and to develop their own quality standards and quality control mechanisms. Stimulating the creation of such fora is an appropriate target for policy.

**POLICY RECOMMENDATION 2**

KIBS should also benefit from higher levels of professionalisation, in formulating their internal innovation strategies. Access to skills of innovation management should thus be encouraged, by, for example, dissemination of information on good practice, consultancy support, and specialised programmes of management training.

### 5.2.2 KIBS innovation: SMEs and industrial policy

The main competitive asset of KIBS firms is knowledge, which is largely embedded in the expertise of their staff. For this reason, KIBS are often developed by small firms with a high proportion of professional staff.

These face the same problems that other small innovative firms face - particularly in terms of raising start-up and expansion finance. There may well be questions concerning just how they are treated within the framework of preferential treatment granted to SMEs by national and Community industrial policies. Such policies, especially in the area of technology, have sometimes fostered the establishment of KIBS firms - for example, by providing support for IT consultancy.

On the other hand, industrial policy has frequently been criticised for a focus on manufacturing, especially as far as diffusion and awareness programmes are concerned. Even when they are not explicitly excluded from programmes, it is likely that the problems of small firm KIBS are intensified because they do not recognise their own activities in the publicity surrounding programmes of innovation and training support, or in the invitations to join innovative networks. Lessons might valuably be extracted from the success of SME KIBS who are performing well in these respects (we suspect that these are especially prevalent in the IT field, due to the prominence of service activities like software and networking in this area).

SMEs are also potential users of KIBS, but are often constrained from doing so. KIBS have tended to gravitate toward servicing large companies, with the exception of some specialists in "vertical markets" (i.e. niches). In part this reflects the relatively expensive nature of many of the services, and the lengthy period of interaction that is often required in the process of service specification. But it also in all probability reflects the difficulty that SMEs face in defining their needs, identifying appropriate providers, and overcoming (sometimes justified) fears as to the quality and trustworthiness of the service provider . Support could be available here - an example is the Vanguard project with which the UK's Department of Trade and Industry tried to introduce sectoral communities of firms to the use of EDI and related services.

Two policy recommendations thus arise.

**POLICY RECOMMENDATION 3**

Action is needed not only to facilitate access of firms to public R&D programmes but also to familiarise KIBS firms with unfamiliar concepts of R&D and innovation support, and to locate them more firmly in innovation networks. This will result in better feedback from existing policy measures and consequently better policy design. At the same time a more level playing-field will be created for competition between KIBS firms, within the framework of industrial policy interventions. Such action will also provide for access of KIBS to networks of innovators generated by industrial policy.

**POLICY RECOMMENDATION 4**

Support should be forthcoming for programmes which demonstrate to SMEs the scope for their use of the services supplied by KIBS. This might involve schemes designed to introduce sectoral user communities to appropriate service providers, support in establishing the quality of such providers (thus reducing effort expended on searching for appropriate partners with whom to develop interactive relationships), directories and awareness schemes, etc.

### 5.2.3 User-Supplier Relations and Competitive Environments

The issue of joint knowledge development demonstrates the importance of internalisation and externalisation processes in the KIBS domain, and has implications for innovation monitoring activities. For example, it makes clear that principal product classifications are clearly inadequate for such activities. Rather, KIBS innovations from units internal to large manufacturing or service firms should be taken into account. Innovative investment of such an orientation which cannot be classified as R&D should also be recorded.

Other implications for policy also flow from the close user-supplier relations in this field. One set of implications derives from the necessity for trust to be developed between the parties concerned, so that they can exchange “intimate” details of their operations to each other. This may lead to problems - relationships may become too close (not just “lock-in”, but also professional problems where it comes to legally or politically sensitive activities, where it comes to working with firms who may be competitors, etc.; and problems associated with anti-competitive practices). These are issues that ideally might be handled by self-regulation in professional bodies and industry associations, but such self-regulation is liable to be fostered, shaped and even regulated by government.

