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The key dimensions of knowledge-intensive business services (KIBS) analysis: a decade of evolution[1]

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Abstract

The importance of knowledge and innovation in modern economies justifies the increasing interest that scholars are taking in studying knowledge-intensive business services (KIBS). The objective of this paper is to track the evolution of the key dimensions on which scholars have based their analyses through a literature review. More specifically, three main issues are addressed: (1) how KIBS are defined in the literature; (2) how KIBS have been investigated empirically by researchers; and (3) how the analysis of KIBS has evolved over time. As a major assumption, the analysis categorises the research topic into three key conceptual dimensions: (i) knowledge; (ii) innovation and (iii) spatial proximity. The major hypothesis is that the way KIBS are seen, studied and perceived by the research community resolutely changed over time and that this evolution can be tracked by observing modifications in the key dimensions associated with the analysis of KIBS.

Keywords: KIBS, knowledge, innovation, spatial proximity

1 Introduction

The importance of knowledge and innovation in modern economies justifies the increasing interest that scholars are taking in studying knowledge-intensive business services (KIBS). Since the mid 1990s, there has been a significant increase in the attention paid to KIBS and their roles and functions in innovation systems. However, in comparison to the manufacturing sectors, KIBS remain poorly studied by analysts of innovation and technological change, and their future development has rarely been considered in terms of policies and roles in their respective innovation and productive systems.

The objective of this paper is to track the evolution of the key dimensions on which scholars have based their analyses through a literature review. More specifically, three main issues are addressed: (1) how KIBS are defined in the literature; (2) how KIBS have been investigated empirically by researchers; and (3) how the analysis of KIBS has evolved over time.

As a major assumption, the analysis categorises the research topic into three key conceptual dimensions: (i) knowledge; (ii) innovation and (iii) spatial proximity. The major hypothesis is that the way KIBS are seen, studied and perceived by the research community resolutely changed over time and that this evolution can be tracked by observing modifications in the key dimensions associated with the analysis of KIBS. The next section will present our research approach. Section 3 synthesises the work per-

formed so far by researchers in terms of definitions and empirical investigations related to KIBS. In section 4, the evolution of the concepts underlying the analysis of KIBS and innovation is examined along the three key conceptual dimensions addressed previously. Finally, the conclusion stresses implications for future research investigating KIBS.

2 Research approach and some general characteristics of the studies included

The review of the academic literature that was conducted in this work focuses on the last fifteen years, which saw a growing interest in understanding KIBS manifested in political as well as scientific debate (Hauknes 1999; Illeris 1991; Miles et al. 1995). Citation databases (ABI Proquest, Web of Science – Social Science Citation Index, EBSCO, Science Direct, and EconLit) were used to identify potential papers with the help of the following keywords: (1) KIBS, (2) knowledge, and (3) innovation. The papers were selected on the basis of their abstracts. This search finally yielded 82 papers in total. This method of searching the literature has the disadvantage that only journal papers (published in English) are included in the databases. This approach is similar to, and partly inspired by, the works of Knoben and Oerlemans (2006), Espino-Rodriguez and Padron-Rbaina (2006) and Pittaway et al. (2004) in other research fields.

Figure 1 depicts the distribution of the selected articles per publication year. Beginning with a very limited number (1989-1996), the rate of articles published on KIBS increased remarkably during the period 1997-2005 to reach an average of over 14 articles per year for the period 2002-2005. A possible explanation is that the publication trend for KIBS, like the one for innovation in manufacturing studies (Becheikh et al. 2006), might be influenced by the series of Community Innovative Surveys (CIS) conducted in Europe in 1997 (CIS2) and 2001 (CIS3). As figure 2 shows, the service industries are most often studied in Europe compared to other regions in the world. Of the countries where the most studies were conducted, eight are European, with the UK, France and Italy ranking as the top three. These results show the possible catalytic effect of the CIS, but also the influence of seminal works by the pioneering scholars who developed this field of research [e.g. Miles (Manchester), Djellal and Gallouj (Lille), and Evangelista (Rome)].

In addition, the distribution of authors of the reviewed articles shows that KIBS research is mainly concentrated in the disciplines of economics (39%), management and business administration (38%) and, to a lesser extent, geography and regional planning

(11%). This result confirms the pre-eminence of economics and business traditions in KIBS studies and in innovation studies. At the same time, it shows that the KIBS phenomenon is not extensively studied among geographers and regional science scholars.

Figure 1: Publications trend, 1989-2005

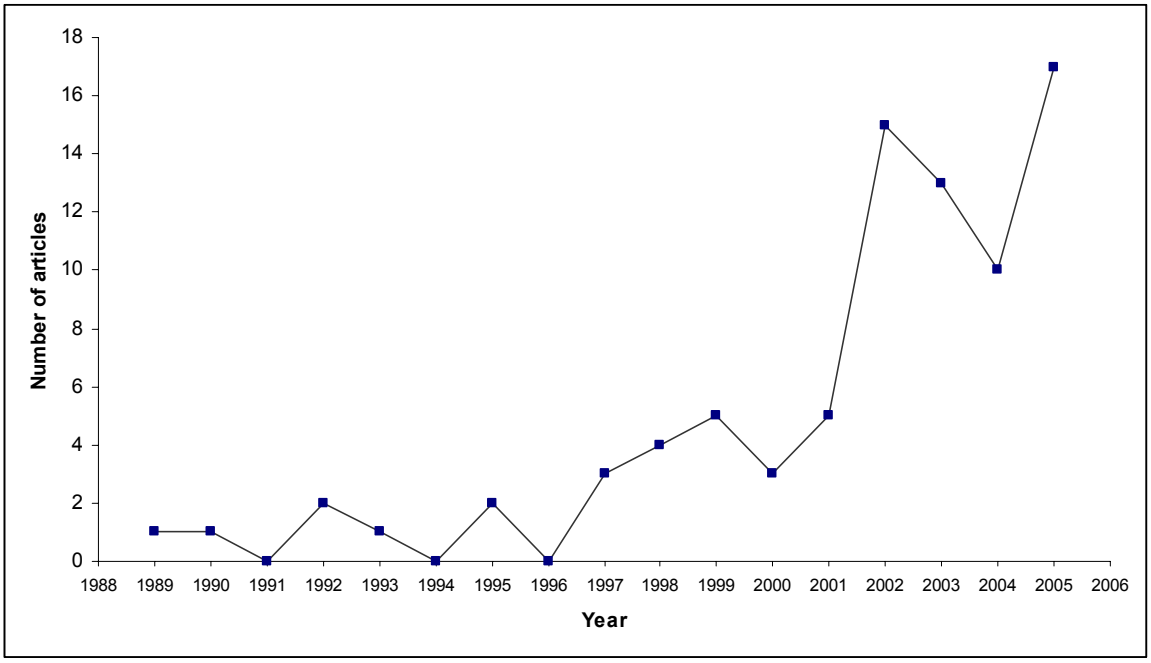


Figure 2: Distribution of the articles on knowledge-intensive business services (KIBS) by investigative region

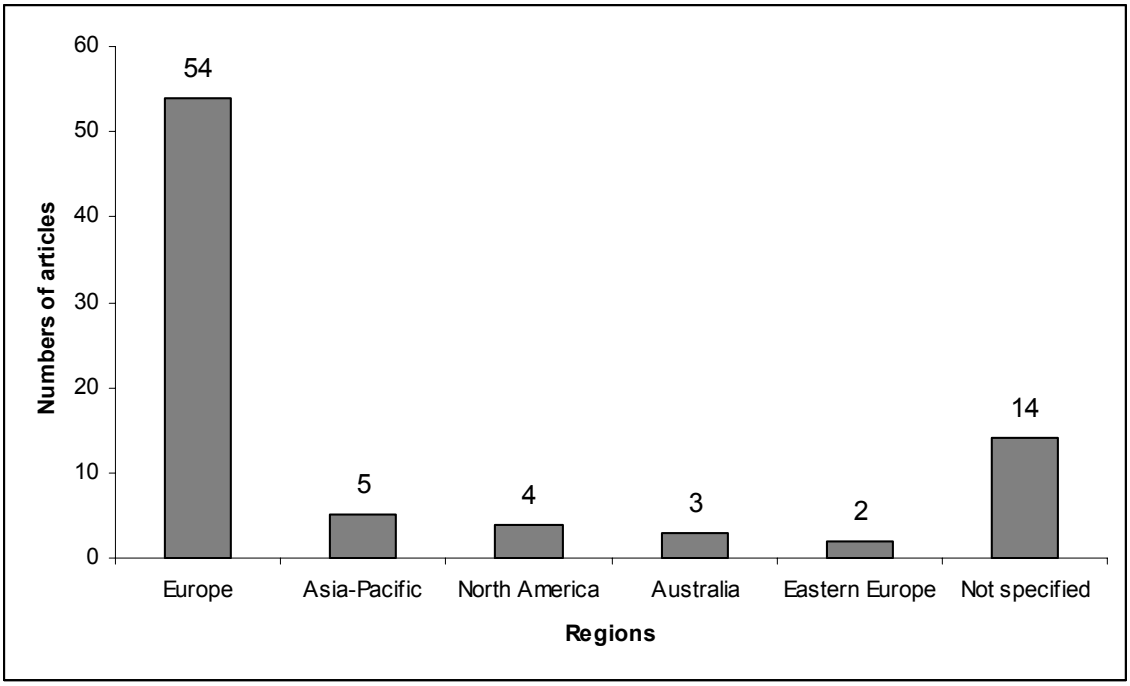
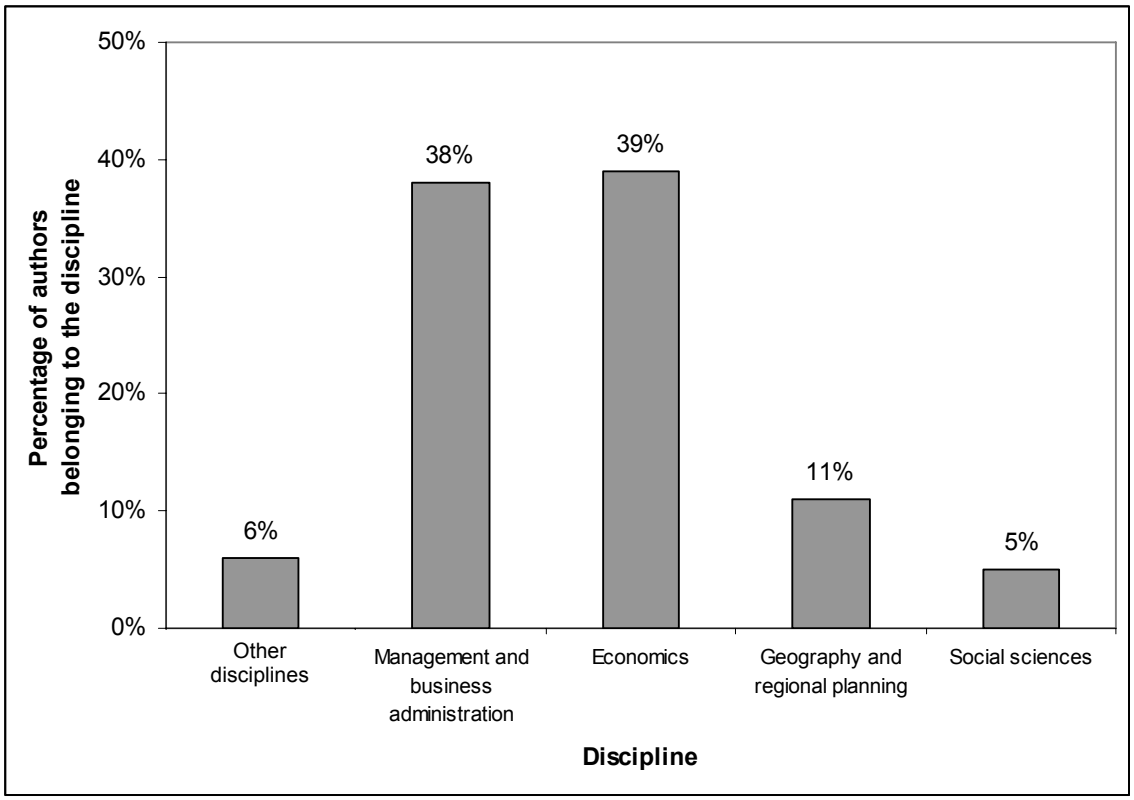