Another set of implications concerns the problems that newer KIBS may have in entering markets - as with many other services, it is hard to demonstrate your product (or trustworthiness) in advance. Quality standards and awards, and systems for the interchange of experience of use of services, may be part of the solution here. This points to a broader need to consider promoting user groups for the exchange of experience, for self-help, and even for exerting pressure on suppliers’ innovation, for some classes of services. Such user groups have formed more or less spontaneously for some new technology services, but there may be a need for more action on a wider front.

The issue of anti-competitive practices is germane to KIBS at a number of levels. At one level, supplier-user interaction is ideally handled by self-regulation in professional bodies and industry associations. Such self-regulation is liable to be fostered, shaped and even regulated by government. At another level, some KIBS have been relatively immune from fierce international competition, especially those associated with spin-offs from governmental organisations such as national research laboratories.

While most KIBS are believed to be internationally mobile, their interactive nature poses barriers to their mobility, even if this is only for cultural reasons (it being hard to demonstrate one's trustworthiness and sensitivity in advance). Quality standards and awards, and systems for the interchange of experience of use of services, may be part of the solution here. This points to a broader need to consider promoting user groups for the exchange of experience, for self-help, and even for exerting pressure on suppliers' innovation, for some classes of services.

**POLICY RECOMMENDATION 5**

The design of industrial policy has to take into account the peculiarities of KIBS, in particular the importance of user-supplier relations in this area. There is an urgent policy need for improved classifications of innovative activities and adapted innovation monitoring systems. Attention should be paid to ways of fostering quality assurance systems, self-regulation, and improved feedback to and between groups of actual and potential clients of these services. User groups have formed more or less spontaneously for some new technology services, but there may be a need for more action on a wider front.

**5.2.4**

## Training and Education

In many services, training issues loom large, as personnel with little technical experience are being required to work with the newest generations of IT. Most KIBS are exceptions here, with considerable experience already accumulated on IT and other relevant technologies - though there may well be acute problems involved in bringing some of the older generations of traditional professionals up-to-date with new technology. Nevertheless, it seems likely that training agencies are often neglectful of the scope for providing services and skills tailored to service firms. Similarly, research and associated high-level training in Higher Education displays a high manufacturing bias. There are many specialised groups who research manufacturing technology, and few that focus on services technology. (And most specialised groups on services only feature innovation to a limited extent). KIBS face many of the problems of "hybrid management" that have been identified as critical for the knowledge-intensive economy, so ways of fostering the development of such skills are a priority.

Many services have not yet assimilated messages about the needs to develop firm-level knowledge strategies and management systems - and they have been neglected in many efforts to diffuse such firm-level practices. KIBS are probably rather better than most services in these respects (and their experience might be helpful in indicating routes whereby other service firms might develop such practices). But there is considerably more scope for transferring the knowledge that has been developed over several decades of R&D management to the managers of these services, and this is another role for training bodies.

**POLICY RECOMMENDATION 6**

Attention is required to the particular mixes of organisational, interpersonal and technical skills that are required by KIBS. Training and education systems need to be able to develop "hybrid" combinations and entrepreneurial attitudes. One type of skill which is required in these services involves a better understanding of the innovation process and its management; another involves the ability to work across conventional sectoral boundaries. Training programmes need to take account of the fluidity of these boundaries, and the new generic professional skills that are emerging in consequence.

**5.2.5**

**Intellectual Property Rights**

KIBS innovation is affected by several features of industrial policy, including the treatment of Intellectual Property Rights (IPRs). The issue of IPR is mentioned more by analysts than by KIBS firms themselves - at least those interviewed in the course of our case studies. We are of course aware that some software companies place much stress on copyright. Perhaps our case study firms accept the status quo as part of the reality of their operations, rather than seeing it as a problem that could easily be overcome. Some IT service suppliers argue that the use of copyright and similar regulations to protect software innovations has already extended too far, and that whole avenues of development have been unfairly monopolised by those most able to take advantage of the rules (chiefly big firms). Others argue that the weak appropriability regimes in which KIBS function slows the pace of innovation or leads to lock-in strategies.