Figure 3: Distribution of the authors by discipline



3 What do we know about KIBS?

This section addresses the following two issues: how KIBS are defined in the literature and how KIBS have been investigated empirically by researchers. How are KIBS defined?

In general terms, KIBS are mainly concerned with providing knowledge-intensive inputs to the business processes of other organisations, including private and public sector clients. Miles et al. (1995) identified three principal characteristics of KIBS:

1. They rely heavily upon professional knowledge;
2. They *either* are themselves primary sources of information and knowledge *or* they use knowledge to produce intermediate services for their clients' production processes;
3. They are of competitive importance and supplied primarily to business.

In more precise terms, Miles et al. (1995: 18) defined KIBS as '*services that involved economic activities which are intended to result in the creation, accumulation or dissemination of knowledge'.* Another general definition is provided by Tovoinen (2006: 2), who defined KIBS as '*expert companies that provide services to other companies and organizations'.* In addition, den Hertog (2000: 505) suggested a more precise definition of KIBS: *'private companies or organizations who rely heavily on professional knowledge, i.e. knowledge or expertise related to a specific (technical) discipline or (technical) functional-domain to supply intermediate products and services that are knowledge based'.* Finally, Bettencourt et al. (2002: 100-101) defined KIBS as '*enterprises whose primary value-added activities consist of the accumulation, creation, or dissemination of knowledge for the purpose of developing a customized service or product solution to satisfy the client's needs*'.

Thus, three core elements may be derived from these definitions. First, the term *"*business services*"* is related to those specialised services demanded by firms and public organisations and not produced for private consumption (Strambach 2001). Second, the expression *"*knowledge intensive*"* can be interpreted either in terms of labor qualification (Miles 2005) or in terms of the conditions for the transactions between the service provider and the service user or procurer (Hauknes 1999). Third, the term *"*knowledge intensive firms*"* refers to firms that are undertaking complex operations of an intellectual nature where human capital is the dominant factor (Alvesson 1995).

While the definition of KIBS may be debatable, Wong and He (2005: 2) stated that: "*The definition of KIBS provides a platform to study group of services which is very actively integrated into innovation systems by joint knowledge development with their*

clients, and which consequently create considerable positive networks externalities and possibly accelerate knowledge intensification across economy".

Thus, there is no standard approach and accepted definition of KIBS (Wood 2002). However, a certain consensus exists about the branches and firms belonging to the KIBS sector. The nomenclature here often follows the NACE (Classification of Economic Activities in the European Community), which has proven increasingly popular in identifying KIBS, at least in Europe: KIBS as a sector comprises – amongst others – computer and related activities, research and development, and other business services. Each category contains sub-categories, for example, computer and related activities unfold into 6 subcategories (hardware consultancy, software consultancy and supply, data processing, database activities, maintenance and repair of office, accounting and computing machinery, and other computer related activities), and so on. Table 1 depicts the composition of the different sectors and sub-sectors defining KIBS.

In addition, Miles et al. (1995: 29-30) distinguish between 'traditional professional services (P-KIBS)*'* and 'new-technology-based services (T-KIBS)*'.* P-KIBS are *'traditional professional services, liable to be intensive users of new technology (business and management services, legal accounting and activities, market research,* etc.*)'.* T-KIBS are mainly related to information and communication technologies as well as technical activities (IT related services, engineering, R&D consulting, etc.).

In this schema, the term KIBS has been used to refer to service firms that are characterised by their high knowledge intensity and the orientation of their services to other firms and organisations, services that are predominantly non-routine. Nevertheless, some sub-sectors of activities corresponding to services and displaying similar features (high levels of qualified labor and the use of new technologies) are usually not considered as KIBS. For instance, services such as health care-related services and specialised services related to resourced-based sectors (agriculture, forestry, mining and gas extraction) are not identified as KIBS.

Table 1: KIBS sectors and sub-sectors

NACE	Description
72	Computer and related activities
721	Hardware consultancy
722	Software consultancy and supply
723	Data processing
724	Data base activities

NACE	Description
725	Maintenance and repair of office, accounting and computing machinery
726	Other computer related activities
73	Research and development
7310	Research and experimental development in natural sciences and engineering
7320	Research and experimental development in social sciences and humanities
74	Other business activities
741	Legal, accounting, book-keeping and auditing activities; tax consultancy; market research and public opinion polling; business and management consultancy; holdings
7411	Legal activities
7412	Accounting, book-keeping and auditing activities; tax consultancy
7413	Market research and public opinion polling
7414	Business and management consultancy activities
742	Architectural and engineering activities and related technical consultancy
743	Technical testing and analysis
744	Advertising
7484	Other business activities n.e.c.

3.1 How has KIBS been investigated empirically?

In this section, the ways in which the empirical investigation of KIBS has evolved over the last decade are summarised. In this respect, specific attention is paid to: (1) research trends in KIBS analysis and (2) methodology for KIBS analysis. The main objective is to map the research studies and key finding of KIBS.

3.1.1 Research trends in KIBS analysis

Research on KIBS has been carried out since the middle of the 1990s. Broadly speaking, the development of studies in this field has evolved and is characterised by three

main phases of development.[2] The first phase includes mainly theoretical reflections – with little empirical concern – recognizing KIBS as a peculiar sector. Miles et al. (1995) proposed the first detailed elaboration of KIBS following (and inspired by) the works of Barras (1986; 1990) on the use of ICT in services as well as the taxonomy of services by Soete and Miozzo (1990). These seminal studies stressed that KIBS, compared to others branches of services, form a category of service activity *"which is often highly innovative in its own right, as well as facilitating innovation in other economic sectors, including both industrial and manufacturing sectors"* (Miles et al. 1995). This recognition, in turn, has subsequently stimulated significant research efforts theoretically and empirically.

The second phase provides a deeper empirical analysis of KIBS with regard to two specific questions: (i) do KIBS innovate? and (ii) do KIBS innovate differently from manufacturing? With respect to the first question, the most important development that has contributed to the understanding of the innovation process and innovative patterns has been the implementation of the Community Innovation Survey[3] (CIS). This survey was developed to collect micro-level data on the innovation activities of firms. It includes questions dealing with innovative processes as well as innovative performance. Studies based on CIS data focus mainly on topics such as patterns of innovation and sources of competitiveness (Camacho/Rodriguez 2005; Evangelista 2000; Hollenstein 2003; Tether 2003; Tether/Hipp 2002), innovation and sectoral performance (Cainelli et al. 2004; Cainelli et al. 2006; Evangelista/Savona 2002; Evangelista/Savona 2003), and innovation and inter-firm collaboration (Tether 2003). When addressing KIBS, these papers focus essentially on the innovation activities of KIBS within national frameworks only.

In parallel, scholars have developed their own database based on relatively large scale surveys directed towards KIBS and sub-sectors in order to provide a comprehensive picture of the innovative patterns of KIBS (Balaz 2003; Djellal/Gallouj 2001; Freel 2006; Koch/Stahlecker 2006; Koschatzky 1999; Leiponen 2005; Muller 2001; Tether 2005;

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2 It is important, however, to stress that efforts to explore and research innovation in services have been undertaken from three different perspectives (Coombs/Miles 2000). The first perspective is the 'assimilation approach', which considers that services, and innovation in services, are fundamentally similar to manufacturing and innovation in manufacturing. The second perspective is the 'demarcation approach', which considers services and their innovation activities are highly distinctive from manufacturing and their innovation activities. The third perspective is the 'synthesis approach', which considers that services and manufacturers do not follow entirely different approaches to innovation.

3 The first CIS was performed in 1993 and was then carried out in 1997 and 2001. For more detailed information on the CIS, see Smith (2005).

Wong/Singh 2004). These surveys draw heavily, in style and substance, upon OECD manuals and the CIS methodology. The empirical studies on KIBS are still far from being conclusive regarding the distinctive features of innovation in this sector. However, results from the literature reveal that KIBS are major innovators.

For the question "do *KIBS innovate differently from manufacturing?" there* is recognition that innovative activities in KIBS are distinctive from those in manufacturing firms (Camacho/Rodriguez 2005; Gallaher/Petrusa 2006; Sundbo/Gallouj 2000; Tether 1999; Tödtling et al. 2006). For example, Wong and He (Wong/He 2005) showed that KIBS are more intensively engaged in innovation and training activities than their manufacturing counterparts, but that they are less likely to collaborate with international partners and to perform internal R&D. Similarly, Freel (2006) showed that the innovativeness of KIBS is strongly associated with highly qualified employees and intensive collaboration with local customers and suppliers, compared to manufacturing firms.

3.1.2 Methodology for KIBS analysis

In studying KIBS, researchers employed a wide variety of methods, in particular since analyses dealing with KIBS are not restricted to one single discipline. Scholars designed and used a wide variety of qualitative and quantitative data collection methods.

Qualitative case study work has been concerned mostly with innovative processes. Researchers used both structured and unstructured interview guides to uncover information. Interviews were performed in order to characterise client relationships (Bettencourt et al. 2002), the knowledge transfer process (Larsen 2000; Lindsay et al. 2003) and team-based innovative phenomena within KIBS. Interviews have also been used in a corroborative technique, along with questionnaires, to obtain a deeper understanding of the role of KIBS within the regional economies (Koch/Stahlecker 2006). Case study methods were also employed to obtain data on new service development (Gallaher/Petrusa 2006; van der Aa/Elfring 2002).

Quantitative research has been more concerned with patterns (and varieties) of innovation types, forms and consequences. Descriptive statistics were employed to provide evidence of the nature of innovative activities in KIBS (Camacho/Rodriguez 2005; Evangelista 2000; Tether 2003; Tether/Hipp 2002; Vermeulen et al. 2005; Wong/Singh 2004). Cross-country comparisons related to innovation in KIBS were obtained in a similar manner (McCole/Ramsey 2004; Miozzo/Grimshaw 2005; Tether 2003). Multivariate data analyses were performed, comparing patterns of innovative processes in KIBS and manufacturing firms (Freel 2006; Muller/Zenker 2001; Sirilli/Evangelista 1998; Tödtling et al. 2006; Wong/He 2005). Econometric models, using longitudinal

firm-level data, explored the link between innovation and economic performance of KIBS (Cainelli et al. 2004).