There is certainly a link between the extent of supplier-user interaction in KIBS innovation and (both premeditated and "incidental") lock-in phenomena. KIBS innovation often requires joint knowledge development, for example, as specifications for the new service develop hand in hand with the service itself. This generates joint knowledge bases shared between service supplier and client. And these joint knowledge bases can give rise to IPR-related appropriability problems, lock-ins and anti-competitive practices. They may even be the stimulus for mergers and acquisitions.

The debate about IPR is a very serious one, which does not brook of simple solutions. It may affect different sectors, and different firms within sectors, in quite different ways. Furthermore, it is constantly being perturbed by new technical developments and new courtroom decisions (especially in the USA). There is certainly need for more research into the ways in which IPR rules affect services, and high-level work is required to establish appropriate policy guidance. Rather than assert the superiority of one regime or another, at this point in time the most useful proposal that can be made is that such high-level work should be established. Furthermore, we can suggest that this work should be constituted so as to involve substantial inputs from a broad spectrum of actors (not just big firms, not just suppliers); and that it should examine critical sectors first, without necessarily assuming that the lessons that emerge from these will be fully generalisable ones.

**POLICY RECOMMENDATION 7**

High-level work is required to establish appropriate policy guidance on IPR issues as they affect KIBS. This work should involve substantial inputs from a broad spectrum of stakeholders. It should examine critical sectors first, without necessarily assuming that identical policy implications will eventually emerge for other sectors. It should be sensitive to changes that are liable to occur over time, since the pace of technological change makes this a very dynamic area.

### 5.2.6 Regulation and Standards

Innovation in KIBS is induced by competition, and is framed by the availability and stages of development of technological knowledge. Our case studies confirm indications in the literature that both the competitive environment and the regulatory framework in which competition works are very important.

New regulations often generate new needs for technological expertise. Expert knowledge inputs are often supplied by specialised KIBS firms, and as the market and supply of such services grows, competition induces innovation - the use of new technologies, the generation of new service products. Introduction of new regulations needs to be undertaken with understanding of the implication for the development of relevant services - what sort of knowledge development will be required for rapid response to the new environment? What are the challenges facing smaller service providers and smaller potential clients in this situation?

Standards, while providing for economies of scale in production, are effectively a way of “freezing” knowledge of a particular subdomain of activity. This has the advantages of reducing uncertainty, but it can also substitute for the interactive learning process that underlies KIBS innovation. Thus, complete absence of standards may deter investment in developing KIBS, while excessive standardisation acts against the opportunity for KIBS innovation. There are important implications here as to the optimal involvement of KIBS in standardisation. The main implications of this - apart for the need for further research into the underlying processes - is the need to assess the implications of specific standardisation activities on different types of KIBS and their clients.

**POLICY RECOMMENDATION 8**

Processes of regulation and standardisation are bound to have substantial impacts upon KIBS, probably varying by firm size and other features These impacts need to be taken into account, to ensure that advantages are not simply being conferred on the larger and better-established firms. Ways of redressing such balances need to be established - for example, by ensuring that it is not only the most established firms that are consulted in the regulation and standardisation activities, by widely disseminating information on likely rules and protocols, by promoting partnerships in which relevant knowledge can be exchanged, and so on. Standards bodies and industrial trade associations may be critical actors here. This is important not only for the competitive situation among these services, but also in terms of the rapid diffusion of knowledge of how to conform with regulations and standards.

**6.**

## End Notes

[1] These data are drawn from an unpublished report to the OECD prepared by Miles (1995). The US R&D figures derive from R M Wolfe (1994).

[2] OECD, 1991

[3] E.g., Gershuny & Miles (1983); Howell (1988); Marshall et al (1988); Singelmann (1979), Silvestrou et al (1992).