When comparing the two groups of methods, their intellectual added-value differs. In the vast majority of the qualitative studies, the focus was prescriptive in nature, specifying how, and under which conditions, individual KIBS could become more innovative. In contrast, in the vast majority of the quantitative studies, the focus was on innovation patterns, in particular on the influence of specific determinants (such as R&D expenditures, skilled labor, competitive strategies, etc.) on KIBS innovativeness in general.

4 The evolution of the concepts underlying the analysis of KIBS and innovation

When analyzing KIBS, researchers base their investigations on different underlying concepts. One of the major assumptions in this paper is that the way KIBS are seen, studied and perceived by the research community resolutely changed over time and that this evolution can be tracked by observing modifications in the key dimensions associated with the analysis of KIBS. This section examines those changes along three selected key conceptual dimensions: (i) knowledge; (ii) innovation and (iii) spatial proximity.

4.1 Knowledge dimension

As scholars began to consider KIBS as a distinct research topic at the beginning of the 1990s, they most often used terms like "consultancy firms" or "business services" without addressing the "K" for knowledge of KIBS as such. Terms such as "expertise" or "information-rich" were typically employed in order to characterise KIBS. This can be easily recognised when referring, for instance, to Wood et al. (1993: 679) investigating the growth of business services in the UK during the 1980s: "... *the distribution of such services, offering skills and techniques which clients have never developed in-house, has acquired its own dynamic, dependent on the location of other business services as much as other sectors. The 1980s saw an emerging need not just for "information-rich", but for "expertise-rich" environments* ...". At this point in time, KIBS were seen mainly as providers or transferors of specific information for their clients. The definition of KIBS

given by O'Farrel and Moffat (1995: 112) illustrates this perfectly:[4] [KIBS are] "*those services which offer to clients* ***strategic information and expertise*** *which is* ***relatively intangible****, potentially durable in its effects and concurred with problem solving and policy making rather than routine administration*" [emphasis added].

Antonelli (1999) depicted the emergence of KIBS as a result of the institutional formation of an actual market for knowledge. In other words, he argued that a process that increases appropriation of knowledge allows independent firms to specialise in the production of knowledge. This specialisation in the "knowledge field" constitutes – in the views of Antonelli (1999) – the specific mode of production adopted by KIBS. This specific mode is to be opposed to four further modes: i) entrepreneurship; ii) institutional variety; iii) vertical integration; and iv) technological cooperation. Emphasising that "*in such a complex mix, each element is complementary and indispensable*" (Antonelli 1999: 246), Antonelli put forward the concept that "*at the system level, knowledge-intensive business service firms play a major role in augmenting the overall levels of labour productivity, offering each agent access to the technological and scientific information dispersed in the system*" (Antonelli 1999: 254)

This evolution from a vision of KIBS as providing information-based services to the recognition that they provide knowledge-driven services is perceptible in the definition given by Windrum and Tomlinson (1999: 392) of what they call KIS (knowledge-intensive services): "*We define KIS firms as private sector organisations that rely on* ***professional knowledge or expertise*** *relating to a specific* ***technical or functional domain****. KIS firms may be primarily sources of information and knowledge ... or else their services form by intermediate inputs in the products or production processes of other businesses* ..." [emphasis added]. Moreover, these authors stress the fact that manufacturing firms and KIBS are distinct, not only since the former produce artefacts whereas the latter provide services, but also due to the divergent nature of their outputs. In contrast to the outputs of manufacturing firms, which contain a high degree of codified knowledge (they are seen as "commodification of knowledge"), KIBS outputs include a high degree of intangible or tacit knowledge. Consequently KIBS are no longer seen as transferors of specific information but play the role of an interface be-

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4 In the paper by O'Farrel and Moffat (1995), the issue of knowledge is not addressed directly; nevertheless, the authors underline that *"The production and agreement of a written brief prior to service provision may better focus and co-ordinate client and supplier interaction by narrowing the gap between client expectations and supplier perceptions of those expectations."* (O'Farrell/Moffat 1995: 120). This precise statement can be interpreted as a first attempt to describe in a subtle way what may happen in terms of knowledge-related interactions between KIBS and their clients, pointing out notably – without naming it – the possible discrepancy between tacit and codified knowledge.

tween their clients' tacit knowledge base and the wider knowledge base of the economy in providing interactive problem-solving processes.

Going one step further and attempting to adapt the model of organisational knowledge creation of Nonaka and Takeuchi (1995) to KIBS, den Hertog (2000) provided several insights into the interactions taking place between KIBS and their clients. His analysis emphasised the importance of tacit forms of knowledge flows that are at least as important as the codified forms of exchanges taking place during the KIBS-client interactions. The process is described as an enrichment of the knowledge base of the client by confrontation with the knowledge base of the KIBS firm. This definitely means much more than just a transfer of information or the provision of an expertise since, according to den Hertog (2000: 511): "*KIBS can trigger and strengthen processes of knowledge conversion in clients … They can provide new knowledge certainly, but they may also act as catalysts, which help internal communication and knowledge conversion*."

Consequently, doubt can no longer exist about the fact that the knowledge base – and not just the ability to transmit information or to provide expertise – occupies a central place in the literature devoted to the analysis KIBS. Larsen (2001) adopted what he calls a "distributed knowledge system view" presenting the knowledge bases of KIBS as intrinsically linked to the knowledge of their employees. In other words, it is the way the employees of a KIBS interact socially with internal and external colleagues and clients (and form "communities" according to Larsen 2001) that determines its knowledge base and not just the sum of the internally available resources. This, in turn, constitutes a source of radical uncertainty for KIBS: "*The knowledge of the firm is also dispersed, i.e. it is situated in many different places in the firm and no single actor could possibly know of it all*" (Larsen 2001: 84).

Analysing the role knowledge cycles play in the interactions between KIBS and their clients, Muller and Zenker (2001) put forward the hypothesis that these interactions stimulate the generation and diffusion of knowledge within (national and regional) innovation systems. According to their point of view, the appropriation of knowledge by KIBS clients is not the result of a transmission from KIBS to their clients but rather the result of a re-engineering process performed by KIBS in co-operation with their clients. It is the recombination of knowledge previously acquired by KIBS that allows them to create their "own market". This takes the form of an appropriation by clients of this knowledge through integration into their own cognitive context.

This is consistent with the views expressed by Bettencourt et al. (2002), for whom the value-added activities of KIBS consist primarily of the accumulation, creation or dissemination of knowledge for the purpose of developing a customised service to satisfy

clients' needs. For these authors, KIBS are confronted with the necessity to "educate" their clients and not just to "inform" them about the meaning and contents of the provided services. Their main thesis is that clients play a critical role in helping KIBS to co-create or co-produce the knowledge-based service solution: "*Clients' contribution to the service delivery process is integral to service success, affecting both the quality of the service output and, ultimately, clients satisfaction with the service solution provided*" (Bettencourt et al. 2002: 100). In the same line of reasoning, Wood (Wood 2002: 994) stresses that KIBS "… *often offer strategically significant technical or organisational knowledge that client staff do not possess,* ***or could not exploit without*** *consultancy support*" [emphasis added].

Summarising, changes in the ways scholars perceive and analyse the knowledge content of KIBS activities can be tracked. KIBS were initially mainly seen as providing a one-directional "transfer of specialised information" to their clients. In a later stage, it became widely acknowledged that KIBS were not only knowledge suppliers but that the knowledge in question resulted from a co-production process intimately involving their clients.

4.2 Innovation dimension

Early in the 1990s Wood et al. (1993: 698) alluded to the innovative influence KIBS may have on their clients: *"The business service sector now exerts a* ***significant independent and innovative influence*** *on how other businesses gain access to key expertise .... The growing scale and diversity of business services activities reflects a modern mode of operation in which small, high-expertise-based companies play a key role, whatever the efforts of large organisations to dominate some parts of the market"* [emphasis added]. Nevertheless, their focus was limited to the reinforcement or strengthening of KIBS clients' innovation capacities only. KIBS were not seen as potentially innovative in themselves. A similar view can be found in O'Farrell and Moffat (1995) for whom "strategic business services" generated intermediate impacts with the potential to enhance client firm added value and competitive advantage. The innovative contribution of KIBS was also defined in reference to their clients. The inherent logic of the analysis[5] is that the performance of a service corresponds intrinsically to the performance of an activity by an economic unit for the benefit of another in such a way as to **change** the condition of the latter. Consequently the quantities of services produced – and in the present case the impact of services provided by KIBS to their clients – must be measured by considering the **extent of changes** within the consumers of

5 This analysis refers to Hill (1977) and O'Farell and Moffat (1995).

those services (i.e. client firms) and not by observing the activity of the (service) producer (i.e. KIBS). In other words, importance was clearly given at this stage to the changes KIBS services provoke, not to the fact that the services provided by KIBS or KIBS themselves may evolve or change.

But gradually, the vision of KIBS in the literature has evolved from contributors to or facilitators of (manufacturing) innovative changes to co-producers of innovation. In particular, den Hertog (2000) – stressing the almost symbiotic relationship between KIBS and client firms - pointed to the significance of such non-technological factors in innovation as new service concepts, client interfaces and service delivery systems. In addition, he developed a generic model of service innovation that he applied to the case of KIBS. As a result of this analysis, den Hertog (2000) saw KIBS as (i) facilitators; (ii) carriers; and (iii) sources of innovation.

Since then, scholars have considered KIBS as true innovators. For instance, Larsen (Larsen 2001) found empirical evidence for Denmark showing that i) KIBS are more innovation oriented compared to firms of all service sectors taken as a whole; and ii) that there is a relation, considering KIBS, between high levels of internationalisation and high levels of innovation activities. Similarly, and at the same time, Muller and Zenker (2001) investigated empirically the innovation activities of French and German KIBS and SMEs (small end medium-sized manufacturing firms). As a result they put forward the hypothesis of a virtuous innovation circle linking SMEs and KIBS, to be understood as: "… *a circle made virtuous through the knowledge generating, processing and diffusing function KIBS fulfil within innovation systems"* (Muller/Zenker 2001: 1514). In both analyses, the authors recognised explicitly that KIBS do not just contribute to the innovation capacities of their clients but that they are innovative by themselves.

Drawing on empirical evidence from a large scale survey, Tether and Hipp (2002) examined patterns of innovation and sources of competitiveness amongst German service firms, notably KIBS. According to their findings KIBS differ radically from other services when considering innovation issues: "*KIBS firms tended to spend significantly more on innovation (per employee) than did their less knowledge intensive counterparts, suggesting a considerably greater relative commitment to innovation amongst the knowledge intensive firms*" (Tether/Hipp 2002: 173). Moreover, distinguishing between what they call "*high knowledge intensity* ***technical*** *service firms*" and "*high knowledge intensity* ***other*** *service firms*", they observed that R&D appears to be particularly important for technical KIBS compared to non-technical KIBS as a component of their innovation expenditures. At the same time, as evidence of further patterns of investments related to innovation, if KIBS tend to spend more on ICT than services in

general (per employee), they tend to invest **less** (per employee) in new machinery and equipment than services in general.[6] Finally, observing that KIBS earn a considerably larger proportion of their income from tailored services than services generally, these authors emphasised the high degree of "customisation" in the output of service firms. This seems to be especially true amongst the knowledge intensive and technical service firms, whose innovation activities are also relatively more oriented to product innovation.