[4] For a good overview of data on the development of explicit knowledge, as reflected in science and technology indicators, see European Commission (1994). On "routines" in companies, see Nelson and Winter (1982). For the high salience of tacit knowledge in hi-tech - nuclear weaponry in this case - see MacKenzie and Spinardi (1995).

[5] As we shall consider at more length later, however, this need not always involve close interaction at the point of delivery of knowledge as a product in what may appear to be the crucial final transaction if viewed only for accounting purposes. Consider an example. A consultancy report, or a piece of courseware on CD-ROM, may be simply delivered for the user to make what they will of it. But there will usually have been prior interaction, where the consultant or dataware firm has been determining the user requirements - including the knowledge structure into which the new information is to be fitted, and to which it must then be tailored.

[6] This may not involve close interaction at the point of delivery of knowledge as a product or in the final transaction, however. A consultancy report, or a piece of courseware on CD-ROM, may be simply delivered for the user to make what they will of it. But there will usually have been prior interaction, where the consultant or dataware firm has been determining the user requirements - including the knowledge structure into which the new information is to be fitted, and to which it must then be tailored.

[7] Jacques Ellul (1965)

[8] Miles (1990). Along with other studies (e.g. Roach, 1987) this demonstrates that over three-quarters of the IT investment in advanced industrial countries is coming from service industries - more in fact than would be accounted for by their share of economic activity.

[9] Ducatel & Miles (1994)

[10] It is debatable if a sector can be regarded as knowledge-intensive if it is employing knowledge produced elsewhere without substantial learning on the part of its own organisation and personnel. It would be participating in knowledge-intensification without itself becoming Knowledge-Intensive.

[11] Other classes of agent include non-business-related public education and certain public administration services.

[12] E.g., Baven & Elfring (1992); Elfring (1994). The classic study is Greenfield (1966).

[13] An exact necessary extent of service firms' development is not possible to establish precisely, because of national variations in the location of service functions - for example, countries like Germany and Japan tend to accomplish these functions on an in-house basis rather than via specialised produce services. For a statistical exploration see Pousette (1990), and the work of Elfring (1992).

[14] Classic studies are Bell (1973); Fuchs (1968, 1969).

[15] Gershuny & Miles (1983); Elfring (1992).

[16] Bilderbeek & Buitelaar (1991, 1992); Bressand et al (1989); Ducatel (1994); Faulhaber et al (1986); Guile and Quinn (1988a, b, c); Sundbo (1993a).

[17] On "industrialisation of services" see the classic study by Levitt (1976). On parallel and convergent trends in manufacturing and services, see Miles (1987); Postner (1991); Quinn et al (1988, 1990a,b); Quinn & Paquette (1990).

[18] See footnote 12 and also various studies by Tordoir (e.g., 1986, 1991, 1993); a series of studies on design services has also been carried out by Robin Roy and colleagues at the Open University in the UK. Interesting work is also underway at IFRESI in Lille, where a major study of services innovation has been prepared by Gallouj (1992), and see also Gadrey et al (1994).

[19] See footnote 17; for the role of service functions within manufacturing, see, for example, the important contribution of Mathé & Shapiro (1993) and the more popular account of Zemke (1990).

[20] As might be expected, the variety of terms reflects a variety of emphases - some authors focusing more on technology, some on professional functions; some definitions are more institutional (e.g. in Italy there is a Federation of Advanced Tertiary Industries) and some more analytic.

[21] E.g. Miles (1993).

[22] Here we view money as a form of information - even coins are really symbols, and much financial activity is a matter if reassigning property entitlements.

[23] Social change can also pose daunting knowledge requirements. The moves toward European integration, for example, mean changing legal and administrative circumstances, and consultancy and other services have arisen to help firms deal with this changing context. Environmental regulation is another case in point.

[24] Howells (1988, 1989); Howells & Green (1989); Elfring (1994).

[25] Barker (1993; Daniels & Moulaert (1991) ); Gallouj (1994); Krolis (1986); Marshall et al (1988); Stanback (1979).