Considering that services are typically involved in changing the state of people, artefacts, or of information and knowledge, rather than (primarily) producing artefacts themselves (Miles 2005), and that the value of services is primarily to be judged by their effects on the user rather than how they are produced (Wood 2005), converging conclusions may be reached. According to Wood (2005), service functions **sometimes led and sometimes followed** significant changes in other goods- and services-based functions, depending broadly on the comparative utility of their key expertise to their clients. "*Significant competitive change in a service-based economy never depends on a **single input**, but always on a **conjunction of expertise** in and between various phases of production: not just technological, but also creative, managerial, financial, human resource, logistical, marketing and regulatory expertise*" (Wood 2005: 431) [emphasise added]. Whereas, Miles (Miles 2005) clearly considered KIBS as drivers of development and not just as accompanying entities of their clients in noting that "*Since KIBS' growth is much faster than that of other sectors, it cannot just be driven by the growth of those sectors that are users of KIBS*" (Miles 2005: 43).

Summarising, a shift in the vision of KIBS by scholars with regards to innovation activities can be tracked. Initially, KIBS were seen as accompanying entities supporting their clients' innovation processes and adopting from time to time technologies developed elsewhere. Lately, they have been recognised as innovators and carriers of change on behalf of – and in cooperation with – their clients.

4.3 Spatial dimension

The acknowledgement of the obvious propensity of KIBS to concentrate in metropolitan areas constitutes the first step in the analysis of the relationships between their activi-

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6 Noting that KIBS were more likely to identify external sources of information and were also more likely to engage in co-operative arrangements for innovation than services firms in general, they remarked "*However, given the prominence attached to interactions in the innovation literature, it is perhaps surprising that external sources of information were not more widely recognised as important for innovation*..." (Tether/Hipp 2002: 178).

ties and their spatial distribution (Wood et al. 1993). For example, they found that "*London had ten times the number of such jobs found in the next largest cities, greater Manchester and Birmingham .... In general, inner London was the headquarters focus for the larger management and other consultancy organisations, operating internationally, with a growing number of branches in provincial cities*" (Wood et al. 1993: 678).

In parallel, investigating empirically how much the location of KIBS clients influences the impact of the services provided, O'Farell and Moffat (1995) could not detect significant regional differences. Empirical research performed to assess the performance of client manufacturing plants in two regions, Scotland and the southeast of England, did not reveal significant interregional differences, indicating that in this respect space may not matter. An explanation can be found when turning to Antonelli (1999: 254) who asserted that: "*The remote access to knowledge-intensive business services made possible by new information and communication technologies, give these firms a global scope of action … so that multinational knowledge-intensive business service firms can gradually emerge, combining the advantages of proximity and variety*".

Nevertheless, this assumption was challenged by Koschatzky (1999) who put forward the hypothesis that KIBS innovation activities also reflect their ability to interact with their partners and that these phenomena are not spatially neutral. He suggests the existence of a relationship between the innovation intensity of a firm, its integration in networks and the spatial range of its interactions. With the help of a probit model, two samples of firms (i.e. manufacturing companies and KIBS) were investigated in different regions of Germany. As a result of the analysis, some major findings with regards to KIBS can be identified. First of all, local innovation networking appears to be more important for KIBS than for manufacturing firms. "*In general, spatial distance between co-operation patterns matters, more in advisory services, while spatial proximity in the interaction with technical services is not a given precondition for networking*" (Koschatzky, 1999, p. 752). Secondly, ties between innovating KIBS and research institutes appear as mainly of an interregional nature, contrary to the close regional links with manufacturing firms: "*Looking at the network relations with other services and research institutes innovation intensive service firms exhibit a stronger tendency towards interregional than intraregional networking*" (Koschatzky 1999: 753). Finally, and probably most important in order to understand the influence of space on KIBS activities, interregional differences in networking behaviour exist in such a way that firms in central regions show a higher probability for interregional interactions, while in rural areas intraregional contacts dominate.

In a similar way, Muller and Zenker (2001) underlined also the empirically perceptible influence of proximity, location and regional and national innovation systems on the

propensity of KIBS to interact, on their knowledge-related activities and more generally on their innovation capacities. Assuming consequently that space must have an influence in this respect on KIBS activities, they referred to Héraud (2000: 4), asserting that: *"There is an apparent paradox in the new knowledge-based economy: to a certain extent, the trend of de-materialisation and the development of the techniques of communication should help the creative networks to get rid of distance; but at the same time it appears that complex cognitive processes need not only large flows of codified scientific and technical information, but also a lot of tacit knowledge for using and interfacing that information. Then proximity does matter, since building common tacit knowledge implies close contacts, at least at the beginning."*

Keeble and Nachum (2002) provided an analysis of national and regional patterns of KIBS characteristics in the UK, with the help of a detailed survey of 300 small and medium-sized KIBS located in central London, East Anglia and southwest England. Starting from the evidence of the geographic concentration (or clustering) of KIBS and of the existence of "counterparts" (i.e. decentralised localisation of KIBS in small towns and rural regions of southern Britain), they tried to answer the main question: why do KIBS cluster? It appears from their analysis that KIBS operating in central London differ significantly from their decentralised counterparts (displaying in particular a much higher level and intensity of global activity). Keeble and Nachum (2002) interpreted the clustering of KIBS as a consequence of the need for and benefits of proximity and accessibility to clients (in London itself as well as on a global scale). At the same time, the survey results provided strong evidence of the existence and importance of localised processes of "collective learning" and networking involving KIBS. Finally, the high rates of spin-offs of new firms from existing local businesses in London reinforce the idea that "space does in fact matter" for KIBS.