[26] See footnotes 12, 18, 19.

[27] Lacity & Hirschheim (1993).

[28] E.g. Illeris (1989); Riddle (1986); for the statistical difficulties see Pousette (1990).

[29] See, in particular, Vandermerwe & Chadwick (1989). For studies of transnational service activities, see Dunning (1989) and Enderwick (1989).

[30] See Wolfe (1994).

[31] E.g., Soete & Verspagen (1991).

[32] E.g., Pollak (1991).

[33] Kleinknecht et al (1991); Pollak (1991)

[34] Kleinknecht et al (1991).

[35] Pavitt (1984).

[36] This was articulated by Barras in a number of studies, in particular Barras (1984, 1986a, 1990).

[37] Belleflamme et al (1986); the main study of “servuction” is Eiglier & Langeard (1987).

[38] Quinn & Paquette (1990). Ducatel & Miles (1994) pay attention to services in this context. See also van der Aa & Elfring (1991). R A Wolfe (1994) reviews current literature on organisational innovation.

[39] The main qualification to this forecast is that diversity along some parameters may be restricted by regulations, for example those governing working conditions and terms of employment. Another major influence is the championing of particular organisational solutions by management consultants, business schools, and other sources of advice and training. These rarely speak with one voice, especially since to do so would involve them in some loss of their own product differentiation.

[40] But at the same time, we anticipate that the changes that make manufacturing itself “converge” with services (Table 2) are liable to mean that much more innovation within manufacturing is of a non-standard kind. This would be liable to lead to renewed attention to enlarging innovation statistics, even were there to be little attempt to take services on board.

[41] See especially Sundbo(199 3b), who uses the term “modulization”.

[42] E.g. Gummerson (1993), a study prepared for the International Service Quality Association.

[43] Design is sometimes treated as an adjunct to R&D, as in “R&D&D”. One study which promises to examine service design, but really focuses on more commonly researched aspects of services innovation, is Voss et al (1992).

[44] Quintas & Millar (1992).

[45] Soete & Miozzo (1993)

[46] Miles (1989, 1993); see also Rajan (1987).

[47] Kevin Morgan has articulated this perspective, especially in comparative studies undertaken for the Berkeley Roundtable on the Information Economy (BRIE): for an early account see Cawson, Morgan and Webber (1988).

[48] The third meaning of “common” is “low-class” - this certainly does not apply.

[49] Some dataware activities are probably closer to conventional publishing and broadcasting than they are to other KIBS, but specialised dataware services are at least at present extremely demanding in terms of supplier-client knowledge exchanges. The useful term “dataware” is borrowed from Kubicek & Seeger (1992).

[50] See especially Teece (1986).

[51] Considerable documentation on such systems has been produced in the course of the DELTA programme. STARTUP (1990), Zorkoczy (1990).

[52] These range from components - such as new generations of microprocessor chip or memory storage device - through devices - such as new models of PC or multimedia workstation - to whole network systems - such as ISDN or Intelligent Network services. Fortunately, few service suppliers have to take full cognisance of all sorts of changes!

[53] Levitt (1976); Sundbo (1993b).

[54] Cf. footnote 51 on educational applications. Thomas and Miles (1990) provide a study of innovation processes in telematics.

[55] Quintas & Millar (1992).

[56] Gummerson (1993); Irons (1994); Sundbo (1993b).

[57] Gummerson (1993) and Irons (1994) each mention several cases.

[58] An interesting example of this is displayed in the collaboration between Microsoft and the UK-based educational publisher Dorling-Kimbersly; in developing CD-ROMs based in part on their exiting book catalogue, the publisher has been using the software firm’s usability laboratories. Incidentally, the publisher also had to put in a great deal of work developing its own authoring software, since the tools supplied by Microsfot, though regarded as being highly sophisticated, did not meet the specialised requirements of the publication and the publisher’s staff.

[59] Recall Adam Smith: “the division of labour is limited by the size of the market”.

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