In a very similar way, Wood (2002) addressed the issue of the existence of specifically urban benefits by focusing on major consultancy firms in the UK. For him, KIBS (and particularly large ones) gradually strengthen the "global" rather than the "local" attributes of cities: "*The key dimension of urban advantage lies in the quality of the national and, increasingly, the international exchanges to which they give access*" (Wood 2002: 999). This results in particular from the growing importance of multinational clients for (international) KIBS. Here the link can be made between concentration, geographic range and innovativeness of KIBS by referring to Czarnitzki and Spielkamp (2003: 23), who asserted that: "*The export-ratio of business services is an indicator for market success as well as internationalisation. The analysis reveals that business services with more organised or continual innovative behaviour have significantly higher export activities than firms that do not innovate or undertake R&D in a systematic way*."

According to Wood (2005) a knowledge-based regional polarisation is currently taking place, in which KIBS play a pivotal role. Locations of KIBS mirror a **corporate-dominated** knowledge infrastructure. KIBS in core regions innovate by reinforcing clients' own capacities to connect to international business intelligence and methods: "*More generally ... the greatest benefits of knowledge-intensive interdependence are to be found in major city regions, especially those with significant global roles. Here, the likelihood of internationally successful market innovation is maximised, arising from the conjunction of commercial, manufacturing, trading, business, consumer and public sector activities*" (Wood 2005: 438).

Recently, Koch and Stahlecker (2006) investigated the interrelationships between KIBS foundations and their respective innovation and production systems in three German metropolitan regions (Bremen, Munich and Stuttgart). They stressed that, especially in the early stages of the development of newly founded KIBS, geographical proximity to their suppliers and clients seems to play a crucial role. In addition, they showed that the structure and the configuration of the regional knowledge base could play an important role in the growth of these newly founded firms. They stressed that: "*depending on the specific techno-economic and institutional structure, regions can be seedbeds or incubators for the foundation of KIBS. Key factors of the foundation activities (i.e. quantity, dynamic, quality) in this particular sector relate to the quality of regional bound entrepreneurial 'social' networks and - with regard to the function of KIBS within innovation systems – the structure and configuration of the regional knowledge potential*" (Koch/Stahlecker 2006: 129).

Summarizing, compared to the knowledge and innovation key conceptual dimensions, it is more difficult to identify a shift related to the spatial dimension in KIBS analysis. So far, researchers mainly have attempted to analyze the location of KIBS and the factors explaining their growth.

5 Conclusion: towards a fusion of concepts?

In light of the three key conceptual dimensions, (i) knowledge, (ii) innovation and (iii) spatial proximity, selected for the literature analysis, the following findings can be highlighted. An evolution in the way scholars perceive and analyse the knowledge content of KIBS activities can be tracked. KIBS were initially mainly seen as providing a "transfer of specialised information" to their clients. Nevertheless, a succession of reflections and analyses led to an evolution in this perception. KIBS are now acknowledged to allow a change of state of their clients in knowledge terms. The services they perform can ultimately be seen as leading to a kind of "fusion" of the respective knowledge bases of KIBS and the clients. Moreover, a shift can be identifed in how innnovation

activities within KIBS have been perceived and analyzed. Initially, innovation in KIBS was seen solely as the adoption of technologies developed by the the manufacturing sector. Then, it was recognised that KIBS may have a major influence on their clients' innovative capacities. Recently, KIBS have been recognised as actors innovating by themselves – in relation to their clients – and for themselves as well as for their clients. With respect to the third key conceptual dimension, i.e. the spatial dimension, researchers have mainly attempted, so far, to analyse the location of KIBS and the factors explaining their growth. However, this dimension has been, compared to the other two, an approach that has been explored less in the current literature.

The analysis performed of the evolution of the key dimensions on which scolars based their analysis of KIBS suggests several areas of research that could improve the understanding of KIBS. The three key conceptual dimensions, (i) knowledge; (ii) innovation and (iii) spatial proximity, are intimately interrelated. The major implication for future research and policy developments resulting from this review is that by now the concepts underlying the analysis of KIBS are somehow converging. This is consistent with the views developed by Miles (2005) who asserted that KIBS allow innovation by fusing generic and local knowledge together: "*In many ways, what they [KIBS] are doing is locating, developing, combining and applying various types of generic knowledge about technologies and application to the local and specific problems, issues and contexts of their clients ... they are involved in a process of fusing generic and local knowledge together*" (Miles 2005: 45).

With respect to future research in the field of KIBS, it seems clear from this paper that one of the main challenges is to sort out more systematically the relationship between the three key dimensions investigated, in particular the roles and functions of KIBS in creating and diffusing knowledge and fostering regions as innovation systems. As stated by Doloreux (2002: 259): "*we do not know much about how these sectors are involved in the functioning of [Regional Innovation] systems and how they interact with knowledge-based firms … we do not know which services are the most vital to the system… [and whether this] varies according to regions*". Two avenues of research seem promising in this respect. The first one considers the contribution of KIBS to the success – or failure – of regional innovation systems. In particular, it would seem helpful to develop more precise statements about the role of KIBS in innovative regions in analysing institutional conditions and mechanisms that affect the development of appropriate forms of governance and policies that foster KIBS activities. The second field of further research consists of promoting a deeper understanding of the role of specific ("talented") individuals within KIBS. These individuals could possibly be called "knowledge angels" due to their suspected (but until now not demonstrated) influence in terms of knowledge generation and circulation. The investigation of their individual con-

tributions to innovation processes supported by KIBS as well as to the ones taking place within KIBS in different socio-cultural contexts could provide new elements allowing a better understanding of how and why knowledge, innovation and spatial proximity are interrelated.

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